What's in my ink: an analysis of commercial tattoo ink on the US market.

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1. Summary Tables

Table S1. Summary of carrier solution composition determined by NMR and GC-MS

Brand	Name	Reported Composition	Observed Composition
Intenze	Bright Red	water, glycerol, isopropyl alcohol, Hamamelis Virginiana extract	isopropyl alcohol, ethanol, water, glycerol, propylene glycol, one unidentified component (Figure S3-5)
	Lemon Yellow	water, glycerol, isopropyl alcohol, Hamamelis Virginiana extract	isopropyl alcohol, ethanol, water, propylene glycol
	Light Green	water, glycerol, isopropyl alcohol, Hamamelis Virginiana extract	isopropyl alcohol, ethanol, water, propylene glycol
	Mario's Blue	water, glycerol, isopropyl alcohol, Hamamelis Virginiana extract	water, ethanol, glycerol, isopropyl alcohol
	Snow White Opaque	water, glycerol, isopropyl alcohol, Hamamelis Virginiana extract	ethanol, water, glycerol, propylene glycol, higher alkane
	True Black	water, glycerol, isopropyl alcohol, Hamamelis Virginiana extract	glycerol, water, ethanol
Solid Ink	Red	water, glycerol, isopropyl alcohol, Hamamelis Virginiana extract	glycerol, isopropyl alcohol, water, poly(ethylene glycol)
	Yellow	water, glycerol, isopropyl alcohol, Hamamelis Virginiana extract	glycerol, isopropyl alcohol, water, poly(ethylene glycol)
	Medium Green	water, glycerol, isopropyl alcohol, Hamamelis Virginiana extract	isopropyl alcohol, water, propylene glycol, glycerol, poly(ethylene glycol)
	Nice Blue	water, glycerol, isopropyl alcohol, Hamamelis Virginiana extract	isopropyl alcohol, water, propylene glycol, glycerol, poly(ethylene glycol), multiple unidentified components (Figure S80-84)
	White	water, glycerol, isopropyl alcohol, Hamamelis Virginiana extract	propylene glycol, 1-butanol, isopropyl alcohol, water, one unidentified component (Figure S85-86)
	Lining Black	water, glycerol, isopropyl alcohol, Hamamelis Virginiana extract	isopropyl alcohol, ethanol, water
World Famous	Paul Rogers Red	water, isopropyl alcohol, rosin, Hamamelis Virginia extract, benzyl alcohol, glycerol	isopropyl alcohol, ethanol, water, benzyl alcohol, glycerol, poly(ethylene glycol)
	Great Wall Yellow	water, isopropyl alcohol, rosin, Hamamelis Virginia extract, benzyl alcohol, glycerol	isopropyl alcohol, water, benzyl alcohol, glycerol, poly(ethylene glycol), higher alkane
	Northern Lights Green	water, isopropyl alcohol, rosin, Hamamelis Virginia extract, benzyl alcohol, glycerol	isopropyl alcohol, ethanol, water, benzyl alcohol, glycerol, propylene glycol, poly(ethylene glycol)
	Nile River Blue	water, isopropyl alcohol, rosin, Hamamelis Virginia extract, benzyl alcohol, glycerol	isopropyl alcohol, ethanol, water, benzyl alcohol, glycerol, poly(ethylene glycol)
	White House	water, isopropyl alcohol, rosin, Hamamelis Virginia extract, benzyl alcohol, glycerol	isopropyl alcohol, ethanol, water, benzyl alcohol, glycerol, propylene glycol, poly(ethylene glycol)
	Pitch Black	water, isopropyl alcohol, rosin, Hamamelis Virginia extract, benzyl alcohol, glycerol	isopropyl alcohol, water, benzyl alcohol, glycerol, poly(ethylene glycol), one unidentified component (Figure S135-136)
Dynamic	Fire Red	water, isopropyl alcohol	isopropyl alcohol, water
	Canary Yellow	water, isopropyl alcohol	isopropyl alcohol, water
	Green	water, isopropyl alcohol	isopropyl alcohol, water
	Blue	water, isopropyl alcohol	isopropyl alcohol, water

	White	water, isopropyl alcohol	isopropyl alcohol, water
	Black	water, isopropyl alcohol	isopropyl alcohol, water
Starbrite	Scarlet Red	water, isopropyl alcohol	isopropyl alcohol, water, 1-butanol, poly(ethylene glycol), one unidentified component (Figure S171-173)
	Canary Yellow	water, isopropyl alcohol	water, isopropyl alcohol, BHT, poly(ethylene glycol)
	Lime Green	water, isopropyl alcohol	isopropyl alcohol, water, poly(ethylene glycol)
	Country Blue	water, isopropyl alcohol	water, isopropyl alcohol, propylene glycol, poly(ethylene glycol), higher alkane, one unidentified component (Figure S164-167)
	Brite White	water, isopropyl alcohol	water, isopropyl alcohol, propylene glycol, higher alkane, one unidentified component (Figure S184-186)
	Jet Black Outline	water, isopropyl alcohol	isopropyl alcohol, water, hexamethylenetetramine, poly(ethylene glycol)
Mom's Millennium	Monthly Red	water, glycerol, ethanol, DMDM Hydantoin	isopropyl alcohol, ethanol, water, glycerol, poly(ethylene glycol)
	Hello Yellow	water, glycerol, DMDM Hydantoin	isopropyl alcohol, water, ethanol, glycerol, poly(ethylene glycol)
	Ectoplasmic Green	water, glycerol, ethanol, DMDM Hydantoin	ethanol, isopropyl alcohol, water, benzyl alcohol, glycerol, poly(ethylene glycol), multiple unidentified components (Figure S209-211)
	Blue Balls	water isopropyl alcohol, glycerol, DMDM Hydantoin	isopropyl alcohol, water, ethanol, glycerol, poly(ethylene glycol)
	Power White	water, isopropyl alcohol, glycerol, DMDM Hydantoin	ethanol, water, isopropyl alcohol, benzyl alcohol, glycerol, poly(ethylene glycol), one unidentified component (Figure S214-216)
	Black Onyx	water, glycerol, DMDM Hydantoin	ethanol, isopropyl alcohol, water, glycerol, poly(ethylene glycol)
Solong	Bright Red	water, glycerol, isopropyl alcohol	water, ethanol, isopropyl alcohol, glycerol, benzyl alcohol, 2-phenoxyethanol, poly(ethylene glycol), higher alkane
	Lemon Yellow	water, glycerol, isopropyl alcohol	water, ethanol, isopropyl alcohol, glycerol, benzyl alcohol, 2-phenoxyethanol, higher alkane, one unidentified component (Figure S243-244)
	Light Green	water, glycerol, isopropyl alcohol	isopropyl alcohol, ethanol, water, benzyl alcohol, 2-phenoxyethanol, glycerol, propylene glycol, poly(ethylene glycol)
	Mario's Blue	water, glycerol, isopropyl alcohol	water, ethanol, isopropyl alcohol, glycerol, benzyl alcohol, 2-phenoxyethanol
	Snow White Opaque	water, glycerol, isopropyl alcohol	isopropyl alcohol, ethanol, water, benzyl alcohol, 2-phenoxyethanol, glycerol
	True Black	water, glycerol, isopropyl alcohol	benzyl alcohol, ethanol, water, isopropyl alcohol, glycerol, 2-phenoxyethanol, multiple

			unidentified components (Figure S2560-259)
One Tattoo World	Bright Red	water, glycerol, alcohol	ethanol, water
	Lemon Yellow	water, glycerol, alcohol	ethanol, water
	Light Green	water, glycerol, alcohol	ethanol, water, 1-propanol
	Mario's Blue	water, glycerol, alcohol	ethanol, water, 1-propanol
	Snow White Opaque	water, glycerol, alcohol	ethanol, water
	True Black	water, glycerol, alcohol	ethanol, water
Raw Ink	Light Red	water, witch hazel, alcohol	ethanol, water, poly(ethylene glycol)
	Light Yellow	water, witch hazel, alcohol	ethanol, water, glycerol, propylene glycol, benzyl alcohol, poly(ethylene glycol)
	Green	water, witch hazel, alcohol	ethanol, water, glycerol, propylene glycol, poly(ethylene glycol), one unidentified component (Figure S318-319)
	Sky Blue	water, witch hazel, alcohol	ethanol, water, glycerol, poly(ethylene glycol), one unidentified component (Figure S322-323)
	White	water, witch hazel, alcohol	ethanol, water, propylene glycol, higher alkane, two unidentified components (Figure S332-343)
	Pitch Black	water, witch hazel	ethanol, water, glycerol, poly(ethylene glycol)

Table S2. Summary of pigments observed by Raman spectroscopy and XRF

Brand	**Name**	**Listed Pigments**	**Pigments Observed by Raman**	**Elements Observed by XRF (Likely pigment in parentheses)**
Intenze	Bright Red	Pigment Red 254	Pigment Red 254	
	Lemon Yellow	Pigment Yellow 14, Pigment White 6, barium sulfate	Pigment Yellow 14	
	Light Green	Pigment Yellow 14, Pigment Blue 15, Pigment White 6, barium sulfate	Pigment Green 7	Ti (Pigment White 6), Cu (Pigment Green 7)
	Mario's Blue	Pigment Blue 15	Pigment Blue 15	Cu (Pigment Blue 15)
	Snow White Opaque	Pigment White 6, barium sulfate	Pigment White 6	Ti (Pigment White 6)
	True Black	carbon black	carbon black	
Solid Ink	Red	no pigment listed	Pigment Red 254	
	Yellow	no pigment listed	Pigment Yellow 74	Ti (Pigment White 6)
	Medium Green	no pigment listed	Pigment Green 7	Ti (Pigment White 6), Cu (Pigment Green 7)
	Nice Blue	no pigment listed	Pigment Blue 15	Ti (Pigment White 6)
	White	no pigment listed	Pigment White 6	Ti (Pigment White 6)
	Lining Black	no pigment listed	carbon black	
World Famous	Paul Rogers Red	Pigment Red 170	Pigment Red 170	

	Great Wall Yellow	Pigment Yellow 14	Pigment Yellow 14	
	Northern Lights Green	Pigment Yellow 14, Pigment White 6	Pigment Green 7, Pigment Yellow 14	Ti (Pigment White 6)
	Nile River Blue	Pigment Blue 15, Pigment White 6	Pigment Blue 15	Cu (Pigment Blue 15)
	White House	Pigment White 6	Pigment White 6	Ti (Pigment White 6
	Pitch Black	carbon black	carbon black	
Dynamic	Fire Red	Pigment Red 210	Pigment Red 210	
	Canary Yellow	Pigment Yellow 74	Pigment Yellow 74	
	Green	Pigment Green 7	Pigment Green 7	Cu (Pigment Green 7)
	Blue	Pigment Blue 15	Pigment Blue 15	Cu (Pigment Blue 15)
	White	Pigment White 6	Pigment White 6	Ti (Pigment White 6)
	Black	carbon black	carbon black	
Starbrite	Scarlet Red	Pigment Red 210	Pigment Red 210	
	Canary Yellow	Pigment Yellow 74	Pigment Yellow 74	
	Lime Green	Pigment Green 7, Pigment Yellow 74	Pigment Green 7, Pigment Yellow 74	
	Country Blue	Pigment Blue 15, Pigment White 6	Pigment Blue 15	Ti (Pigment White 6), Cu (Pigment Blue 15)
	Brite White	Pigment White 6	Pigment White 6	Ti (Pigment White 6)
	Jet Black Outline	carbon black	carbon black	
Mom's Millennium	Monthly Red	Pigment Red 170	Pigment Red 170	
	Hello Yellow	Pigment Yellow 14	Pigment Yellow 14	
	Ectoplasmic Green	Pigment Green 7, Pigment Yellow 14, Pigment White 6	Pigment Green 7, Pigment Yellow 14	Cu (Pigment Green 7), Ti (Pigment White 6)
	Blue Balls	Pigment Blue 15	Pigment Blue 15	Cu (Pigment Blue 15)
	Power White	Pigment White 6	Pigment White 6	Ti (Pigment White 6)
	Black Onyx	carbon black	carbon black	
Solong	Bright Red	Pigment Red 210, Pigment Yellow 65, Pigment Orange 13	Pigment Red 112	
	Lemon Yellow	Pigment Red 210, Pigment Yellow 65, Pigment Orange 13	Pigment Yellow 74	
	Light Green	Pigment Red 210, Pigment Yellow 65, Pigment Orange 13	Pigment Blue 15	Ti (Pigment White 6), Cu (*unclear*)
	Mario's Blue	Pigment Red 210, Pigment Yellow 65, Pigment Orange 13	Pigment Blue 15	Cu (Pigment Blue 15)
	Snow White Opaque	Pigment Red 210, Pigment Yellow 65, Pigment Orange 13	Pigment White 6	Ti (Pigment White 6)
	True Black	Pigment Red 210, Pigment Yellow 65, Pigment Orange 13	carbon black	
One Tattoo World	Bright Red	no pigment listed	Pigment Red 170	
	Lemon Yellow	no pigment listed	Pigment Yellow 74	Ti (Pigment White 6), Zn

	Light Green	no pigment listed	Pigment Green 7	Cu (Pigment Green 7)
	Mario's Blue	no pigment listed	Pigment Blue 15	Ti (Pigment White 6), Cu (Pigment Blue 15)
	Snow White Opaque	no pigment listed	Pigment White 6	Ti (Pigment White 6)
	True Black	no pigment listed	carbon black	
Raw Ink	Light Red	Pigment Red 266, Pigment Yellow 180	Pigment Red 254	
	Light Yellow	Pigment Yellow 180, Pigment White 6	Pigment Yellow 74	Ti (Pigment White 6)
	Green	Pigment Green 36, Pigment Yellow 180, Pigment White 6	Pigment Green 7	Ti (Pigment White 6), Cu (Pigment Green 15)
	Sky Blue	Pigment Blue 15, Pigment White 6	Pigment Blue 15	Ti (Pigment White 6), Cu (Pigment Blue 15)
	White	Pigment White 6	Pigment White 6	Ti (Pigment White 6)
	Pitch Black	carbon black	carbon black	

Table S3. Identifying information of tattoo inks analyzed

Brand	**Name**	**Ref. Number**	**Batch Number**	**Lot Number**
Intenze	Bright Red	1036C0722E24120781	RNR007RRD006IMX40	SS318
	Lemon Yellow	1053C0322K11100081	RHCY014RW024IMX40	SS321
	Light Green	1053C01522F1780483	RHCY013RW023RGR007IMX40	SS318
	Mario's Blue	1053C01322F23120126	RB007IMX40	SS318
	Snow White Opaque	1036C00121L04093349	RW019IMX40	SS312
	True Black	1036C01921I28090663	RHBK00IMX40	SS309
Solid Ink	Red			06.07.22
	Yellow			05.24.22
	Medium Green			05.25.22
	Nice Blue			06.09.22
	White			06.09.22
	Lining Black			06.02.22
World Famous	Paul Rogers Red	WFPRR1		WFPRR21722
	Great Wall Yellow	WFGWY1		WFGWY19661
	Northern Lights Green	WFNLG1		WFNLG20996
	Nile River Blue	WFNRB1		WFNRB26608
	White House	WFWH1		WFWH27038
	Pitch Black	WFPB1		WFPB33317
Dynamic	Fire Red			52024080
	Canary Yellow			52020180
	Green			52021070
	Blue			52027260

	White			52027270
	Black			52026270
Starbrite	Scarlet Red			SR107686
	Canary Yellow			
	Lime Green			
	Country Blue			CB147429
	Brite White			BW128483
	Jet Black Outline			
Mom's Millennium	Monthly Red			MMR6035
	Hello Yellow			MHY8192
	Ectoplasmic Green			MEG6031
	Blue Balls			MBB3415
	Power White			MPW8198
	Black Onyx			MBO8199
Solong	Bright Red	1036MROB	SL2GEN17F89	
	Lemon Yellow	1036MROB	SL2GEN17F89	
	Light Green	1036MROB	SL2GEN17F89	
	Mario's Blue	1036MROB	SL2GEN17F89	
	Snow White Opaque	1036MROB	SL2GEN17F89	
	True Black	1036MROB	SL2GEN17F89	
One Tattoo World	Bright Red			
	Lemon Yellow			
	Light Green			
	Mario's Blue			
	Snow White Opaque			
	True Black			
Raw Ink	Light Red			RUC330
	Light Yellow			RUB99
	Green			RUB321
	Sky Blue			RO122
	White			RUB32
	Pitch Black			RO122

2. Intenze Inks

1.1 NMR Data

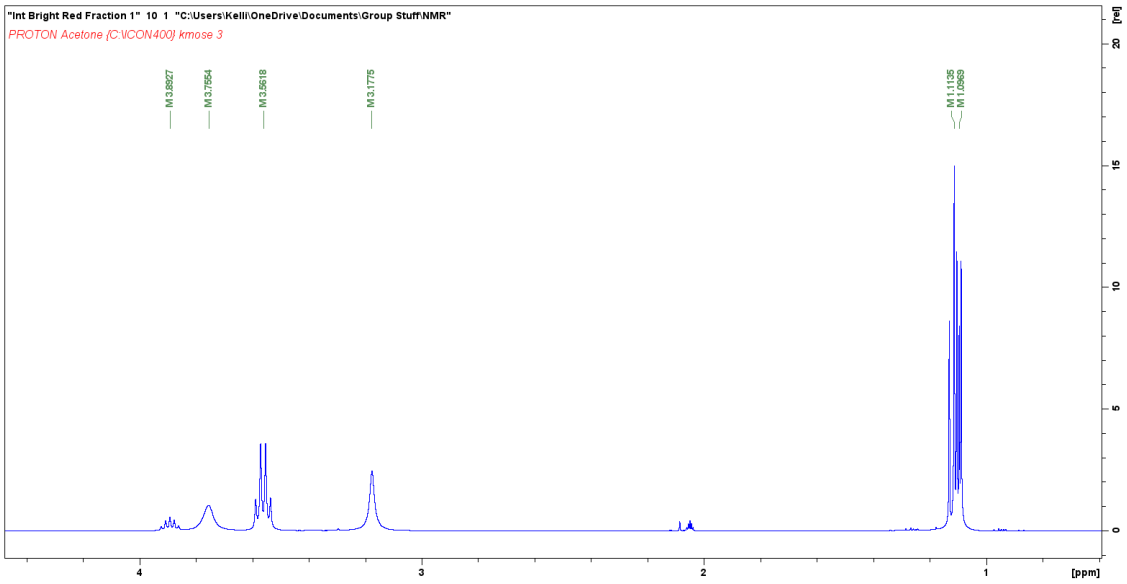

Figure S1. *^{1}H NMR spectrum of Intenze Bright Red distillate in acetone-d6*

Signals from ethanol appear at δ1.135 ppm (triplet) and δ3.5618 ppm (quartet) while signals from isopropanol appear at δ1.0969 ppm (doublet) and δ3.8927 ppm (septet). Broad peaks at δ3.1775 ppm and δ3.7554 ppm can be attributed to water and the hydroxyl hydrogen of isopropanol, respectively. Due to overlapping signals upfield, J-couple constants (6.10 Hz for isopropanol and 7.00 Hz for ethanol) were used to confirm the presence of both isopropanol and ethanol. The solvent peak for acetone-d6 is at δ2.05 ppm.

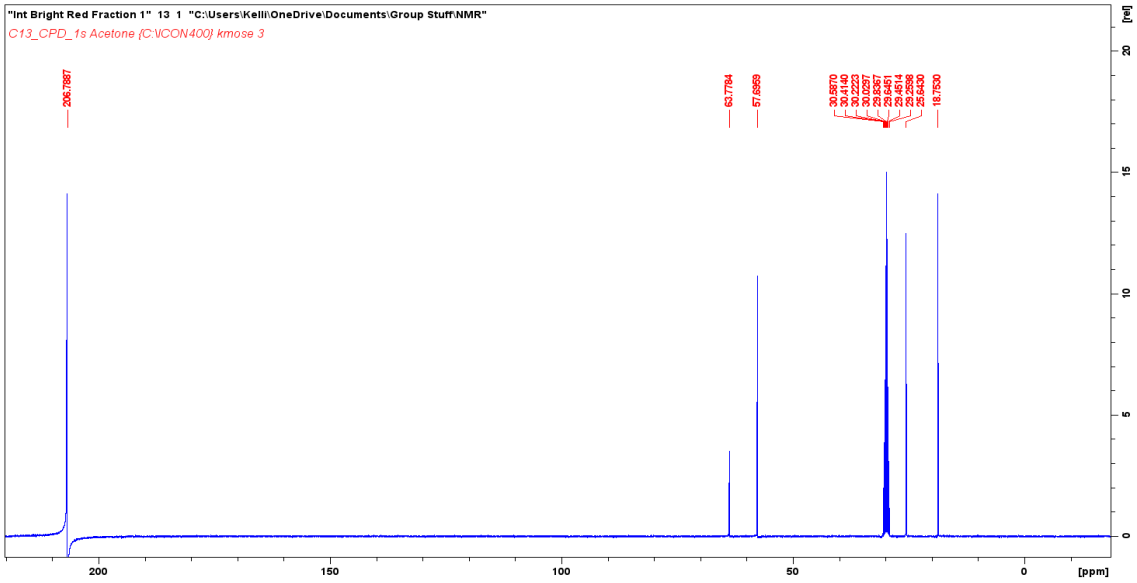

Figure S2. *^{13}C NMR spectrum of Intenze Bright Red distillate in acetone-d6*

Signals at δ18.7530 ppm and δ57.6959 ppm correspond with ethanol while signals at δ25.6430 ppm and δ6.7784 ppm correspond to isopropyl alcohol. The solvent peak for acetone is centered around δ29.84 ppm.

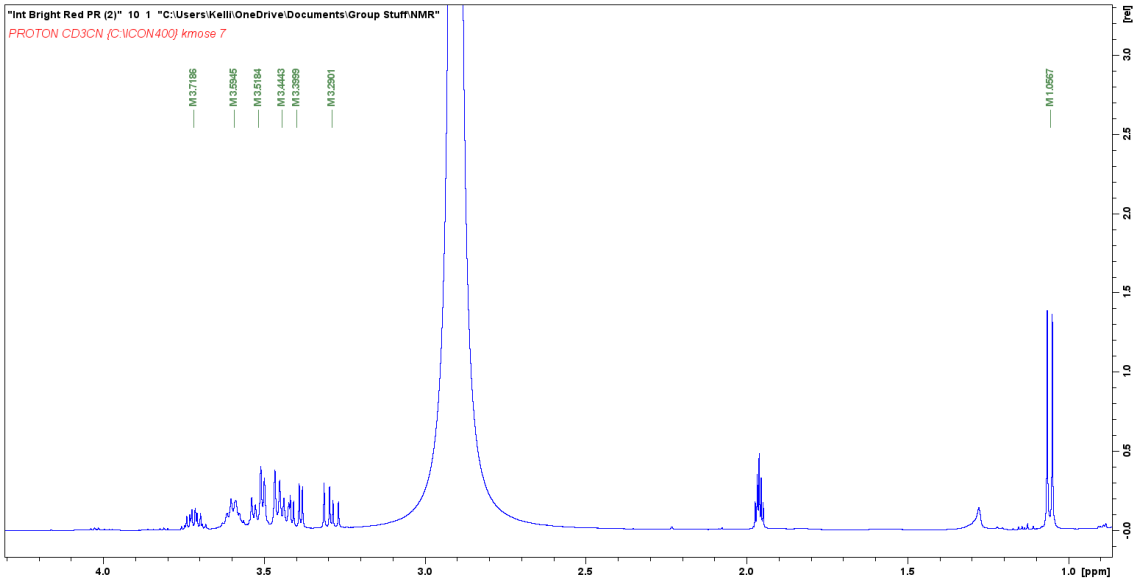

Figure S3. *^{1}H NMR spectrum of Intenze Bright Red pot residue in acetonitrile-d3*

Signals consistent with propylene glycol appear at δ1.0567 ppm (doublet), δ3.7186 ppm (multiplet), δ3.3999 ppm (multiplet), and δ3.2901 ppm (multiplet) while signals from signals from glycerol appear at δ3.5945 ppm (multiplet), δ3.5184 ppm (multiplet), and δ3.4443 ppm (multiplet). ^{1}H-^{1}H COSY was used to confirm the coupling between hydrogen signals. The broad signal at δ1.275 ppm likely is produced by a long-chain hydrocarbon, The acetonitrile solvent peak is located at δ1.94 ppm.

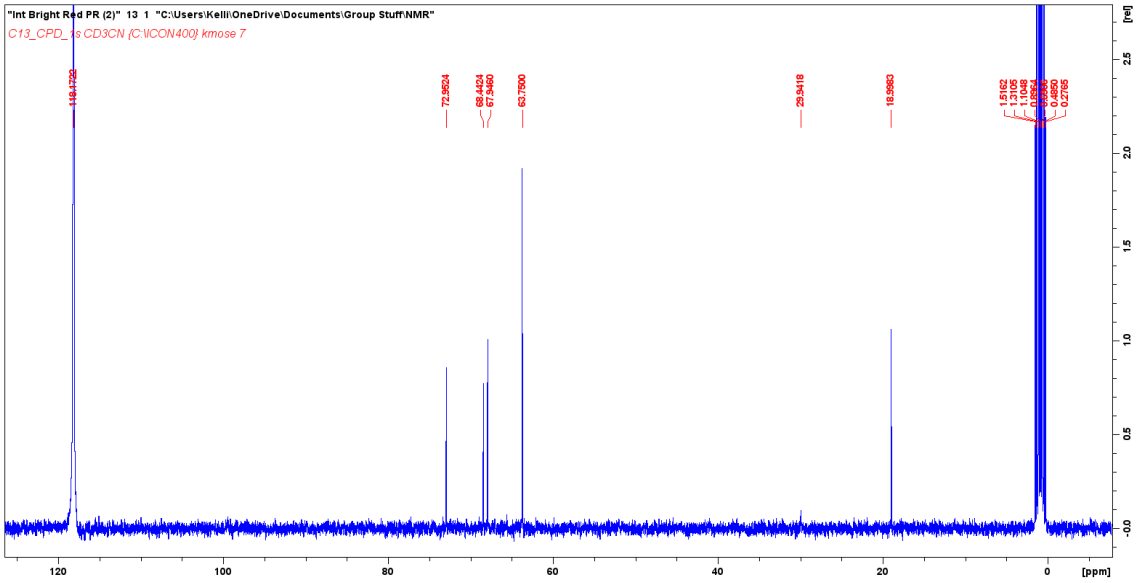

Figure S4. *^{13}C NMR spectrum of Intenze Bright Red pot residue in acetonitrile-d3*

Signals found at δ18.9983 ppm, δ67.9460 ppm, and δ68.424 ppm are consistent with propylene glycol while signals at δ63.7500 ppm and δ72.9524 ppm are produced by glycerol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm. Peaks at δ18.9983 ppm and δ29.9418 ppm are likely produced by a long-chain hydrocarbon.

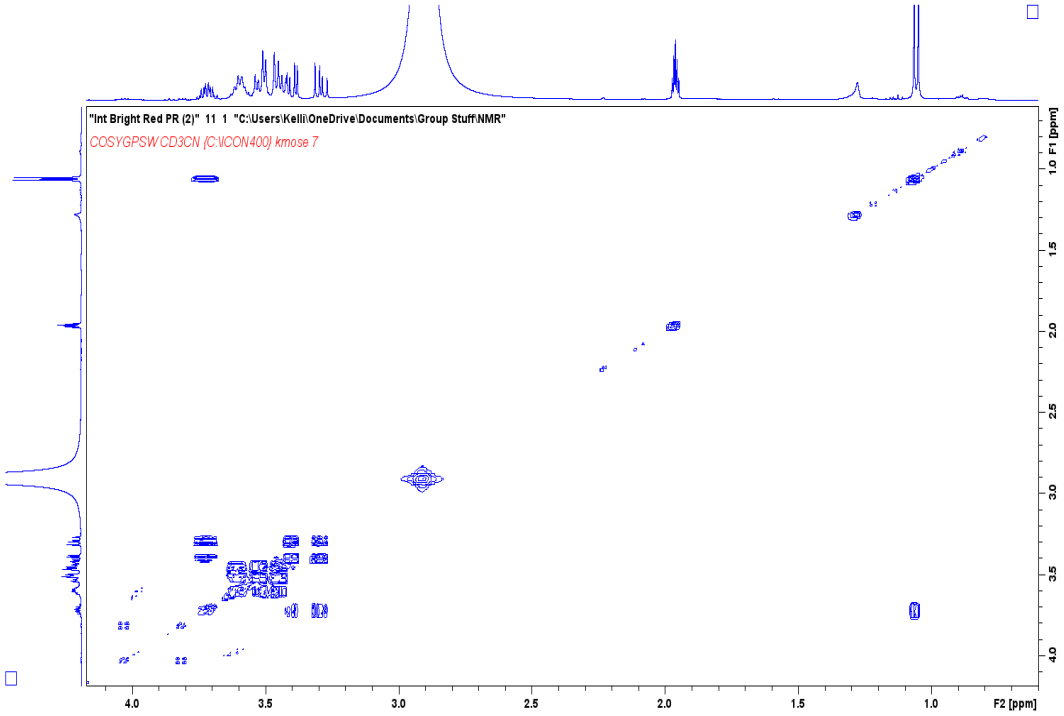

Figure S5. *^{1}H-^{1}H COSY NMR spectrum of Intenze Bright Red pot residue in acetonitrile-d3*

Coupling between peaks at δ1.0567 ppm, δ3.7186 ppm, δ3.3999 ppm, and δ3.2901 ppm indicate that all peaks are produced by the same component, likely propylene glycol. Coupling also occurs between δ3.5945 ppm, δ3.5184 ppm, and δ3.4443 ppm. This is attributed to the presence of glycerol.

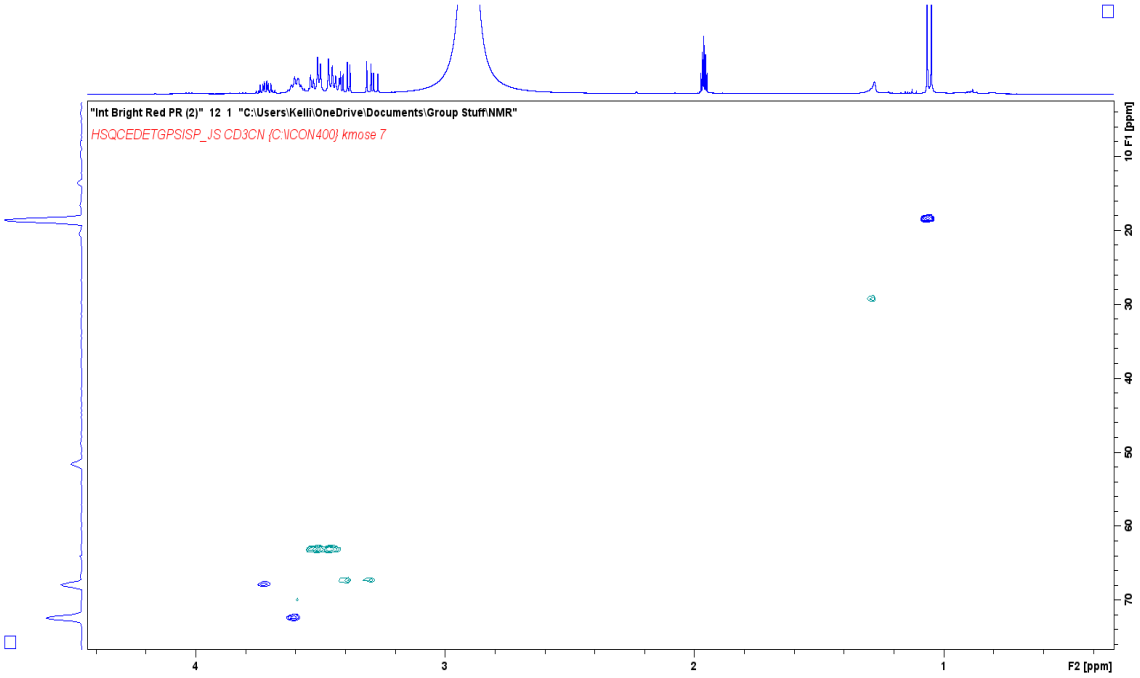

Figure S6. *^{1}H-^{13}C HSCQ spectrum of Intenze Bright Red pot residue in acetonitrile-d3*

Coupling occurs between peaks in the ^{1}H NMR spectrum δ3.7186 ppm and the ^{13}C NMR peak at δ68.424 ppm, as well at the peaks at δ3.3999 ppm, and δ3.2901 ppm and the peaks at δ67.9460 ppm. This, along with the coupling between ^{1}H peak at δ1.0567 and ^{13}C peak at δ18.9983 ppm, suggests that propylene glycol is present. Additionally, coupling occurs between ^{1}H peaks at δ3.5184 ppm and δ3.4443 ppm and ^{13}C peaks at δ63.7500 ppm, as well as the ^{1}H peak at δ3.5945 ppm and ^{13}C peak at δ72.9524 ppm are indicative of glycerol being in the sample. Lastly, a small amount of coupling occurs between the ^{1}H peak at δ1.275 ppm couples with the ^{13}C peak at δ29.9418 ppm suggesting the presence of a long-chain hydrocarbon.

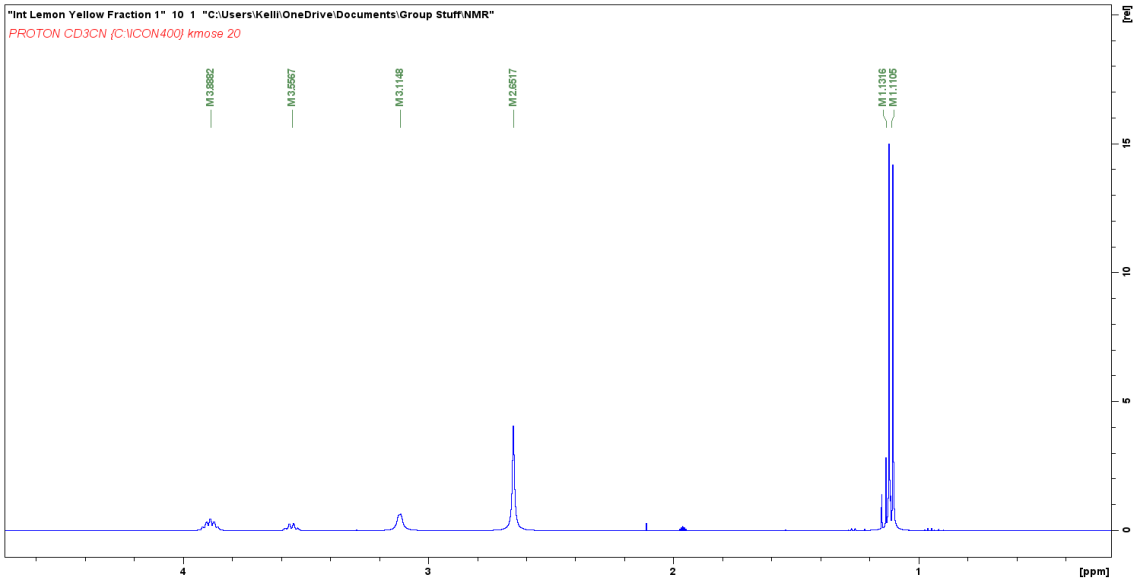

Figure S7. *^{1}H NMR spectrum of Intenze Lemon Yellow distillate in acetonitrile-d3*

Peaks at δ3.8882 ppm (septet) and δ1.1105 ppm (doublet) were identified as isopropanol and peaks at δ3.5567 ppm (quartet) and δ1.1316 ppm (triplet) were identified as ethanol. The singlet at δ2.6517 ppm is attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

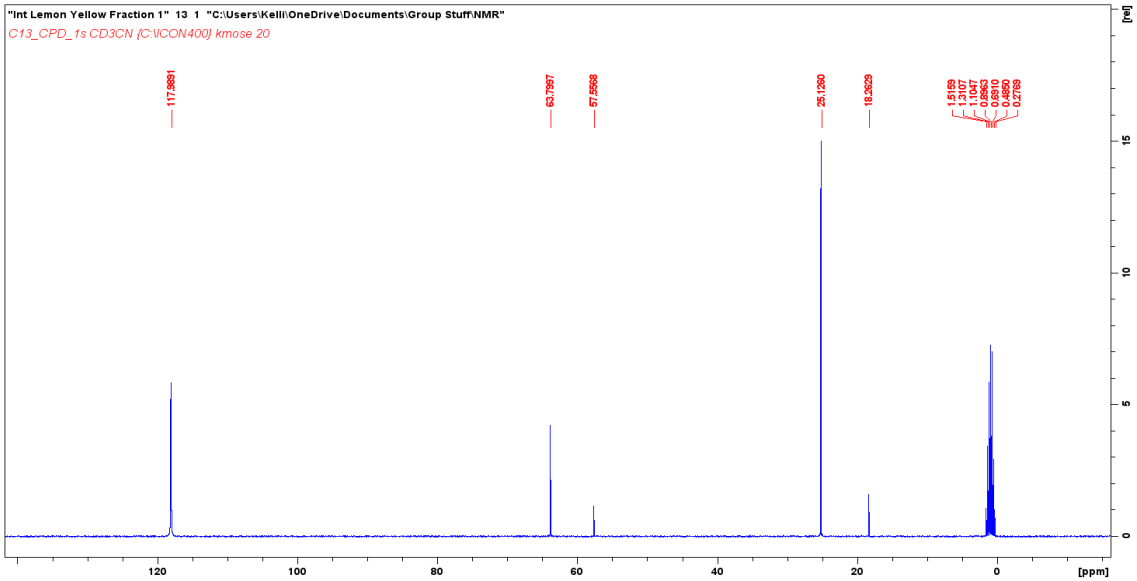

Figure S8. *^{13}C NMR spectrum of Intenze Lemon Yellow distillate in acetonitrile-d3*

Signals found at δ18.2629 ppm and δ57.5568 ppm correspond to ethanol while signals at δ25.1260 ppm and δ63.7997 ppm correspond to isopropanol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

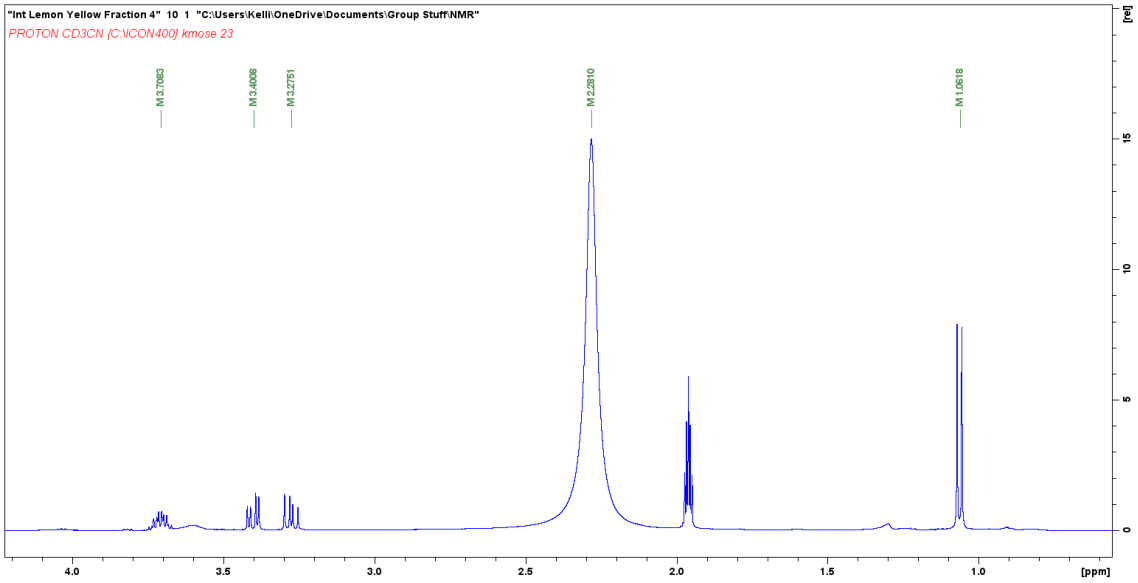

Figure S9. *^{1}H NMR spectrum of Intenze Lemon Yellow pot residue in acetonitrile-d3*

Signals at δ1.0618 ppm (doublet), δ3.2751 ppm (multiplet), δ3.4008 ppm (multiplet), and δ3.7083 ppm (sextet) all are consistent with propylene glycol. The large singlet at δ2.2810 ppm is attributed to residual water. The acetonitrile solvent peak is located at δ1.94 ppm.

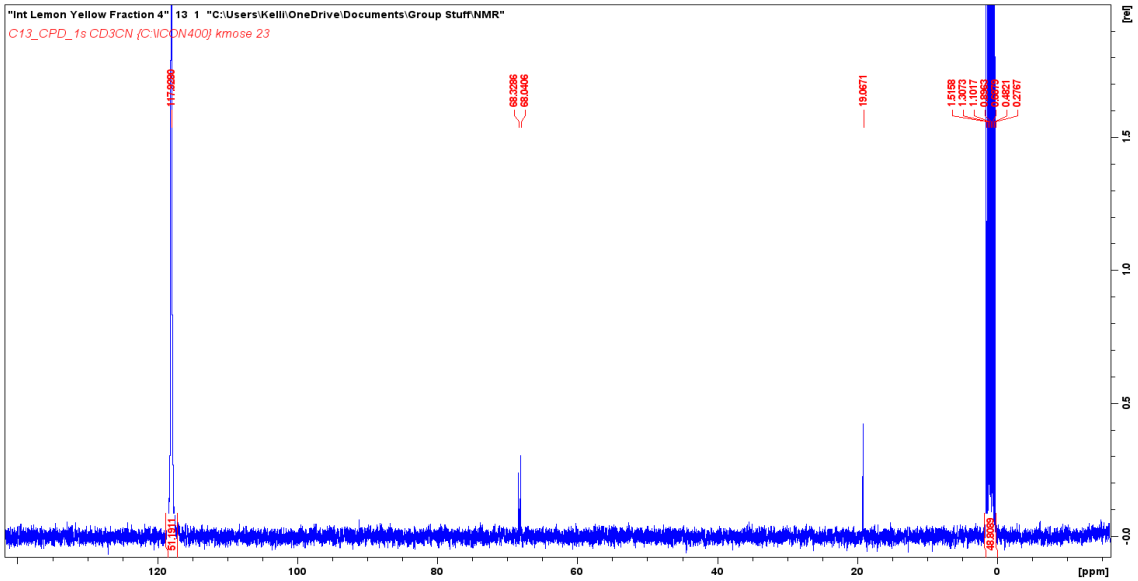

Figure S10. *^{13}C NMR spectrum of Intenze Lemon Yellow pot residue in acetonitrile-d3*

Peaks at δ19.0671 ppm, δ68.0406 ppm, and δ68.3286 ppm all consistent with propylene glycol. The lack of other carbon signals confirms that the large singlet in the ^{1}H NMR (δ2.2810 ppm) is produced by water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

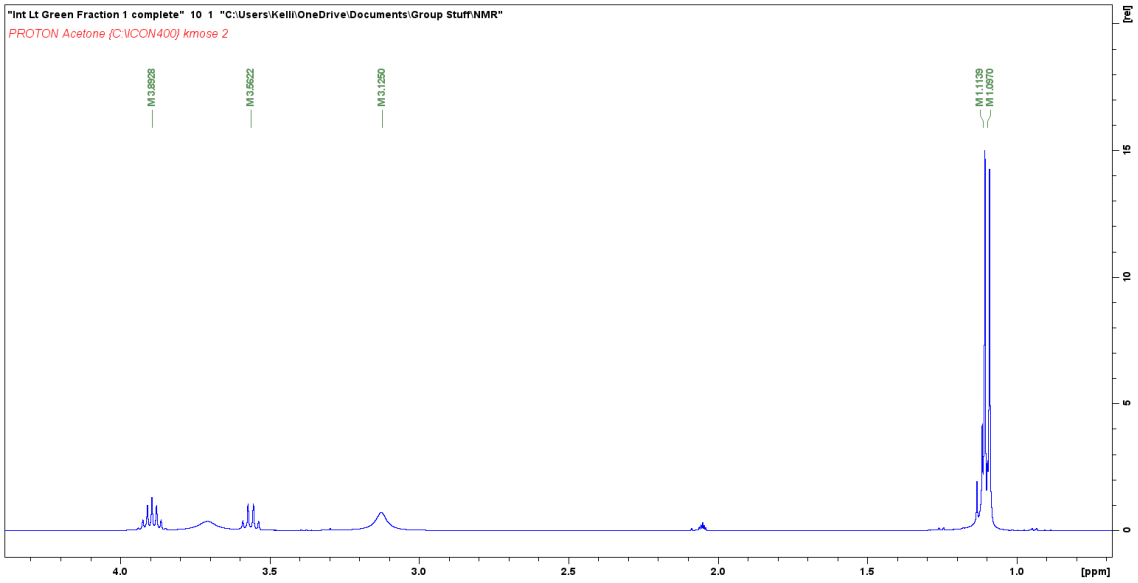

Figure S11. *^{1}H NMR spectrum of Intenze Light Green distillate in acetone-d6*

Peaks at δ1.0970 ppm (doublet) and δ3.8928 ppm (septet) are produced by isopropanol while peaks at δ1.1139 ppm (triplet) and δ3.5622 ppm (quartet) are produced by ethanol. J-coupling constants (6.10 Hz and 7.00 Hz for isopropanol and ethanol, respectively) were used to confirm that the overlapping upfield peaks couple with their respective downfield peaks. The small singlet at δ3.1250 ppm is attributed to water. The solvent peak for acetone-d6 is at δ2.05 ppm.

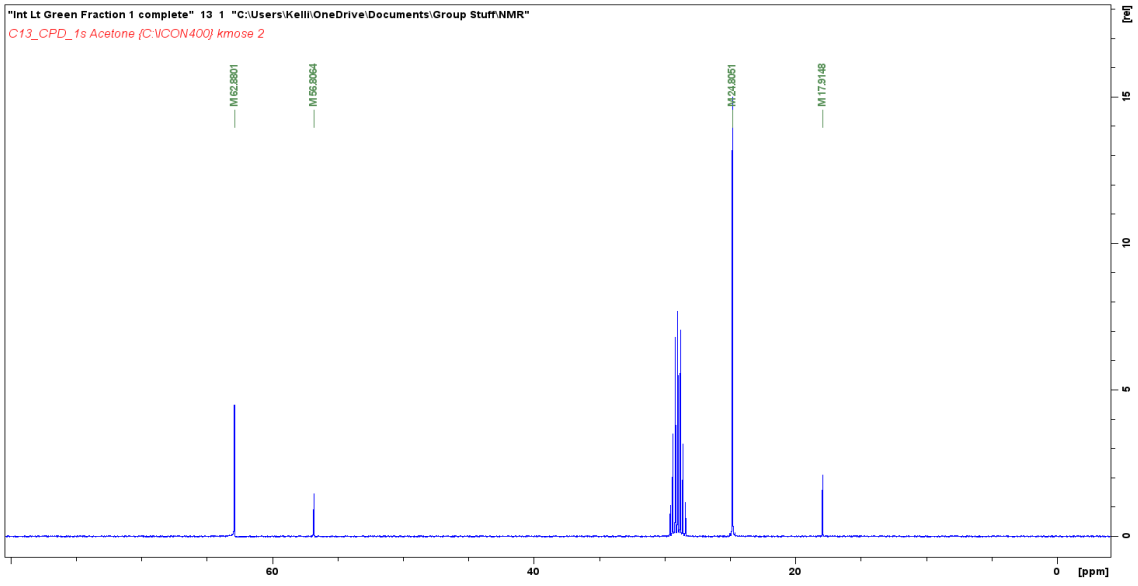

Figure S12. *^{13}C NMR spectrum of Intenze Light Green distillate in acetone-d6*

Peaks at δ17.9148 ppm and δ56.8064 ppm are produced by ethanol, while peaks at δ24.8051 ppm and 62.8801 ppm are produced by isopropanol. The solvent peak for acetone is at δ29.84

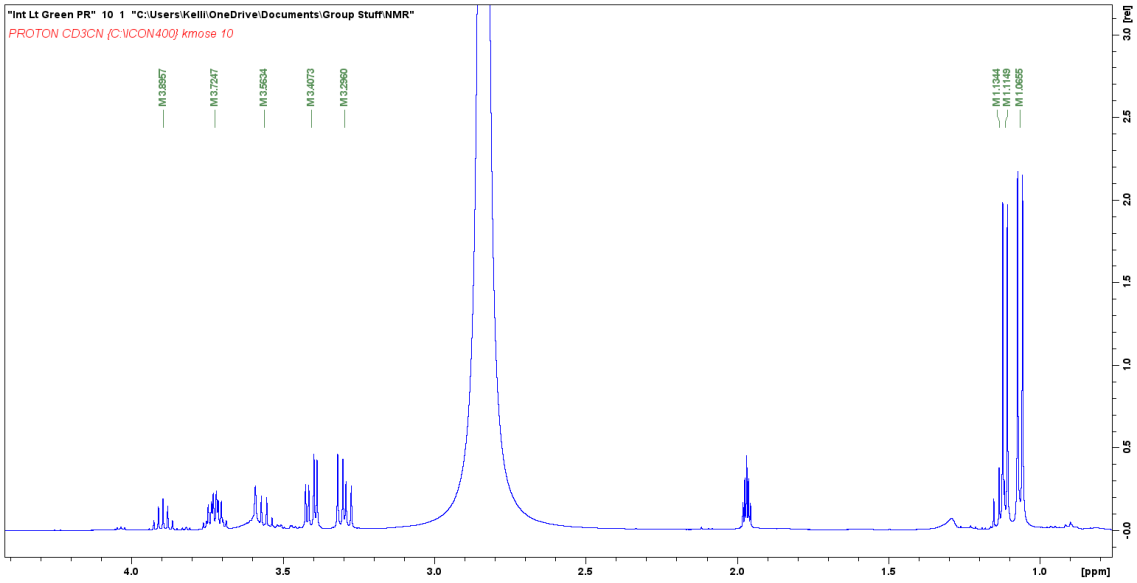

Figure S13. *^{1}H NMR spectrum of Intenze Light Green pot residue in acetonitrile-d3*

Three different components are found in this sample. The first, likely propylene glycol, shows peaks at δ1.0655 ppm (doublet), δ3.2960 ppm (multiplet), δ3.4073 ppm (multiplet), and δ3.7246 ppm (sextet). The second component, isopropanol, shows peaks at δ1.1149 ppm (doublet) and δ3.8957 ppm (septet). The last molecule, ethanol, shows signals at δ1.1344 ppm (triplet) and δ3.5634 ppm (quartet). The acetonitrile solvent peak is located at δ1.94 ppm.

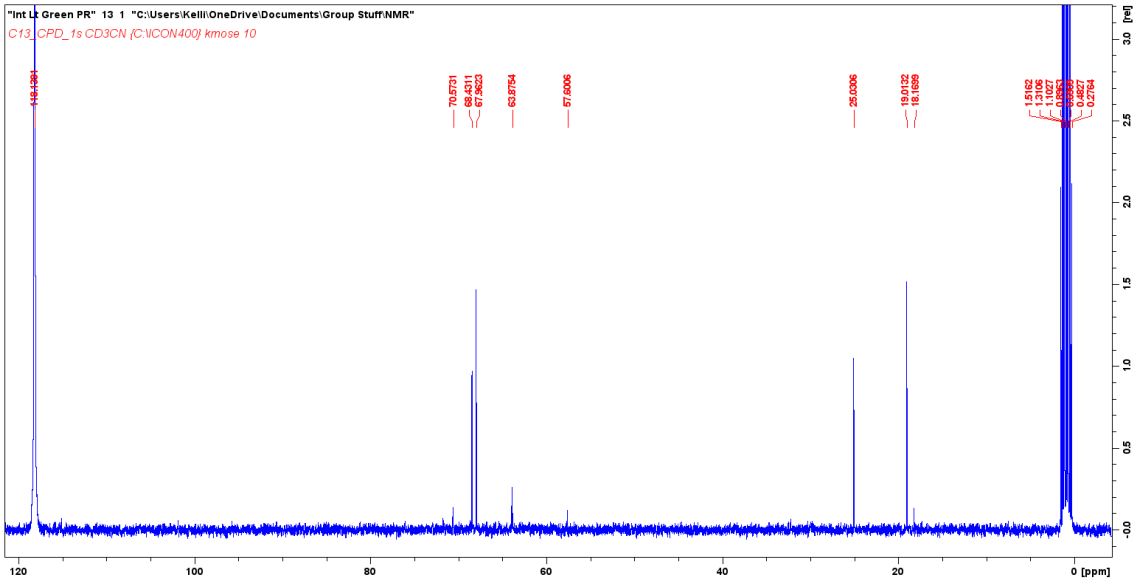

Figure S14. *^{13}C NMR spectrum of Intenze Light Green pot residue in acetonitrile-d3*

^{13}C NMR confirms the presence of ethanol, isopropanol, and likely propylene glycol. Peaks for ethanol appear at δ18.1699 ppm, δ57.6006 ppm. Peaks for isopropanol appear at δ25.0306 ppm and δ63.8754 ppm. Peaks consistent with propylene glycol appear at δ19.0132 ppm, δ67.9623 ppm, and δ68.4311 ppm. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

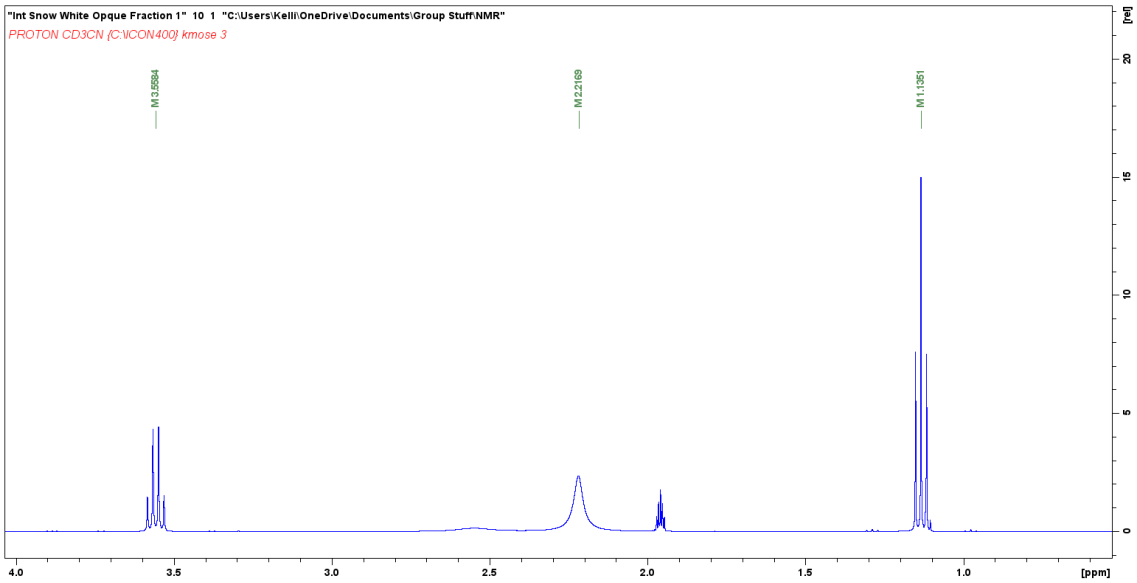

Figure S15. *^{1}H NMR spectrum of Intenze Snow White Opaque distillate in acetonitrile-d3*

Ethanol gives rise to peaks at δ1.1351 ppm (triplet) and δ3.5584 ppm (quartet). The broad peaks at δ2.2169 ppm can be attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

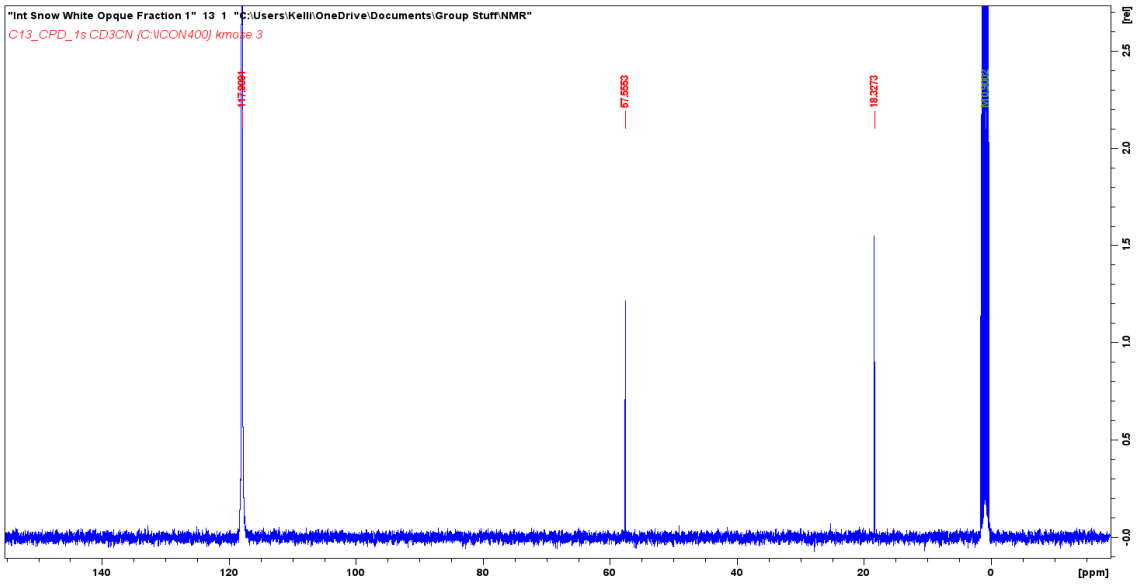

Figure S16. *^{13}C NMR spectrum of Intenze Snow White Opaque distillate in acetonitrile-d3*

Ethanol produces peaks at δ18.3273 ppm and δ57.5553 ppm. The lack of other ^{13}C NMR peaks indicates that the broad singlet found in the ^{1}H NMR spectrum at δ2.2169 ppm is water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

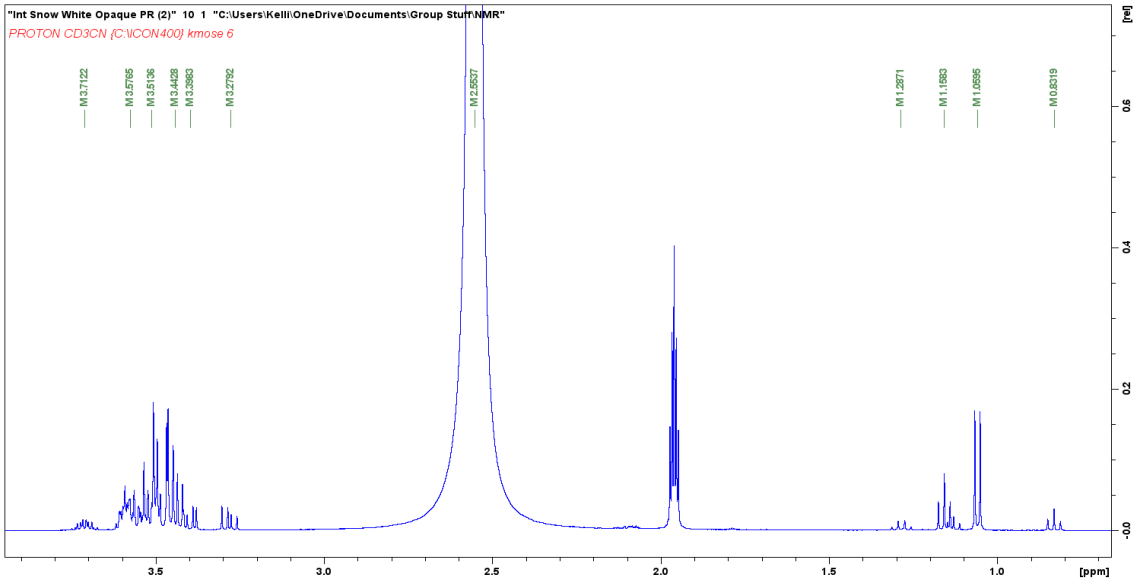

Figure S17. *(top) ^{1}H NMR spectrum of Intenze Snow White Opaque pot residue in acetonitrile-d3*

Propylene glycol is consistent with multiplets at δ3.72122 ppm, δ3.3983 ppm, and δ3.2792 ppm and a doublet at δ1.0595 ppm. Glycerol produces signals at δ3.5765 ppm, δ3.5136 ppm, and δ3.4428 ppm. There are additional peaks found upfield (δ 0.8319 ppm and δ 1.2871 ppm) that could not be identified using only ^{1}H NMR. The triplet at δ1.1583 ppm is likely from ethanol. The acetonitrile solvent peak is located at δ1.94 ppm.

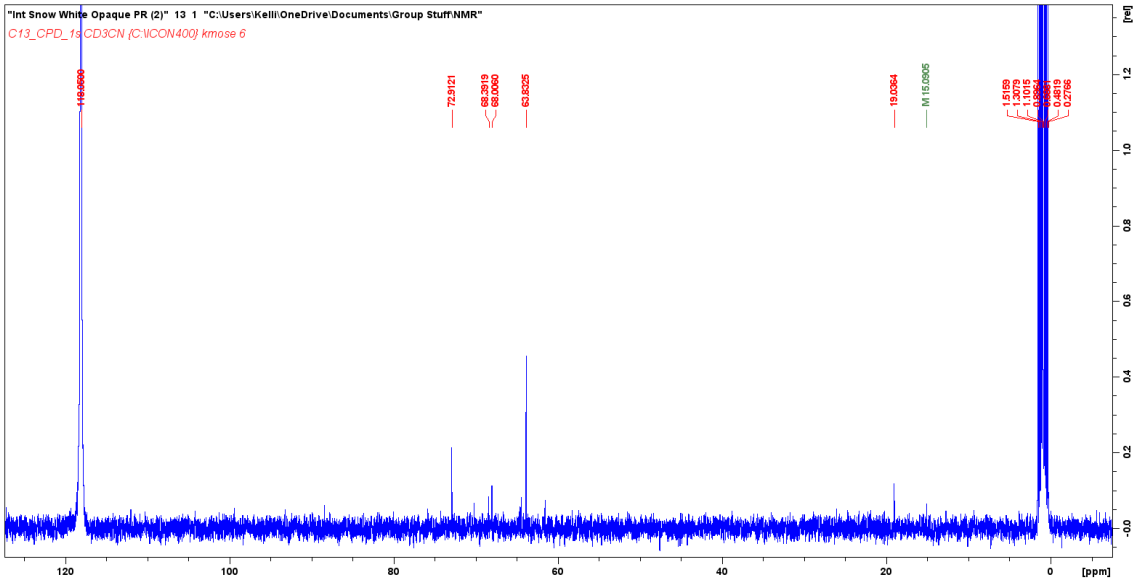

Figure S18. *^{13}C NMR spectrum of Intenze Snow White Opaque pot residue in acetonitrile-d3*

Characteristic peaks of glycerol and propylene glycol appear at δ72.9121 ppm and δ63.8325 ppm, and δ68.1939 ppm, δ68.0060 ppm, and δ19.0364 ppm, respectively. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm. Peaks appearing at δ15.0905 ppm and δ19.0364 ppm suggest the presence of a long-chain hydrocarbon.

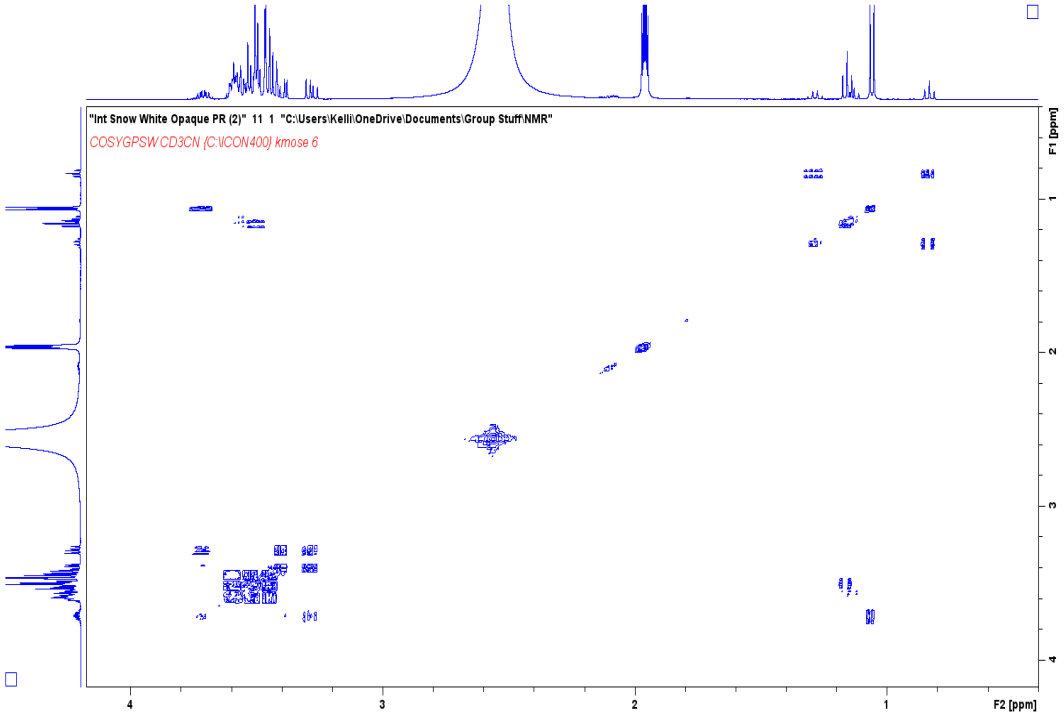

Figure S19. *^{1}H-^{1}H COSY NMR spectrum of Intenze Snow White Opaque pot residue in acetonitrile-d3*

^{1}H-^{1}H COSY reveals coupling between peaks at δ1.2871 ppm (quartet) and δ0.8319 ppm (triplet) though they remain unidentified. There also appears to be coupling between a small triplet at δ1.1298 ppm and a signal around δ3.55 ppm. This is likely residual ethanol. Coupling occurs between the peaks at δ3.72122 ppm, δ3.3983 ppm, and δ3.2792 ppm and a doublet at δ1.0595 ppm suggesting the presence of propylene glycol. Glycerol peaks also display coupling between δ3.5765 ppm, δ3.5136 ppm, and δ3.4428 ppm.

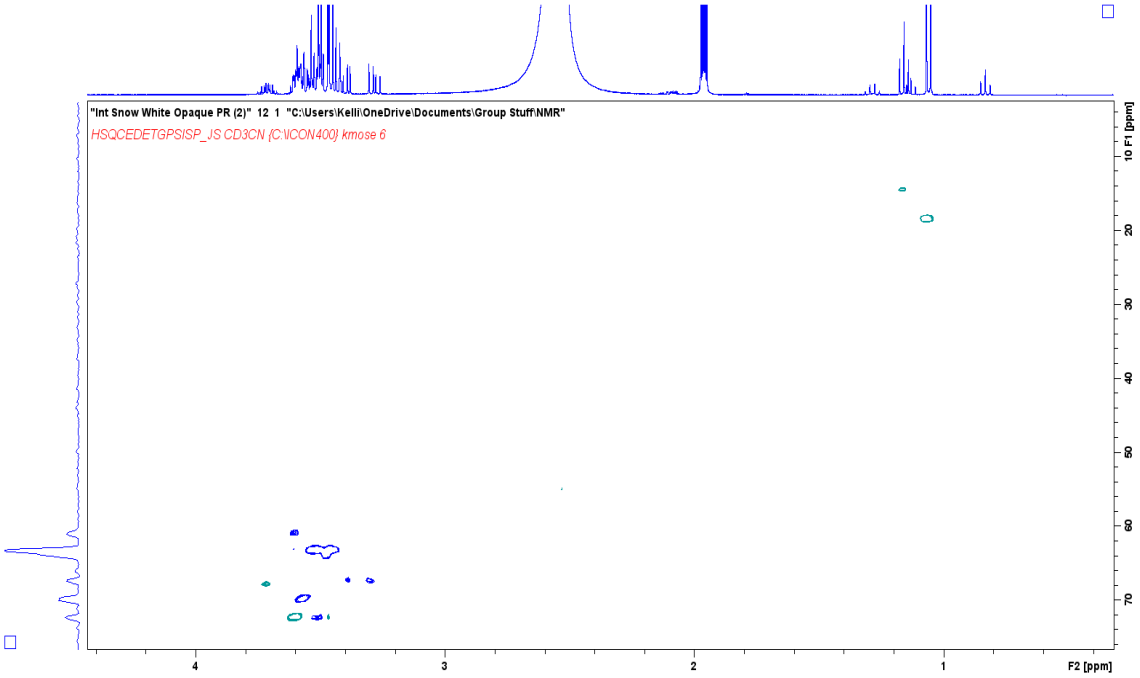

Figure S20. *^{1}H-^{13}C HSQC spectrum of Intenze Snow White Opaque pot residue in acetonitrile-d3*

Coupling occurs between ^{1}H peaks at δ3.3983 ppm and δ3.2792 ppm and the ^{13}C peak at δ68.0060 ppm as well as the ^{1}H peak at δ3.72122 ppm and the ^{13}C peak at δ68.1939 ppm. This, along with the coupling between the ^{1}H doublet at δ1.0595 ppm and the ^{13}C peak at δ19.0364 ppm, is characteristic of propylene glycol. Additionally, coupling occurs between ^{1}H peaks at δ3.5136 ppm and δ3.4428 ppm and ^{13}C peaks at δ63.8325 ppm, as well as the ^{1}H peak at δ3.5765 ppm and ^{13}C peak at δ72.9121 ppm are indicative of glycerol being in the sample. Lastly, a small amount of coupling occurs between the ^{1}H peak at δ1.1.1583 ppm couples with the ^{13}C peak at δ15.0905 ppm suggesting the presence of a long-chain hydrocarbon.

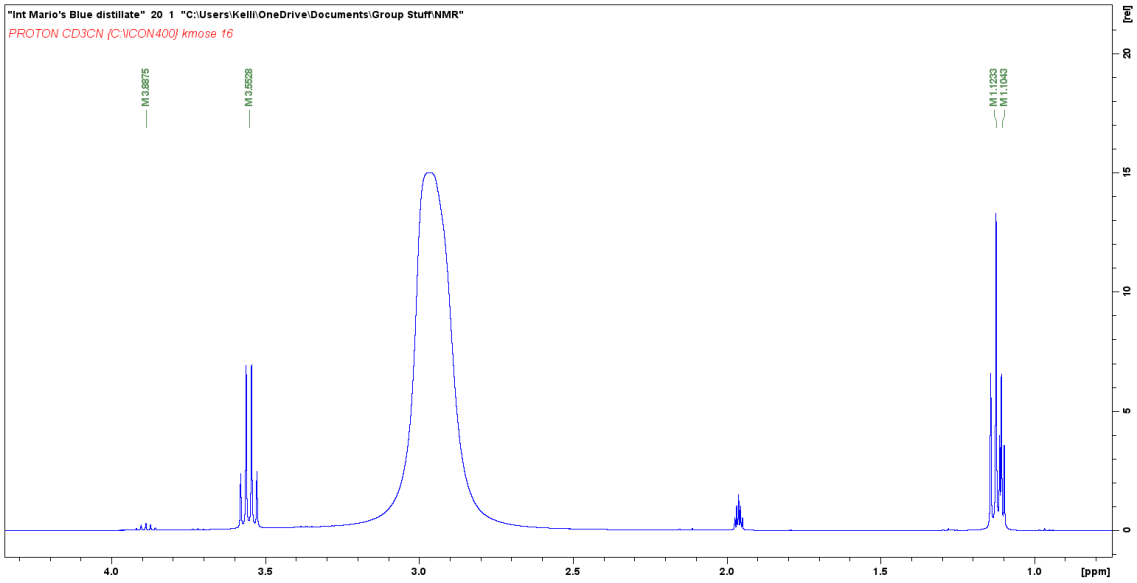

Figure S21. *^{1}H NMR spectrum of Intenze Mario's Blue distillate in acetonitrile-d3*

Ethanol and isopropanol are present in this sample. Ethanol shows peaks at δ1.1233 ppm (triplet) and δ3.5528 ppm (quarter) while isopropanol shows peaks at δ1.1043 (doublet) and δ3.8875 (septet). The acetonitrile solvent peak is located at δ1.94 ppm.

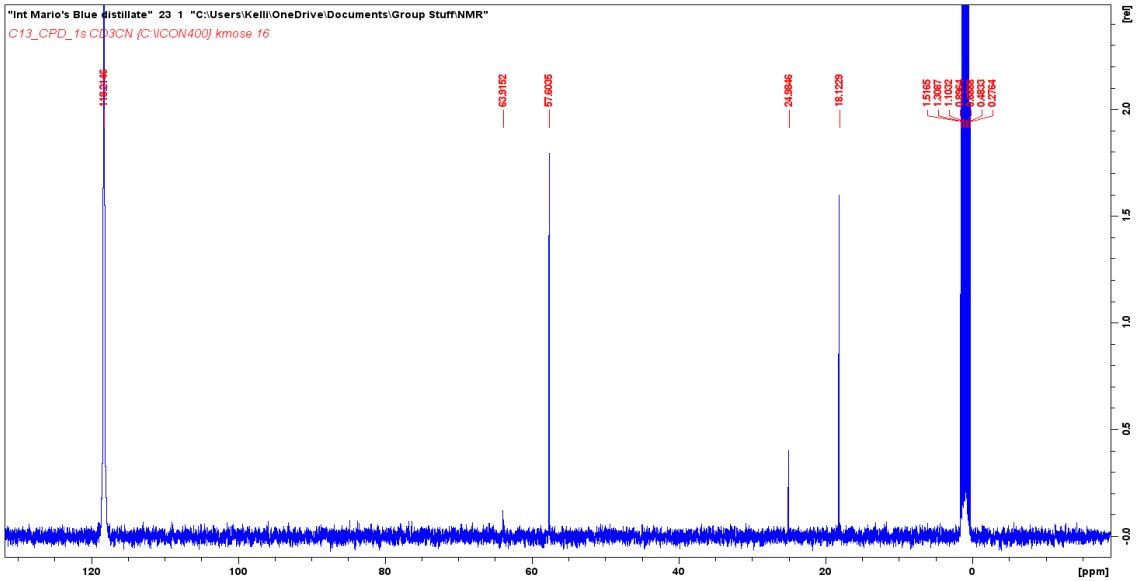

Figure S22. *^{13}C NMR spectrum of Intenze Mario's Blue distillate in acetonitrile-d3*

Large signals at δ18.1229 ppm and δ57.6035 ppm correspond to ethanol while smaller signals at δ24.9846 ppm and δ63.915 ppm correspond to isopropanol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

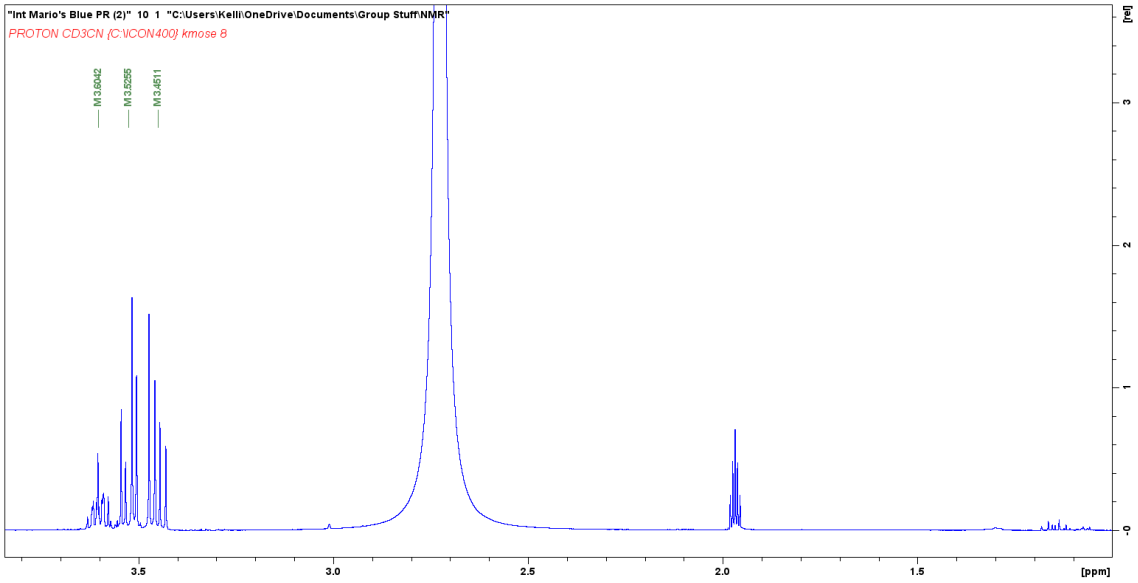

Figure S23. *^{1}H NMR spectrum of Intenze Mario's Blue pot residue in acetonitrile-d3*

Glycerol shows multiplets at both δ3.4511 ppm and δ3.5255 ppm, as well as a pentet at 3.6042 ppm. The large peak centered around δ2.6 ppm can be attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

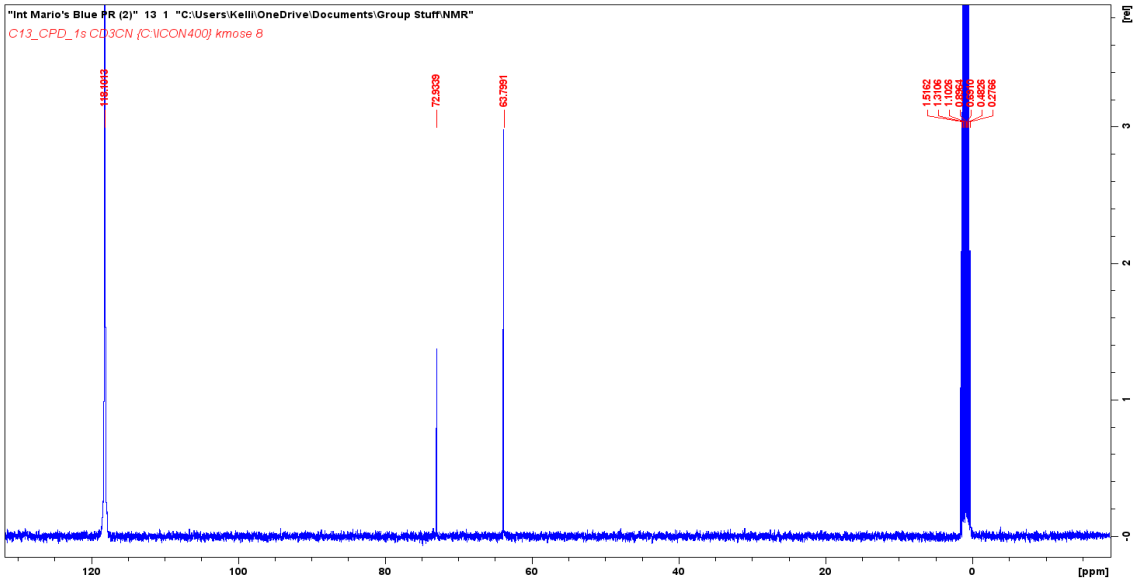

Figure S24. *^{13}C NMR spectrum of Intenze Mario's Blue pot residue in acetonitrile-d3*

^{13}C NMR signals confirm the presence of glycerol in Intenze Mario's Blue. Signals can be seen at δ63.7991 ppm and δ72.3993 ppm. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

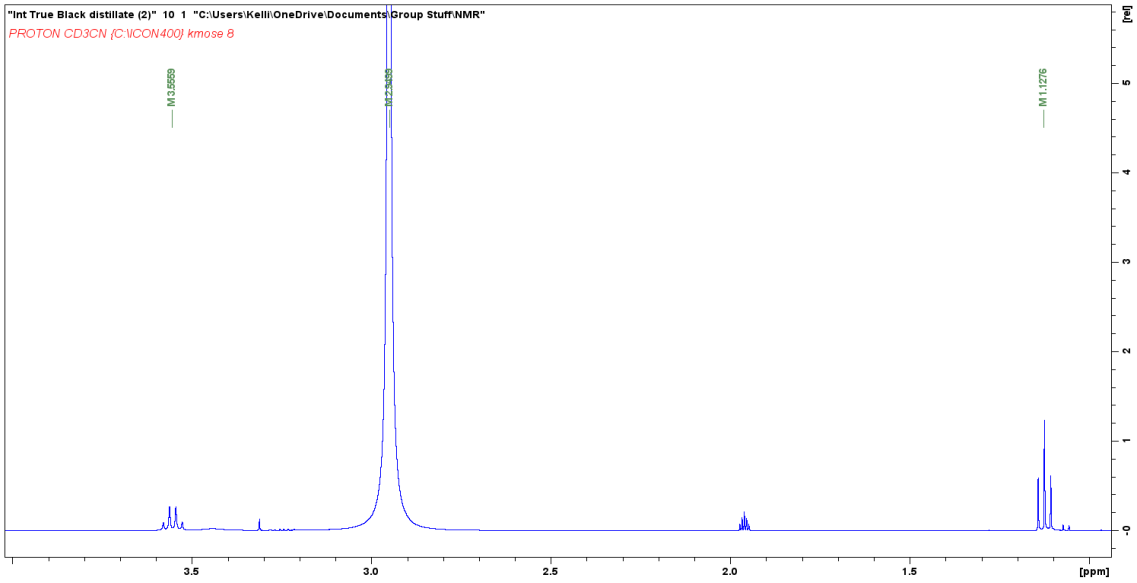

Figure S25. *^{1}H NMR spectrum of Intenze True Black distillate in acetonitrile-d3*

Only ethanol and water are present in this sample. Ethanol peaks appear at 1.1276 ppm (triplet) and δ3.5559 ppm (quartet) while water's peak appears at δ2.9499 ppm (singlet). The acetonitrile solvent peak is located at δ1.94 ppm.

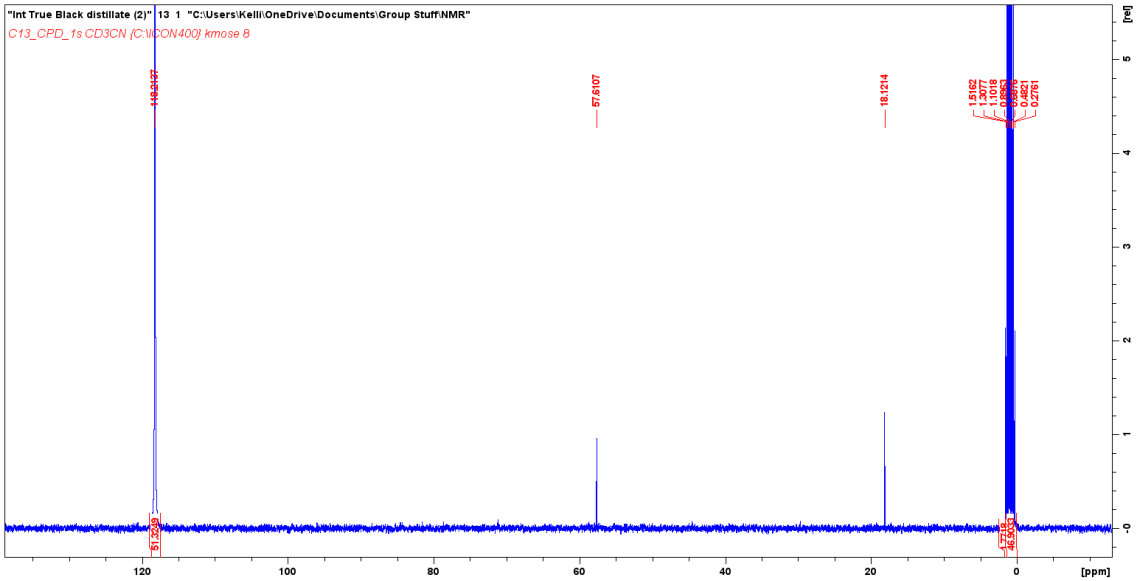

Figure S26. *^{13}C NMR spectrum of Intenze True Black distillate in acetonitrile-d3*

Ethanol produces the only peaks in the spectrum. Peaks appear at δ18.1214 ppm and δ57.6107 ppm. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

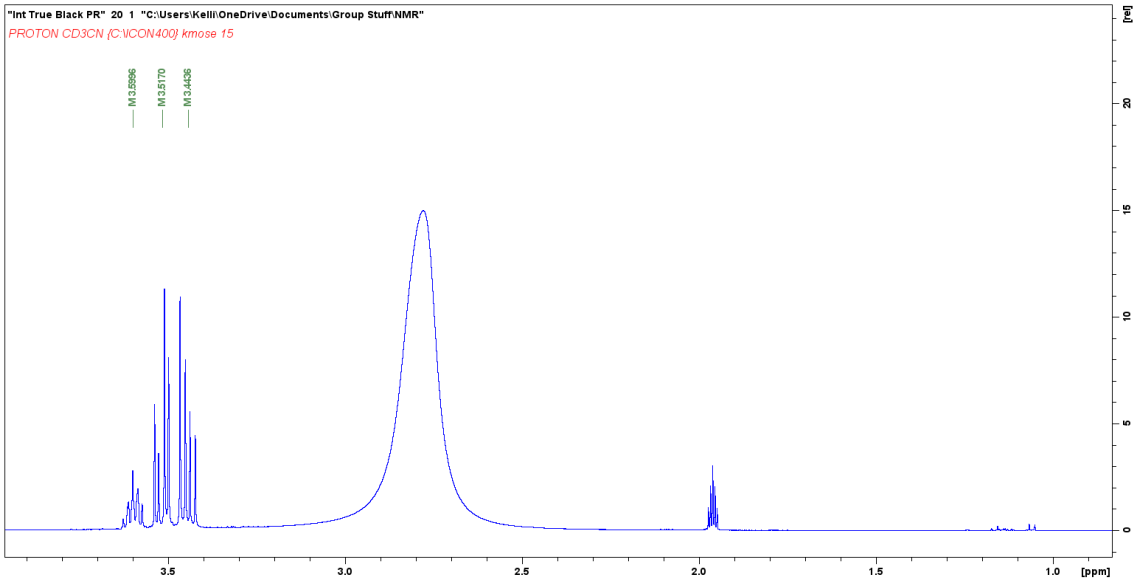

Figure S27. *^{1}H NMR spectrum of Intenze True Black pot residue in acetonitrile-d3*

Signals from glycerol are present in the ^{1}H NMR spectrum. Multiplets at δ3.4436 ppm, δ3.5170 ppm, and a pentet at δ3.5996 ppm are produced by glycerol while the broad singlet at δ2.779 ppm corresponds to water. The acetonitrile solvent peak is located at δ1.94 ppm.

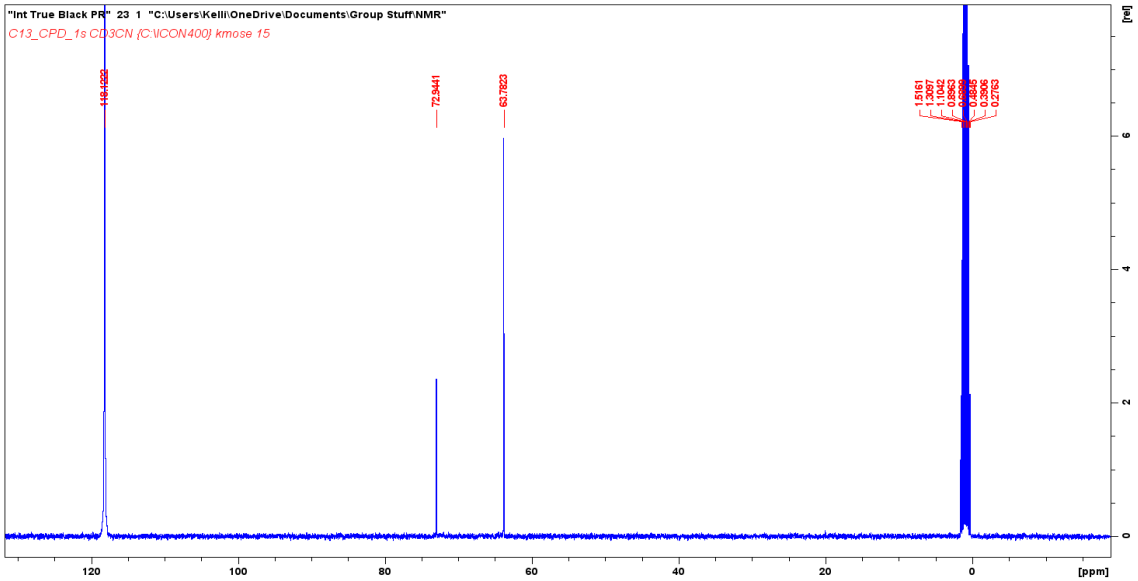

Figure S28. *^{13}C NMR spectrum of Intenze True Black pot residue in acetonitrile-d3*

Peaks at δ63.7823 ppm and δ72.9441 ppm both come from glycerol in the ^{13}C NMR spectrum. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

2.2 Raman Data

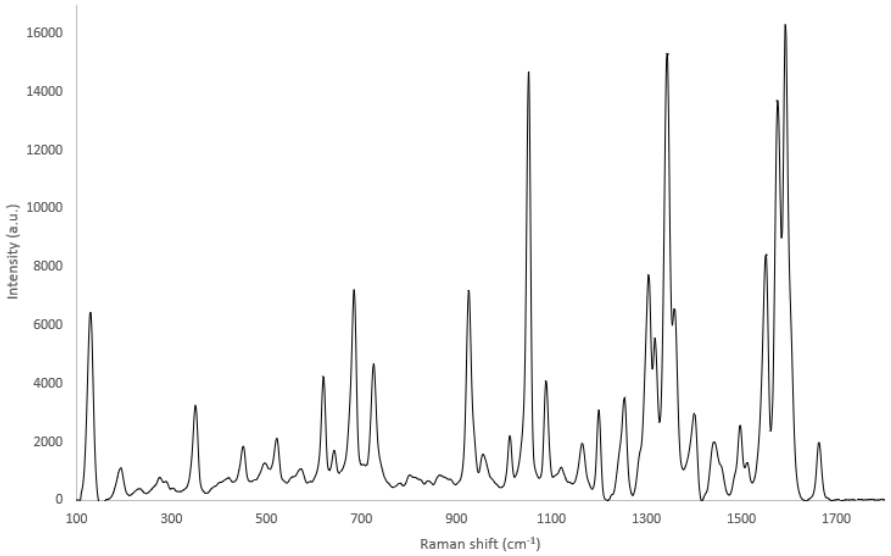

Figure S29. *Raman spectrum of Intenze Bright Red*

Parameters used to obtain this spectrum are as follows: 785 nm, 225mW, 2 second integration, 1 average, 1 boxcar, auto-baseline on. Major peaks at 1664 cm^{-1}, 1592 cm^{-1}, 1576 cm^{-1}, 1552 cm^{-1}, 1344 cm^{-1}, 1304 cm^{-1}, 1052 cm^{-1}, 926 cm^{-1}, 686 cm^{-1}, and 128 cm^{-1} match the major peaks present in the Pigment Red 254 standard spectrum from the SOPRANO Raman spectra database.[1]

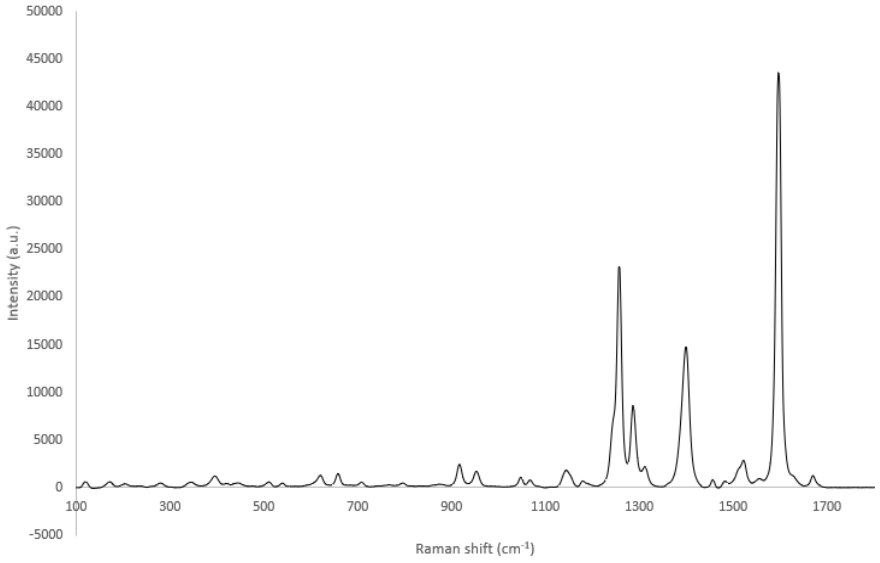

Figure S30. *Raman spectrum of Intenze Lemon Yellow*

Parameters used to obtain this spectrum are as follows: 785 nm, 225mW, 2 second integration, 3 average, 3 boxcar, auto-baseline on. Major peaks appear at 1598 cm^{-1}, 1398 cm^{-1}, 1286 cm^{-1}, and 1258 cm^{-1}. This corresponds to the major peaks of the Pigment Yellow 14 standard in the SOPRANO Raman spectra database.[1]

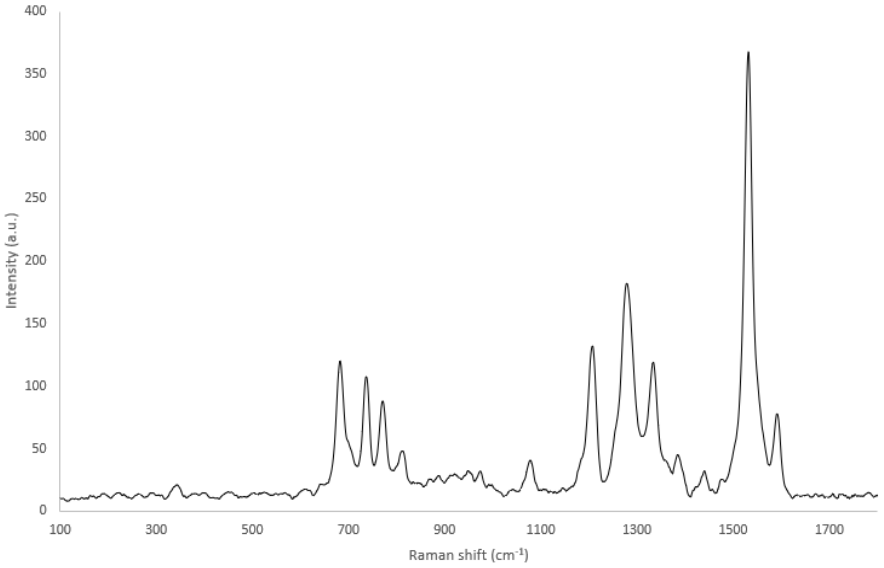

Figure S31. *Raman spectrum of Intenze Light Green*

Parameters used to obtain this spectrum are as follows: 785 nm, 225mW, 3 second integration, 2 average, 2 boxcar, auto-baseline on. Major peaks, including 1532 cm^{-1}, 1334 cm^{-1}, 1278 cm^{-1}, 1208 cm^{-1}, 770 cm^{-1}, 736 cm^{-1}, and 682 cm^{-1}, in the Raman spectrum matches that of Pigment Green 7 in the SOPRANO Raman spectra database.[1]

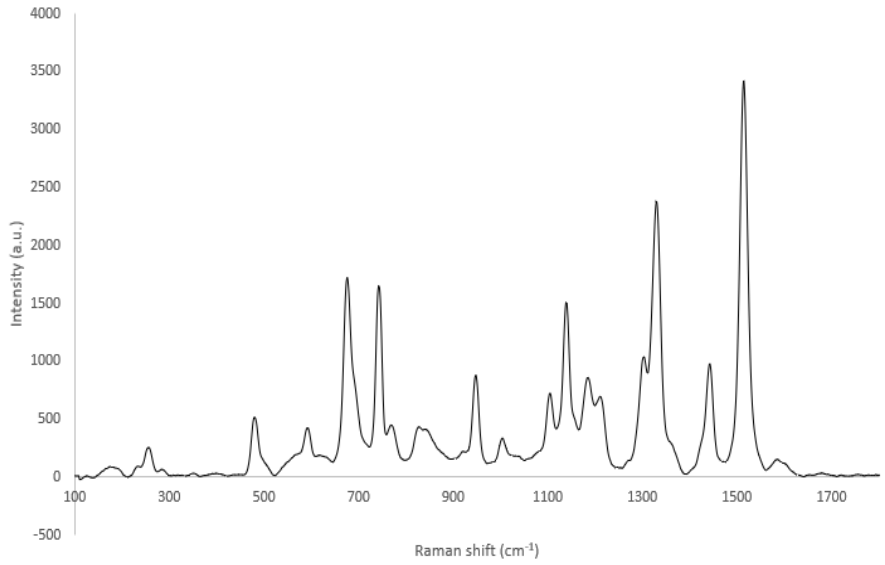

Figure S32. *Raman spectrum of Intenze Mario's Blue*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 2 average, 2 boxcar, auto-baseline on. Major peaks appear at 1514 cm^{-1},1446 cm^{-1}, 1330 cm^{-1},1188 cm^{-1}, 1138 cm^{-1}, 1104 cm^{-1}, 948 cm^{-1}, 742 cm^{-1}, and 676 cm^{-1}. These peaks match the Raman spectrum listed for Pigment Blue 15 on the SOPRANO Raman spectra database.[1]

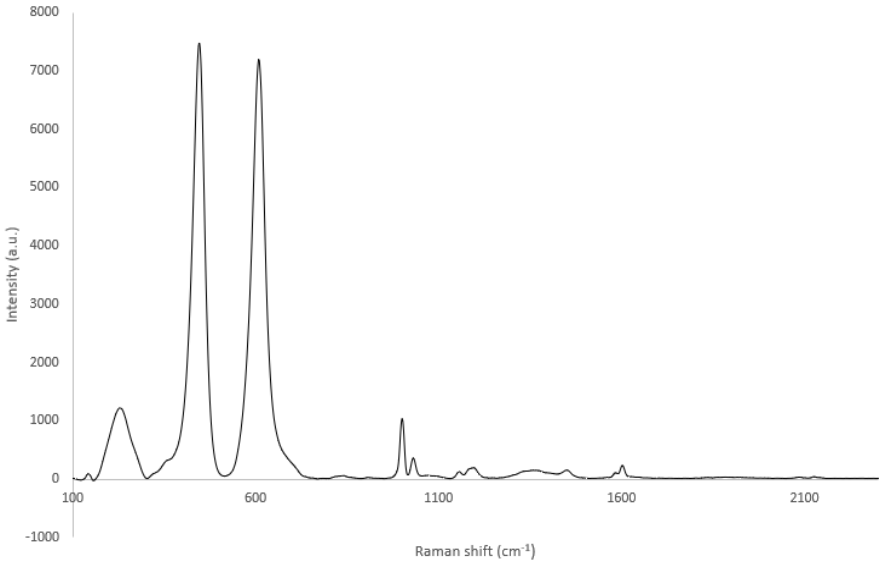

Figure S33. *Raman spectrum of Intenze Snow White Opaque*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 2 average, 2 boxcar, auto-baseline on. Major peaks appear at 610 cm^{-1}, 448 cm^{-1}, and 232 cm^{-1}. These peaks match the standard Raman spectrum of Pigment White 6 (see section 10).

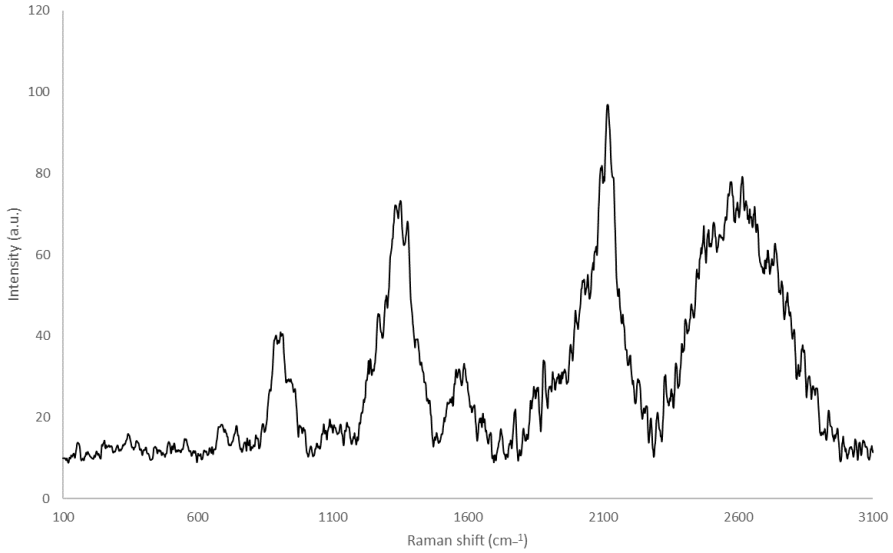

Figure S34. *Raman spectrum of Intenze True Black*

Parameters used to obtain this spectrum are as follows: 785 nm, 200 mW, 15 second integration, 3 average, 2 boxcar, auto-baseline on. Although the spectrum is not very well resolved due to absorption, major peaks appear at 2578 cm^{-1}, 2122 cm^{-1}, 1586 cm^{-1}, 1354 cm^{-1}, and 906 cm^{-1}. The later three peaks correspond to the Raman spectrum of carbon black (see section 10).

2.3 XRF Data

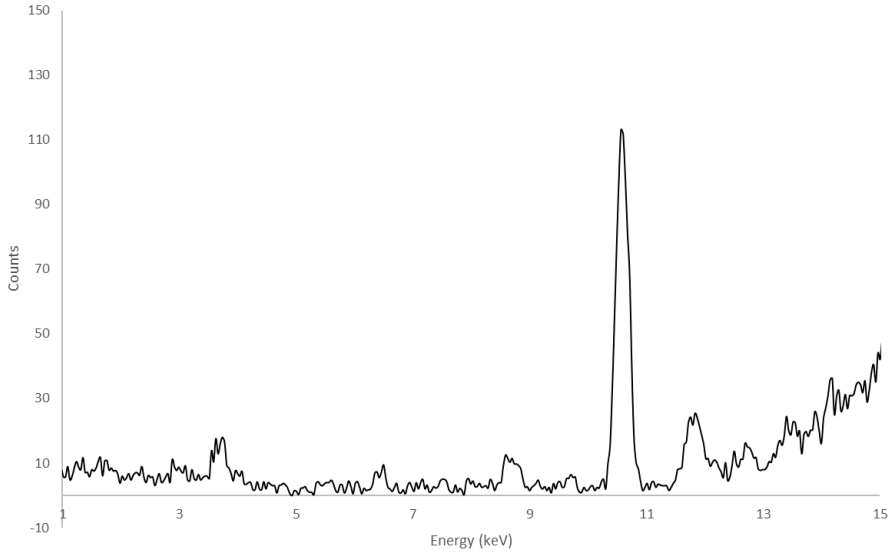

Figure S35. *X-ray fluorescence spectrum of Intenze True Black*

Peaks appear at 10.56 keV and 11.83 keV. These peaks correspond to K-emission lines of arsenic but can be attributed to the microscope slide used to dry the tattoo ink on.

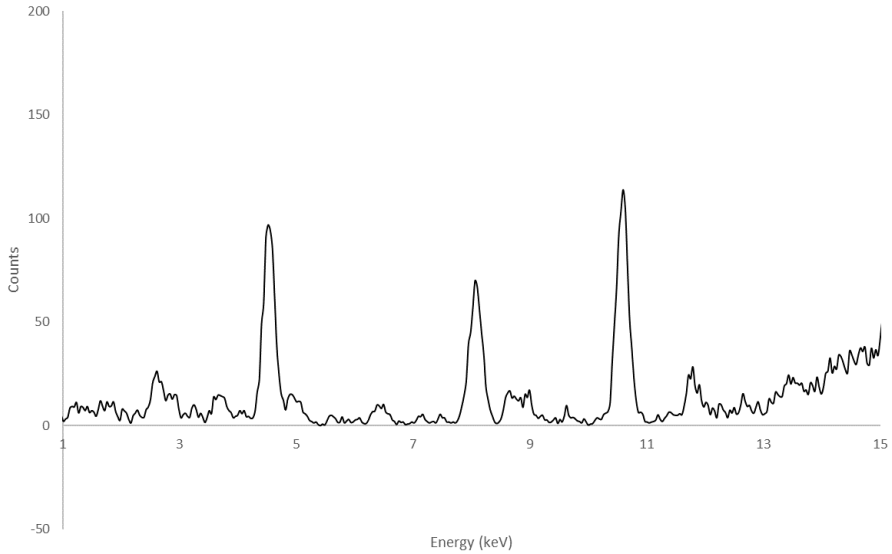

Figure S36*. X-ray fluorescence spectrum of Intenze Light Green*

Peak pairs appear at 4.52 keV and 4.93 keV, 8.10 keV and 8.92 keV, and 10.60 keV and 11.79 keV. These peaks correspond to the K-emission lines of titanium, copper and arsenic, respectively. The presence of titanium confirms the presence of Pigment White 6 while the presence of copper confirms the present of Pigment Green 7. The peaks for arsenic can be attributed to the microscope slide used to dry the tattoo ink on.

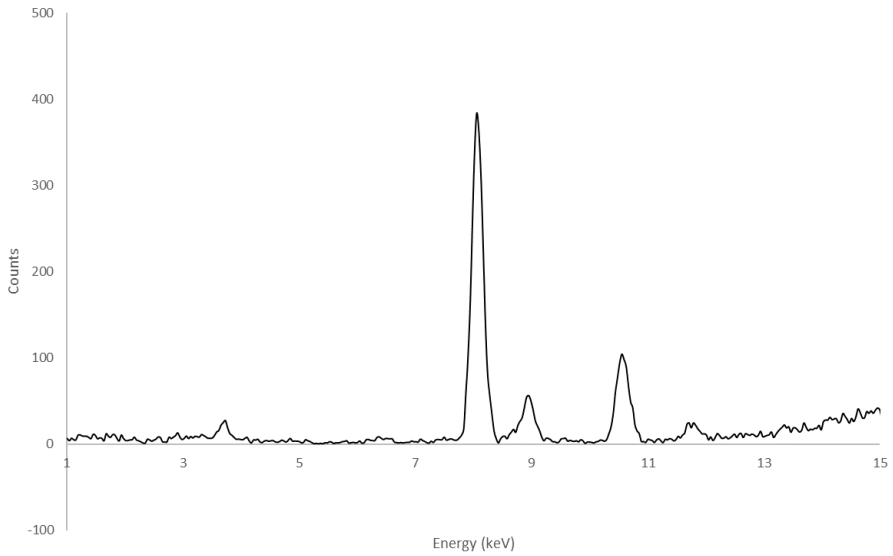

Figure S37. *X-ray fluorescence spectrum of Intenze Mario's Blue*

Peak pairs appear at 8.06 keV and 8.95 keV, and 10.60 keV and 11.79 keV. These peaks can be attributed to the K-emission lines of copper from Pigment Blue 15, and arsenic from the microscope slide used to dry the tattoo ink on.

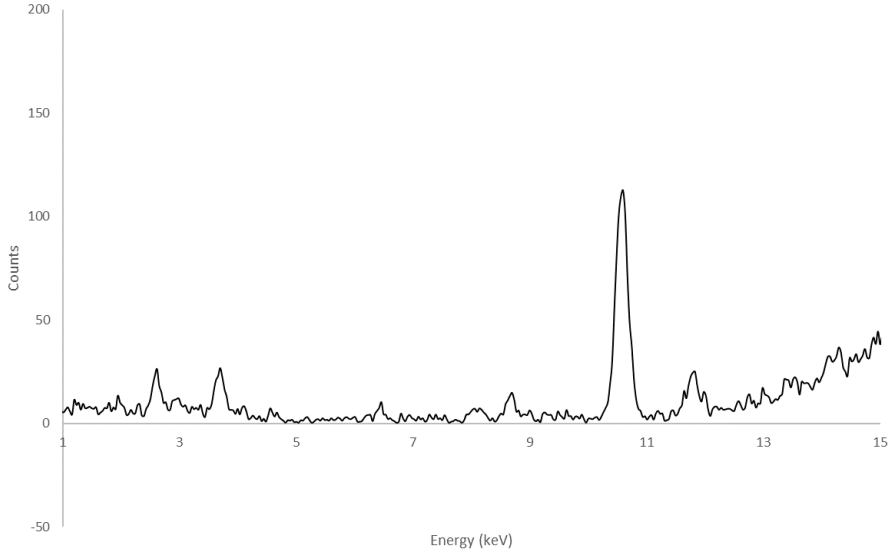

Figure S38. *X-ray fluorescence spectrum of Intenze Bright Red*

No major peak pairs occur in Intenze Bright Red besides at 10.63 keV and 11.86 keV, corresponding to the arsenic present in the microscope slide used to dry the tattoo ink on.

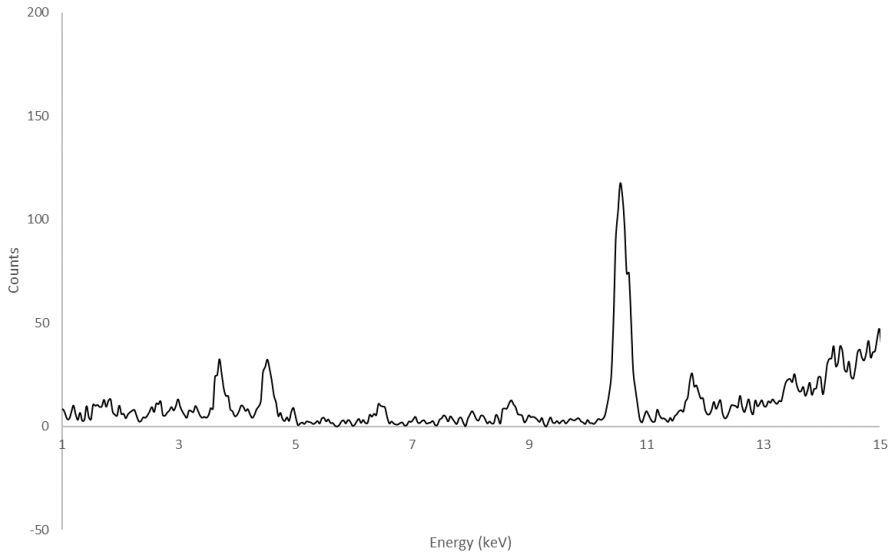

Figure S39. *X-ray fluorescence spectrum of Intenze Lemon Yellow*

No major peak pairs occur in Intenze Lemon Yellow besides at 10.56 keV and 11.79 keV, corresponding to the arsenic present in the microscope slide used to dry the tattoo ink on.

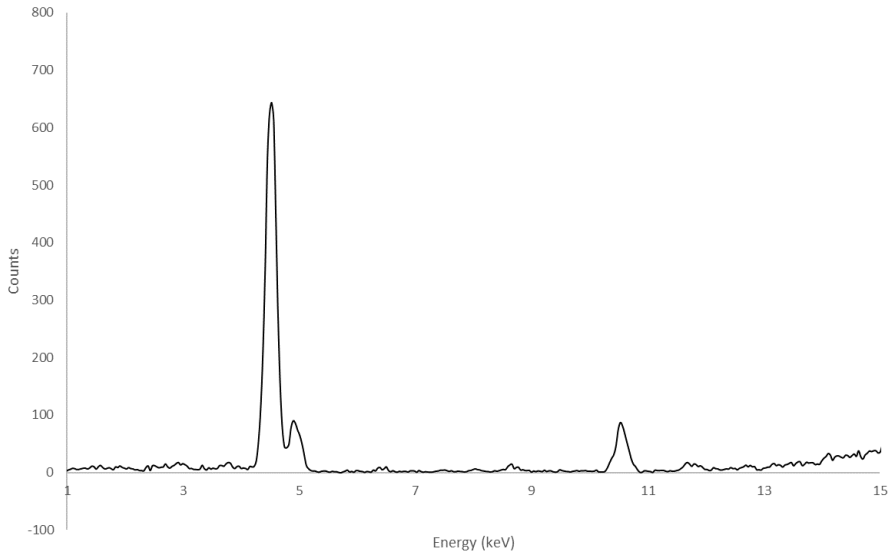

Figure S40. *X-ray fluorescence spectrum of Intenze Snow White Opaque*

A significant peak pair appears at 4.52 keV and 4.93 keV and can be attributed to the K-emission of titanium. This confirms the presence of titanium in the ink in the form of titanium dioxide (Pigment White 6). Smaller peaks at 10.56 keV and 11.72 keV can be attributed to arsenic found in the glass microscope slide used to dry the tattoo ink on.

3. Dynamic Inks

3.1 NMR Data

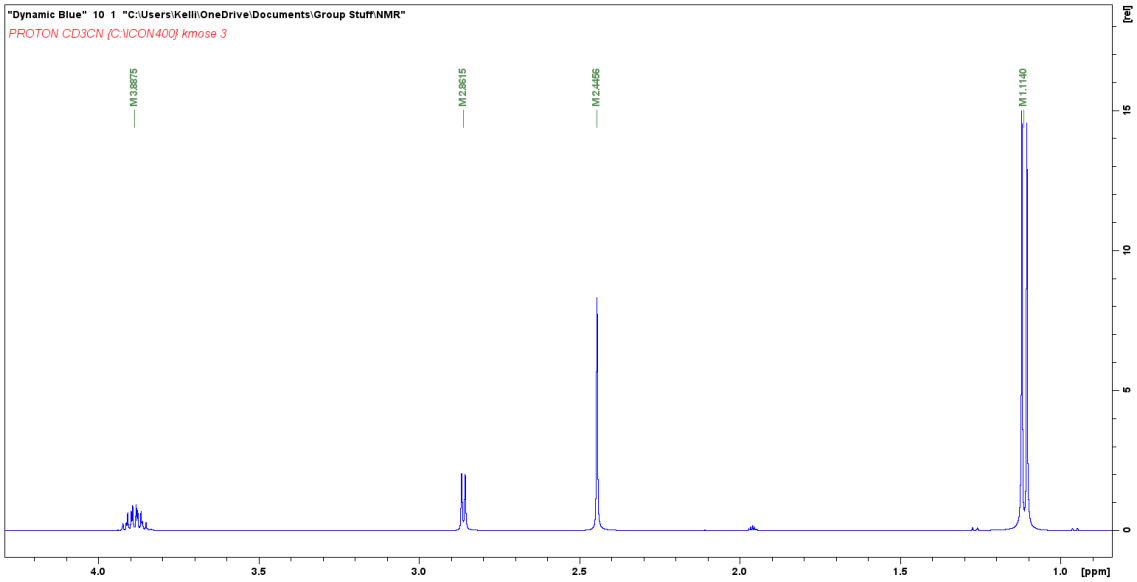

Figure S41. *^{1}H NMR spectrum of Dynamic Blue distillate in acetonitrile-d3*

Isopropanol shows an octet of doublets at δ3.8875 ppm, a doublet at δ1.1140 ppm, and an additional doublet at δ2.8615 ppm. The singlet present at δ2.4456 ppm can be attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

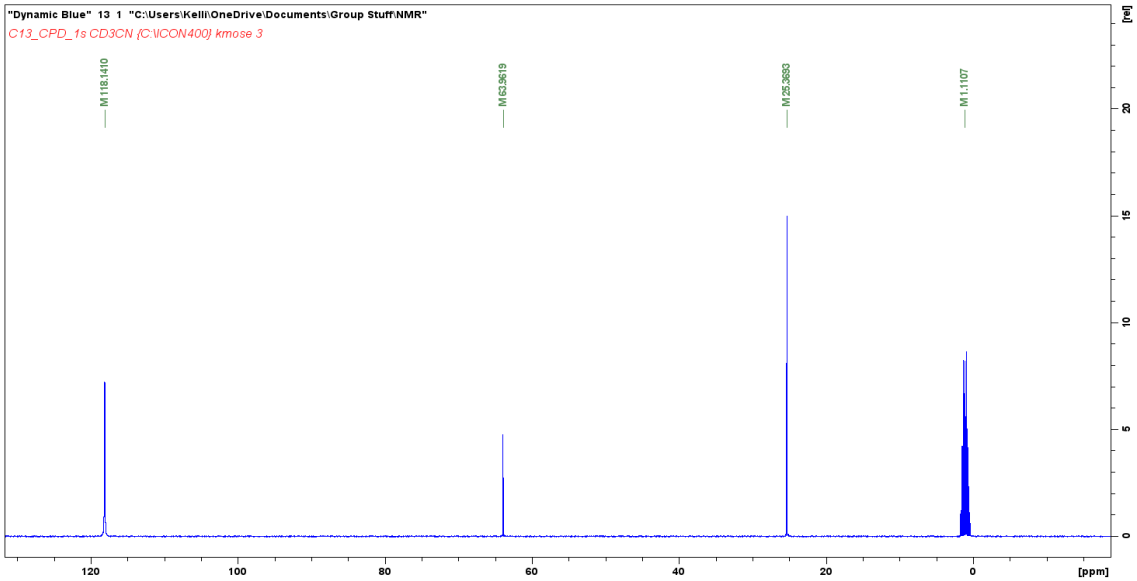

Figure S42. *^{13}C NMR spectrum of Dynamic Blue distillate in acetonitrile-d3*

Two peaks of notice can be observed at δ25.3696 ppm and δ63.9619 ppm. Both peaks correspond to isopropanol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

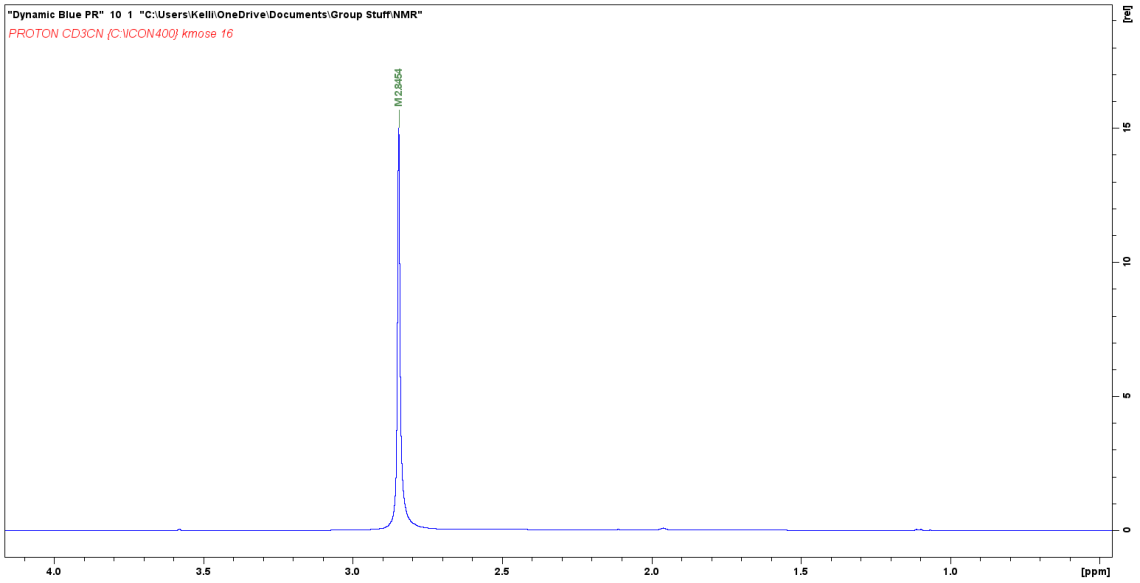

Figure S43. *^{1}H NMR spectrum of Dynamic Blue pot residue in acetonitrile-d3*

The only peak in the spectrum can be found at δ2.8454 ppm. This singlet can be attributed to water in the sample.

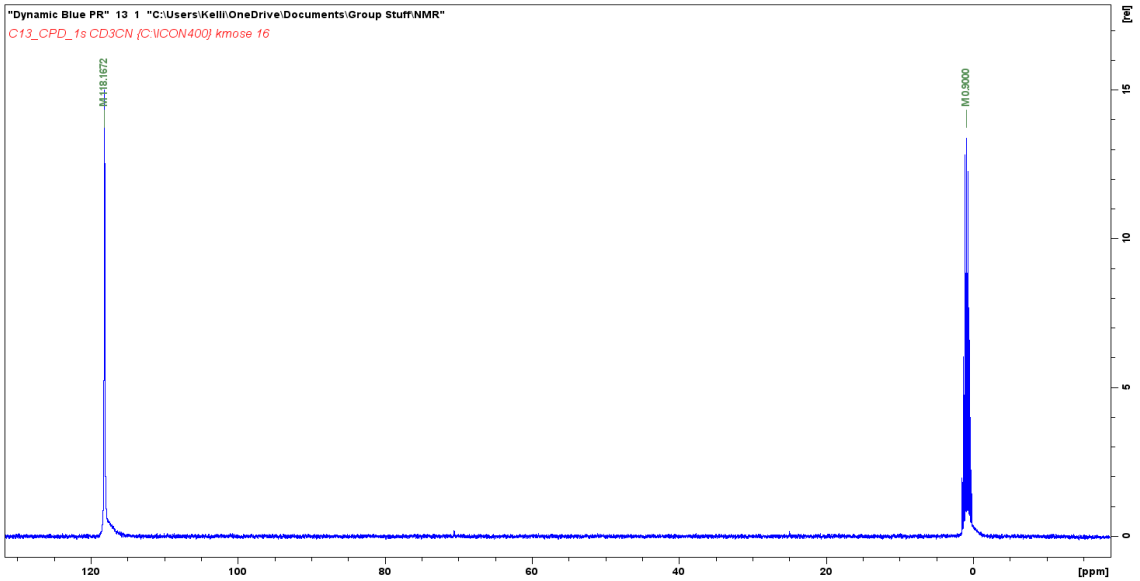

Figure S44. *^{13}C NMR spectrum of Dynamic Blue pot residue in acetonitrile-d3*

The lack of other signals besides that from the solvents supports water being the only component to this sample. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

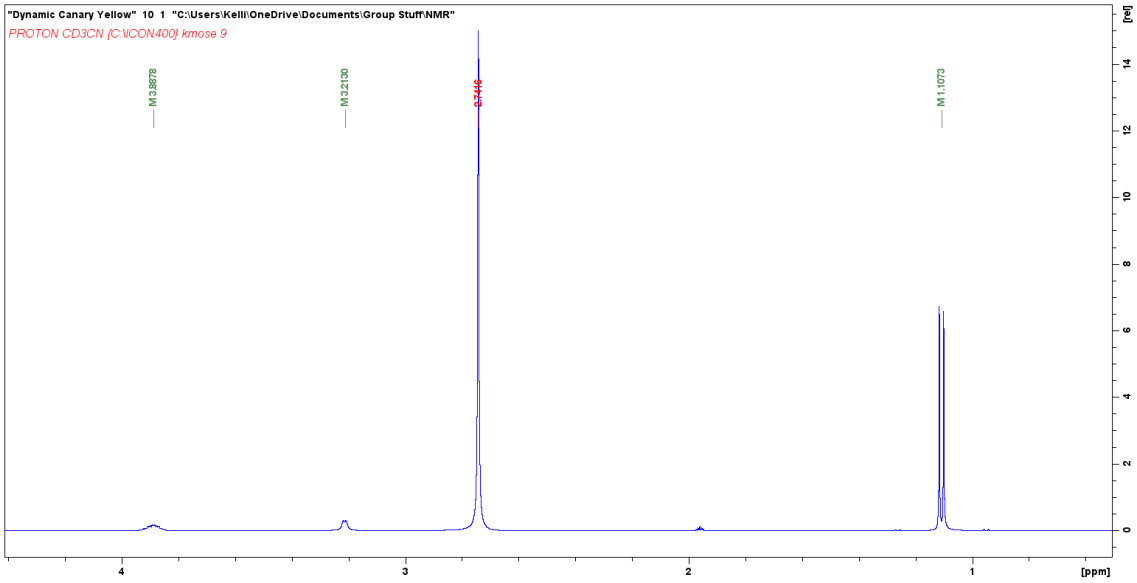

Figure S45. *^{1}H NMR spectrum of Dynamic Canary Yellow distillate in acetonitrile-d3*

Isopropanol shows three major signals, one at δ3.8878 ppm (septet), δ3.2130 ppm (doublet), and δ1.1073 ppm (doublet). The large peak at δ2.7416 ppm can be attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

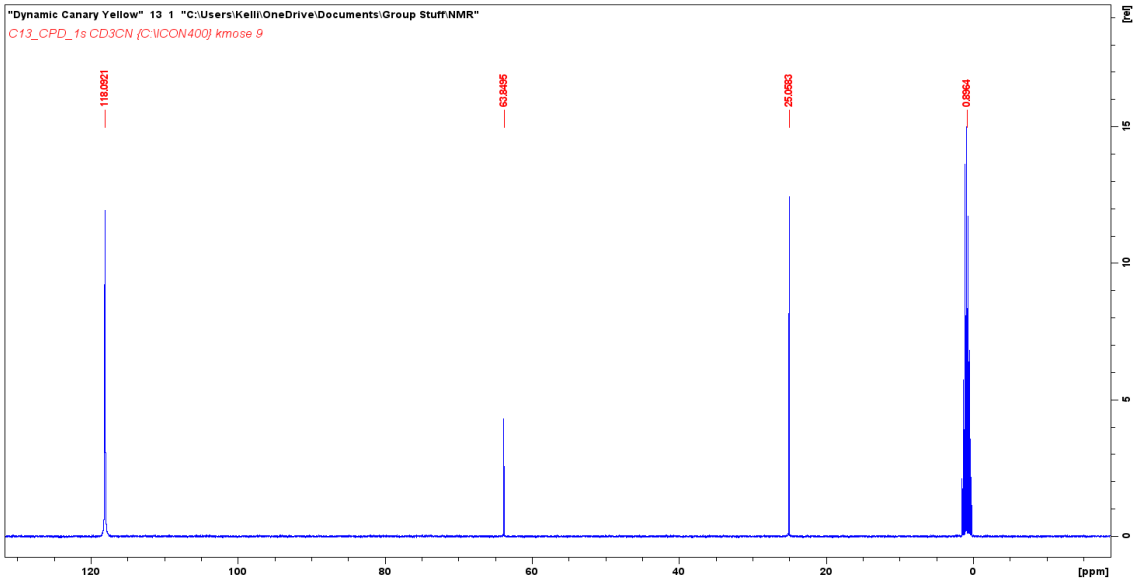

Figure S46. *^{13}C NMR spectrum of Dynamic Canary Yellow distillate in acetonitrile-d3*

Two signals appear at δ25.0583 ppm and δ63.8495 ppm which correspond to that of isopropanol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

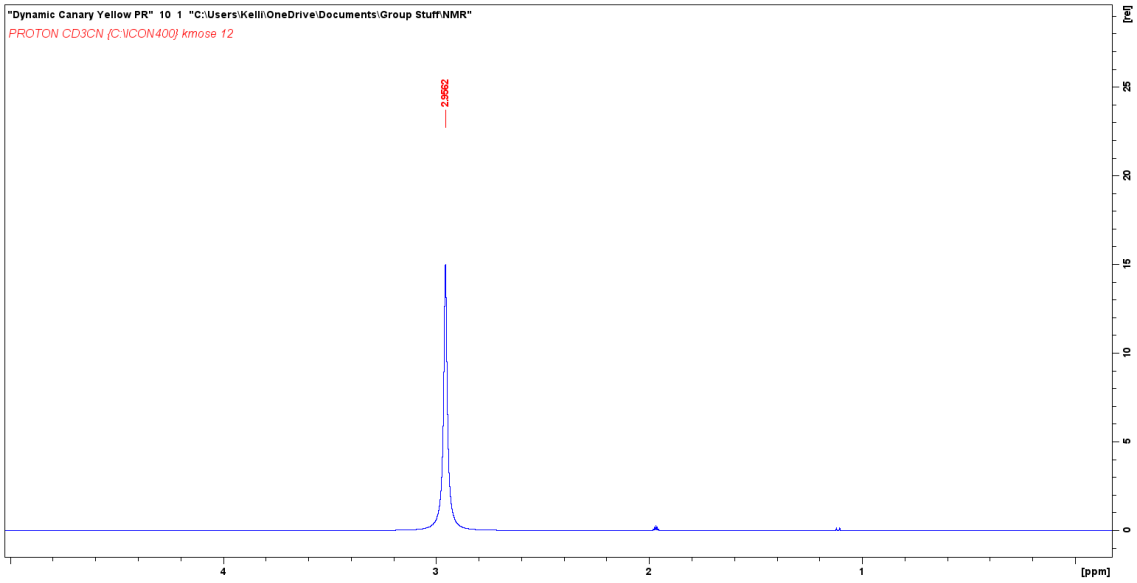

Figure S47. *^{1}H NMR spectrum of Dynamic Canary Yellow pot residue in acetonitrile-d3*

The only signal produced for this sample occurs at δ2.9562 ppm. This peak can be attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

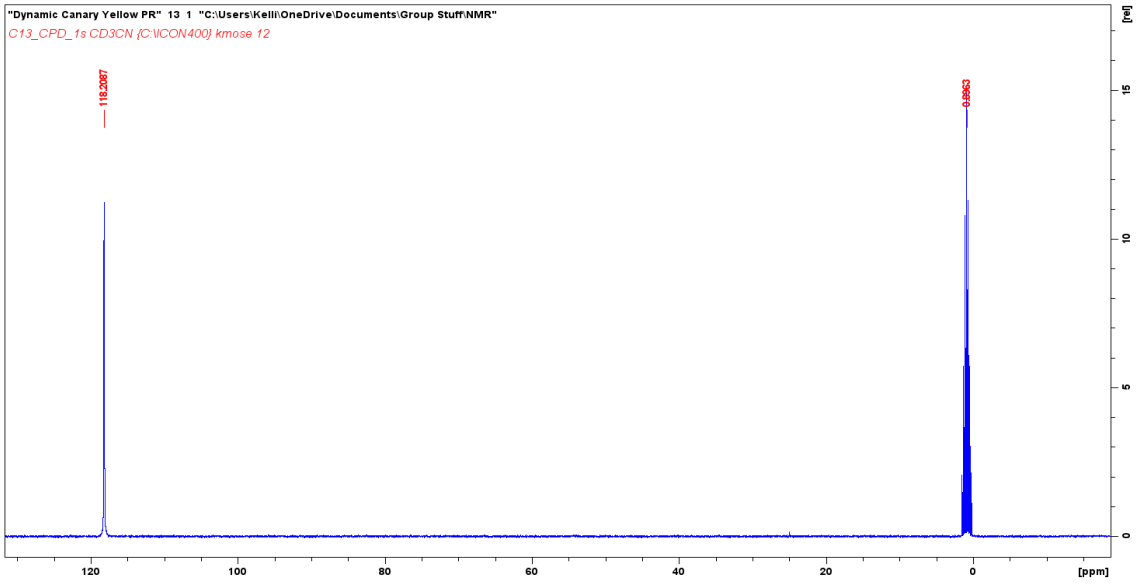

Figure S48. *^{13}C NMR spectrum of Dynamic Canary Yellow pot residue in acetonitrile-d3*

The only peaks that appear in this spectrum are produced from the acetonitrile-d3, confirming the presence of water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

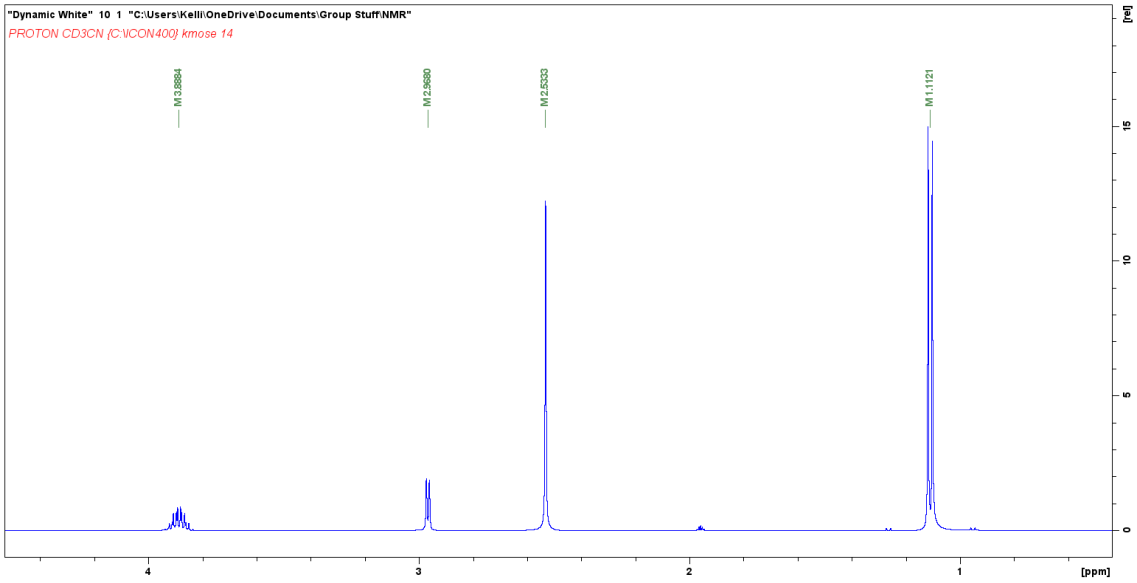

Figure S49. *^{1}H NMR spectrum of Dynamic White distillate in acetonitrile-d3*

Isopropanol shows an octet of doublets at δ3.8884 ppm, a doublet at δ1.1121 ppm, and an additional doublet at δ2.9680 ppm produced by the hydroxide hydrogen. The singlet present at δ2.5333 ppm can be attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

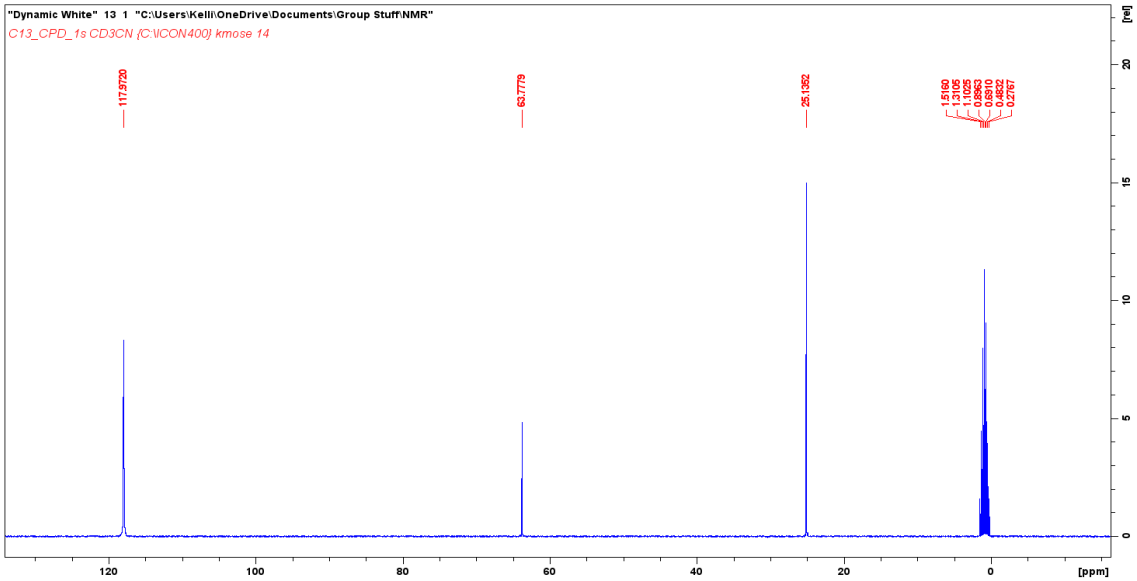

Figure S50. *^{13}C NMR spectrum of Dynamic White distillate in acetonitrile-d3*

Peaks at δ25.1352 ppm and δ63.7779 ppm are attributed to isopropanol in this sample. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

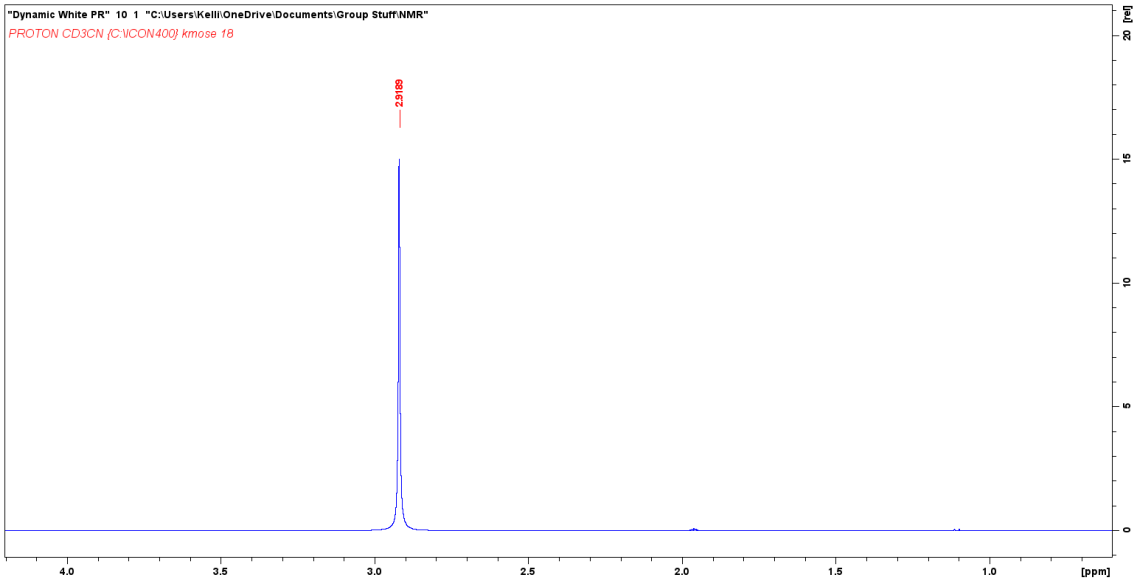

Figure S51. *^{1}H NMR spectrum of Dynamic White pot residue in acetonitrile-d3*

The only peak present occurs at δ2.9189 ppm (singlet). This is likely due to the presence of water in the solution.

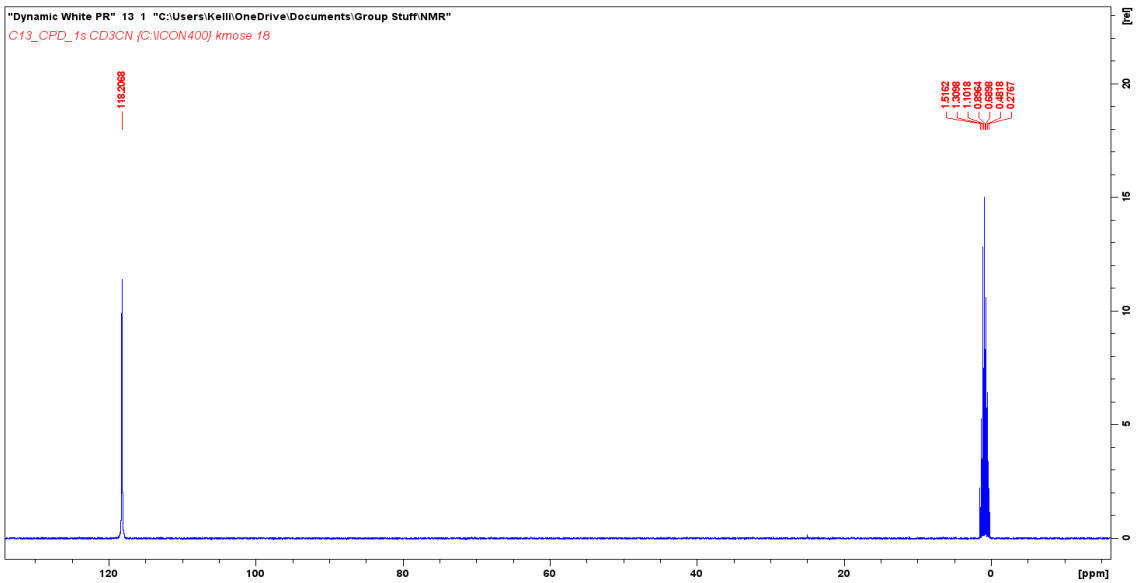

Figure S52. *^{13}C NMR spectrum of Dynamic White pot residue in acetonitrile-d3*

There are no other ^{13}C peaks found in this spectrum other than that of the solvent. The lack of peaks confirms the solution is made up of water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

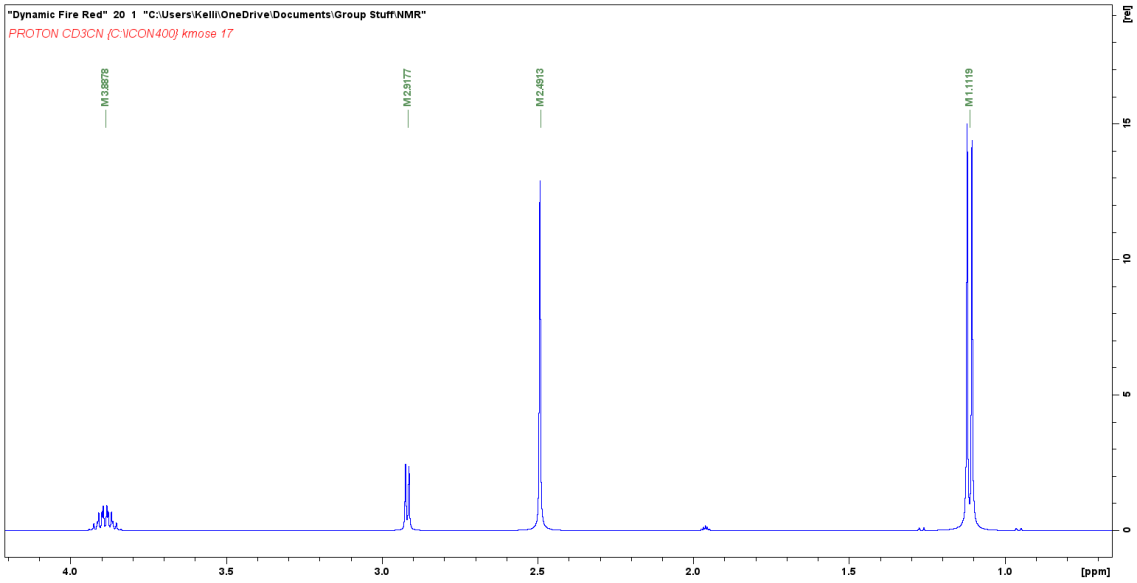

Figure S53. *^{1}H NMR spectrum of Dynamic Fire Red distillate in acetonitrile-d3*

Isopropanol and water are present in the samples. Signals at δ3.878 ppm (octet of doublets), δ2.9177 ppm (doublet) and δ1.1119 ppm (doublet) can be attributed to isopropanol, while the singlet at δ2.4913 ppm can be attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

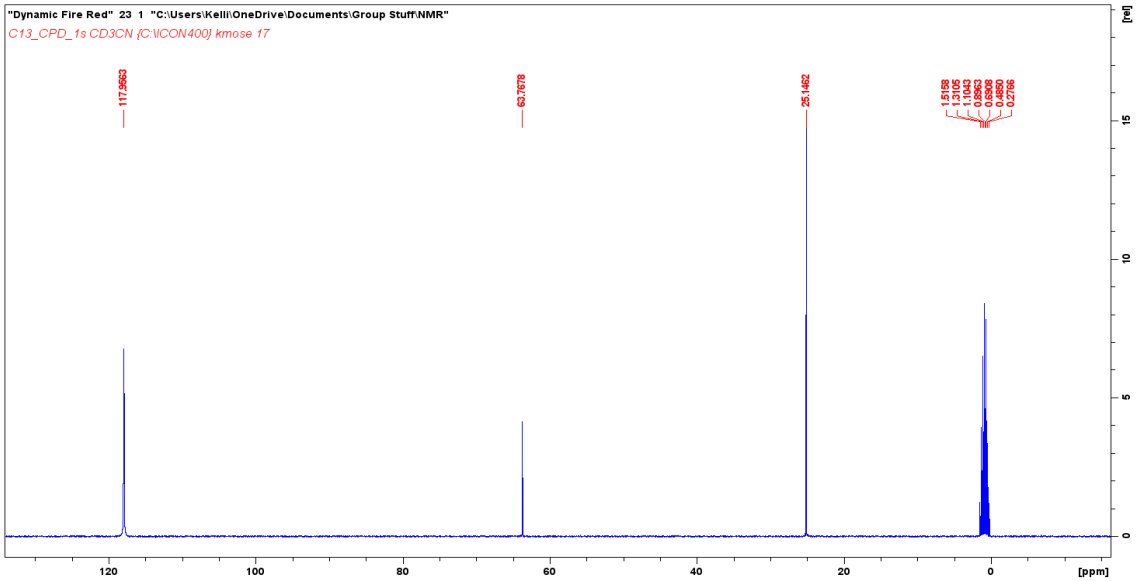

Figure S54. *^{13}C NMR spectrum of Dynamic Fire Red distillate in acetonitrile-d3*

Peaks at δ25.1462 ppm and δ63.7678 ppm can be attributed to isopropanol. The lack of other peaks, besides those of the solvent, alludes to water being in the solution. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

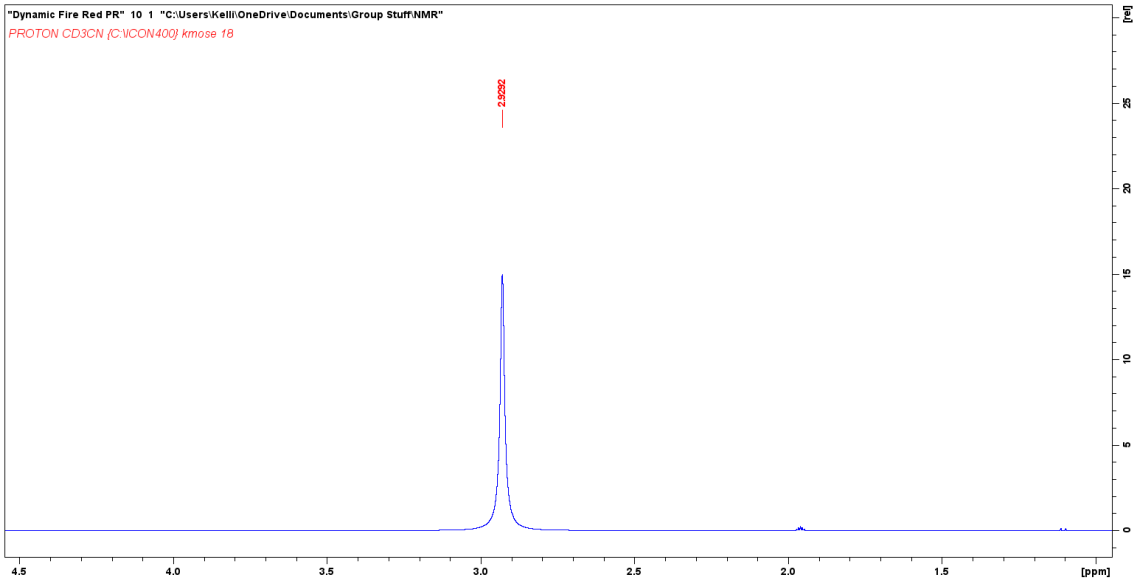

Figure S55. *^{1}H NMR spectrum of Dynamic Fire Red pot residue in acetonitrile-d3*

The only peak that is found in the spectrum is located at δ2.9292 ppm. This peak can be attributed to water.

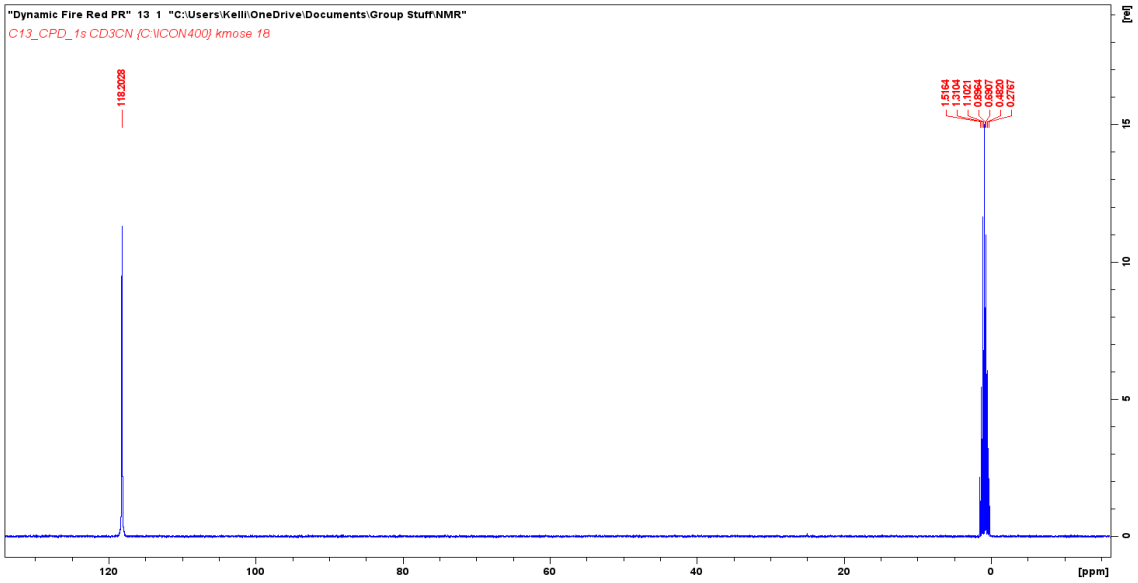

Figure S56. *^{13}C NMR spectrum of Dynamic Fire Red pot residue in acetonitrile-d3*

There are no signals present in the spectrum, besides those from the solvent used. This confirms the presence of water in the solution. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

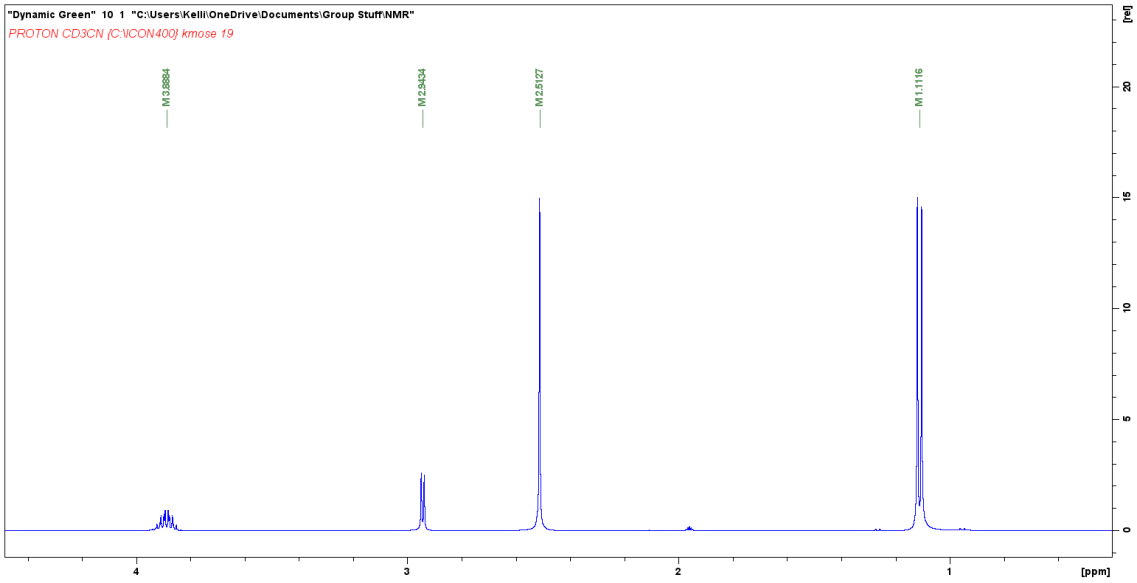

Figure S57. *^{1}H NMR spectrum of Dynamic Green distillate in acetonitrile-d3*

Isopropanol shows an octet of doublets at δ3.8884 ppm, a doublet at δ1.1116 ppm, and an additional doublet at δ2.9434 ppm produced by the hydroxide hydrogen. The singlet present at δ2.5127 ppm can be attributed to water.

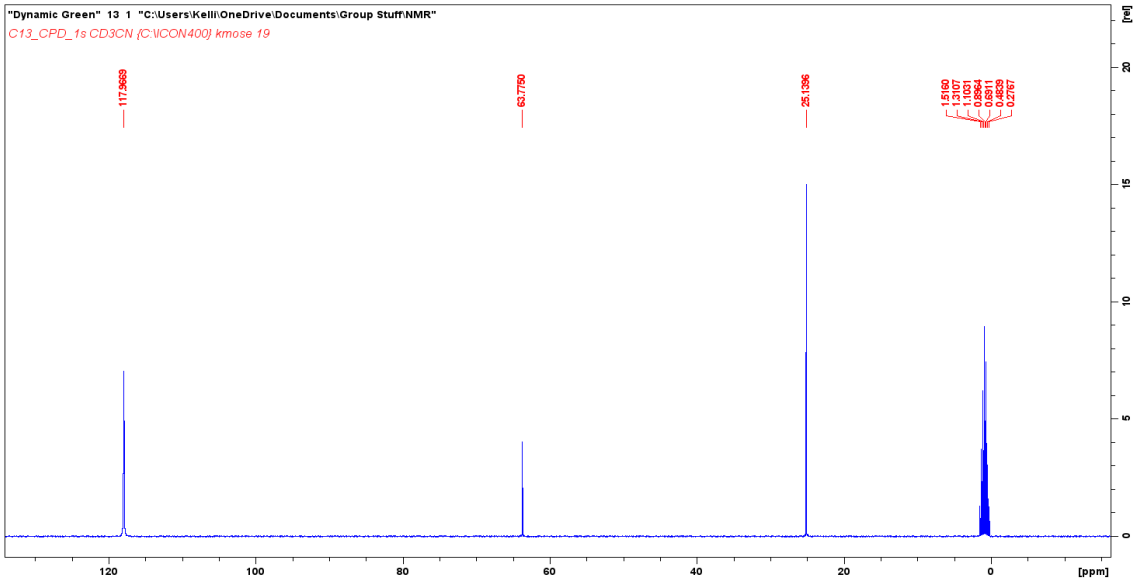

Figure S58. *^{13}C NMR spectrum of Dynamic Green distillate in acetonitrile-d3*

Peaks appear at δ25.1396 ppm and δ63.7750 ppm and can be attributed to isopropanol. The lack of other signals, besides those produced by the acetonitrile-d3 solvent, confirms the presence of water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

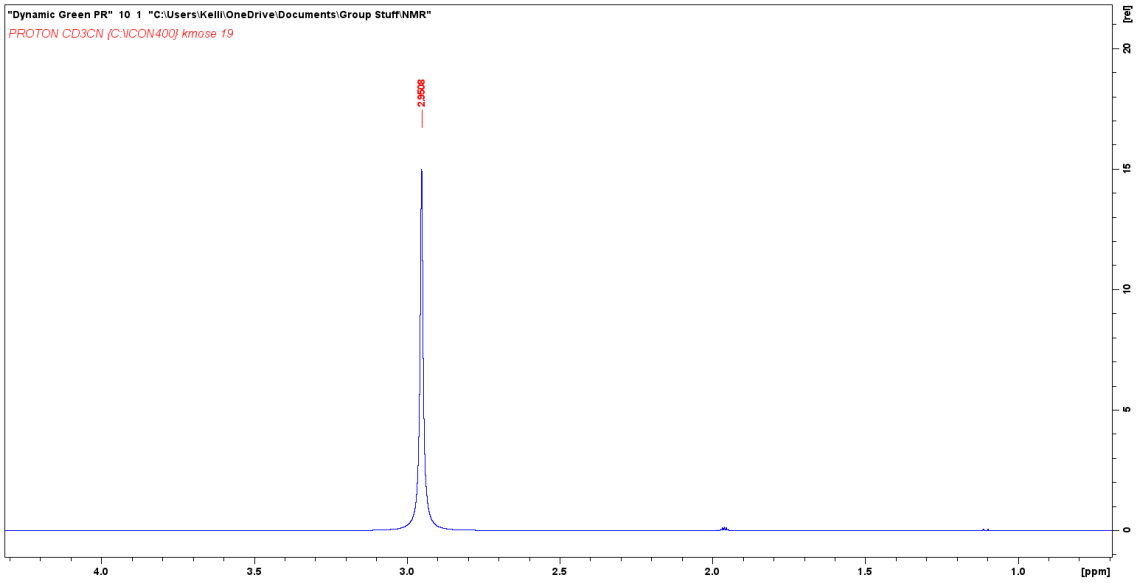

Figure S59. *^{1}H NMR spectrum of Dynamic Green pot residue in acetonitrile-d3*

The only peak present in the spectrum occurs at δ2.9508 ppm. This peak is attributed to water.

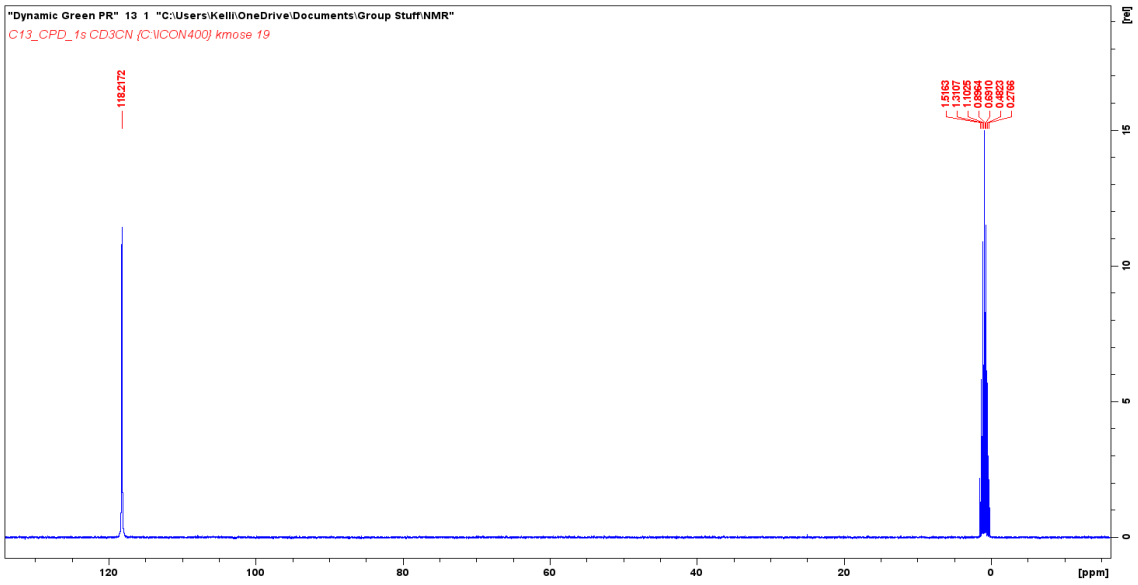

Figure S60. *^{13}C NMR spectrum of Dynamic Green pot residue in acetonitrile-d3*

There are no signals present in the spectrum, besides those from the solvent used. This confirms the presence of water in the solution. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

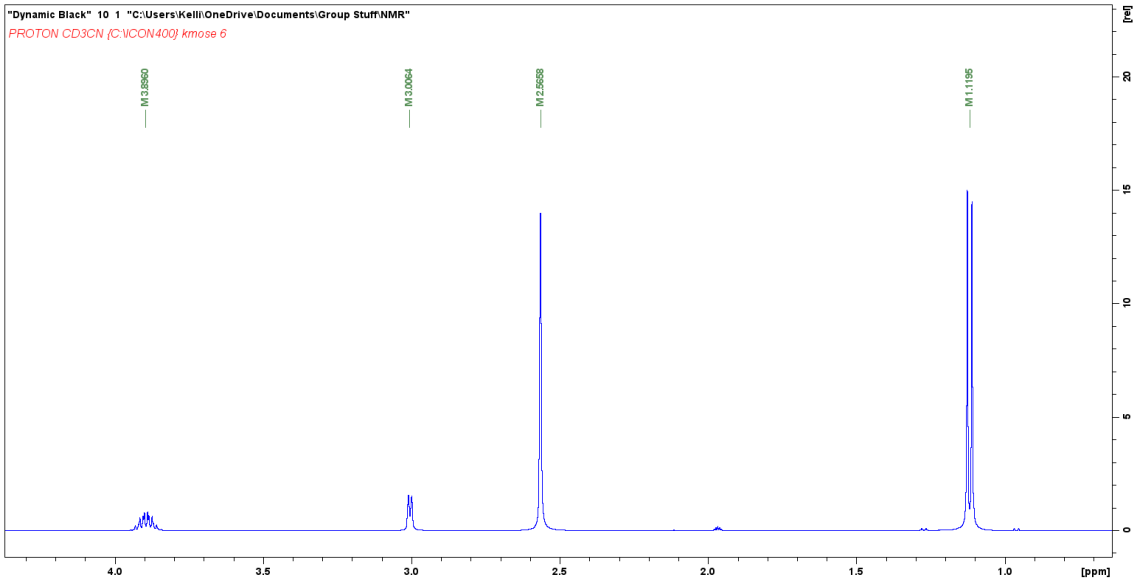

Figure S61. *^{1}H NMR spectrum of Dynamic Black distillate in acetonitrile-d3*

Isopropanol and water are present in solution. Peaks at δ3.8960 ppm (octet of doublets), δ3.0064 ppm (doublet) and δ 1.1195 ppm (doublet) can be attributed to isopropanol, while the singlet at δ2.5658 ppm is attributed to water.

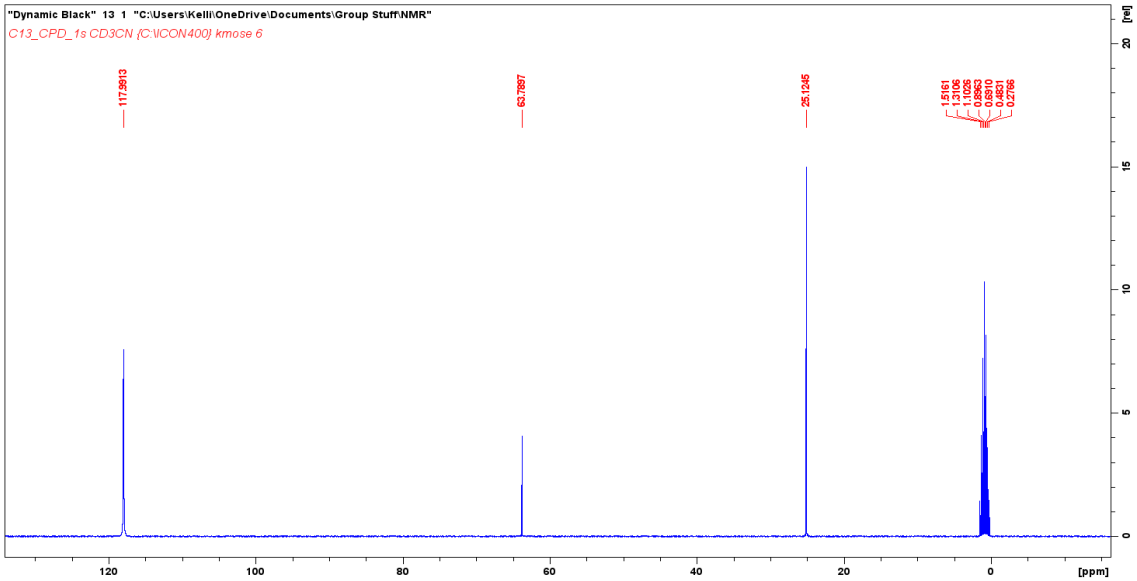

Figure S62. *^{13}C NMR spectrum of Dynamic Black distillate in acetonitrile-d3*

Peaks at δ25.1245 ppm and δ63.7897 ppm correspond to isopropanol. The lack of other signals, besides those of the acetonitrile-d3 solvent, confirms the presence of water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

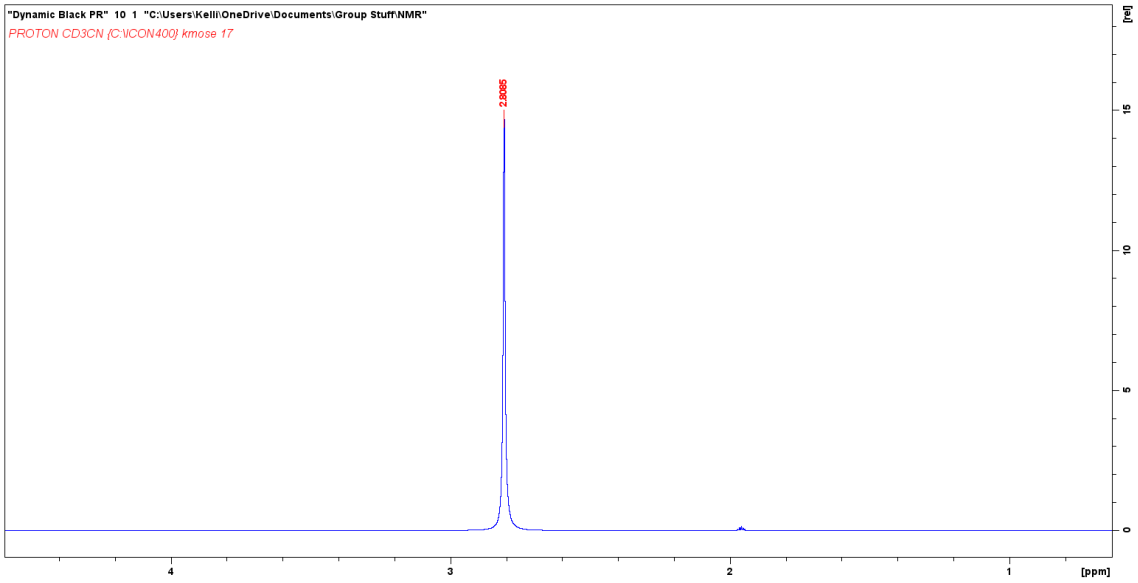

Figure S63. *^{1}H NMR spectrum of Dynamic Black pot residue in acetonitrile-d3*

The only signal present in the spectrum arises from water. It produces as singlet at δ2.8085 ppm.

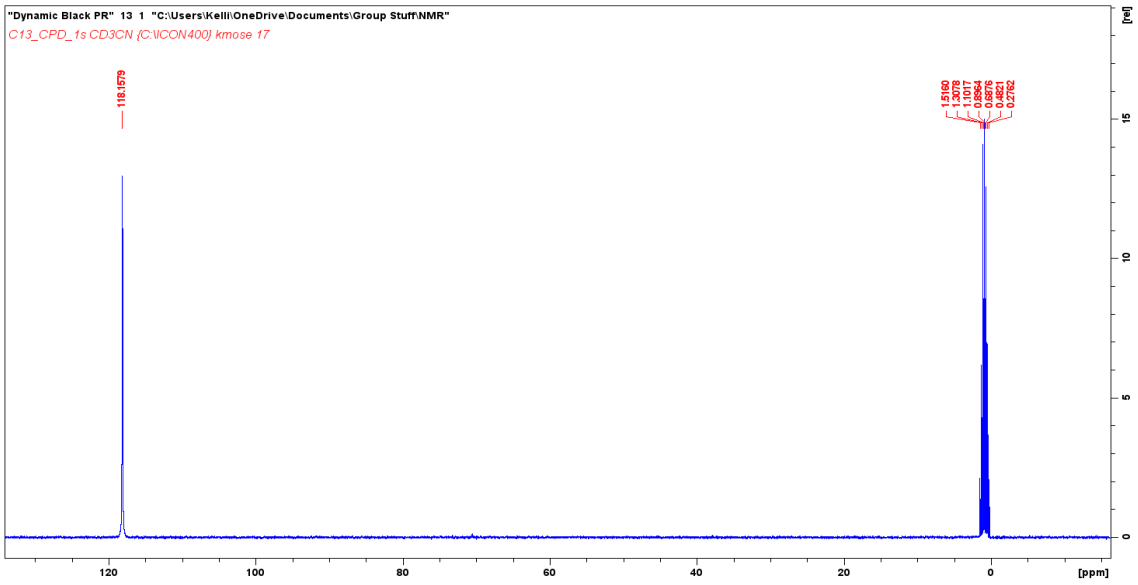

Figure S64. *^{13}C NMR spectrum of Dynamic Black pot residue in acetonitrile-d3*

There are no signals present in the spectrum, besides those from the solvent used. This confirms the presence of water in the solution. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

3.2 Raman

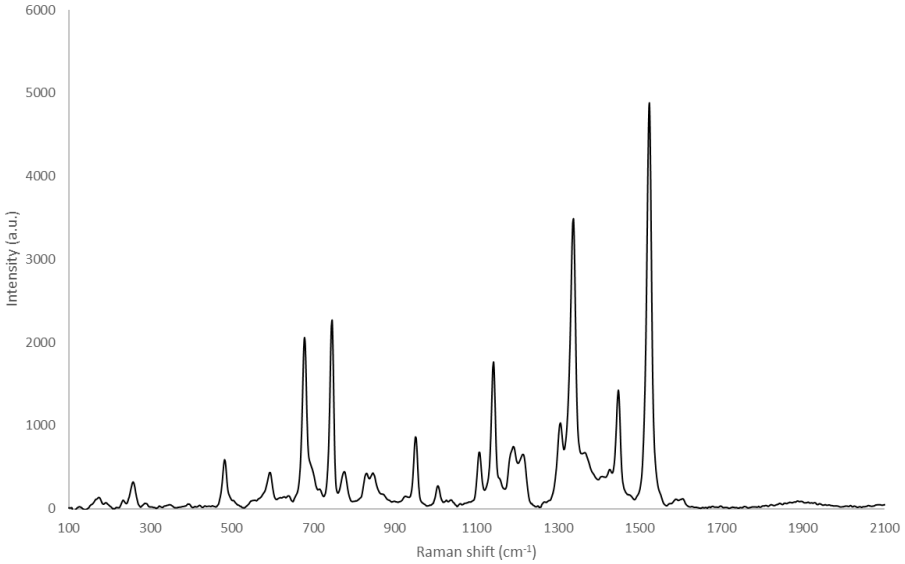

Figure S65. *Raman spectrum of Dynamic Blue*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 1 average, 1 boxcar, auto-baseline on. Major peaks at 1524 cm^{-1}, 1448 cm^{-1}, 1338 cm^{-1}, 1216 cm^{-1}, 1192 cm^{-1}, 1140 cm^{-1}, 1106 cm^{-1}, 746 cm^{-1}, and 680 cm^{-1}. These peaks correspond to Pigment Blue 15 from the SOPRANO spectra database.[1]

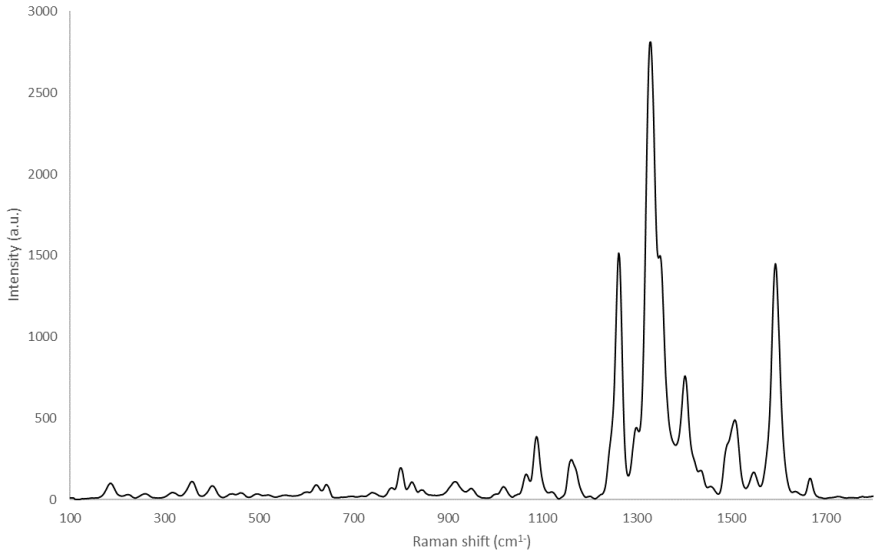

Figure S66. *Raman spectrum of Dynamic Yellow*

Parameters used to obtain this spectrum are as follows: 785 nm, 150 mW, 10 second integration, 3 average, 2 boxcar, auto-baseline on. Major peaks at 1594 cm^{-1}, 1510 cm^{-1}, 1404 cm^{-1}, 1330 cm^{-1}, 1264 cm^{-1}, 1162 cm^{-1}, and 1090 cm^{-1}. These peaks correspond to Pigment Yellow 74 and matches the spectrum produced in the SOPRANO Raman spectra database.[1]

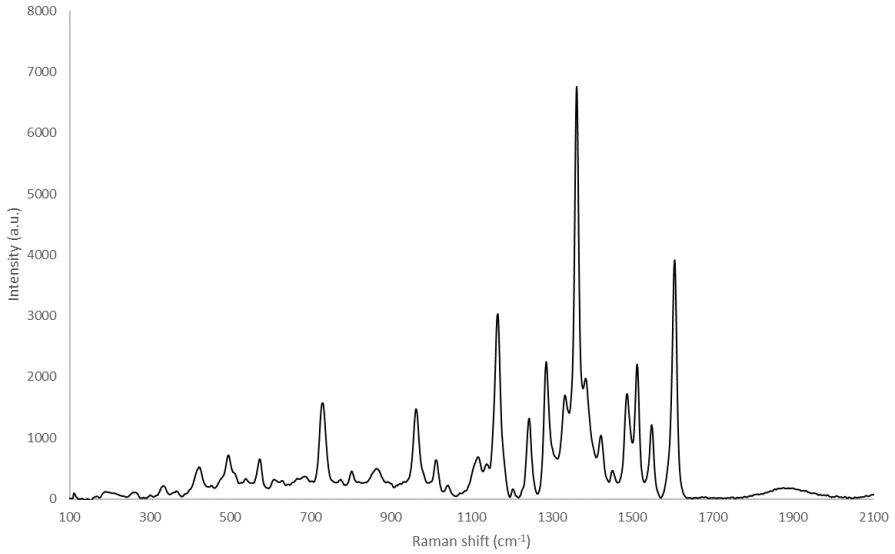

Figure S67. *Raman spectrum of Dynamic Fire Red*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 1 average, 1 boxcar, auto-baseline on. Major peaks, including those at 1606 cm^{-1}, 1548 cm^{-1}, 1512 cm^{-1}, 1490 cm^{-1}, 1362 cm^{-1}, 1286 cm^{-1}, 1244 cm^{-1}, 1164 cm^{-1}, 964 cm^{-1}, and 730 cm^{-1}, match those in the SOPRANO Raman spectrum of Pigment Red 266.[1]

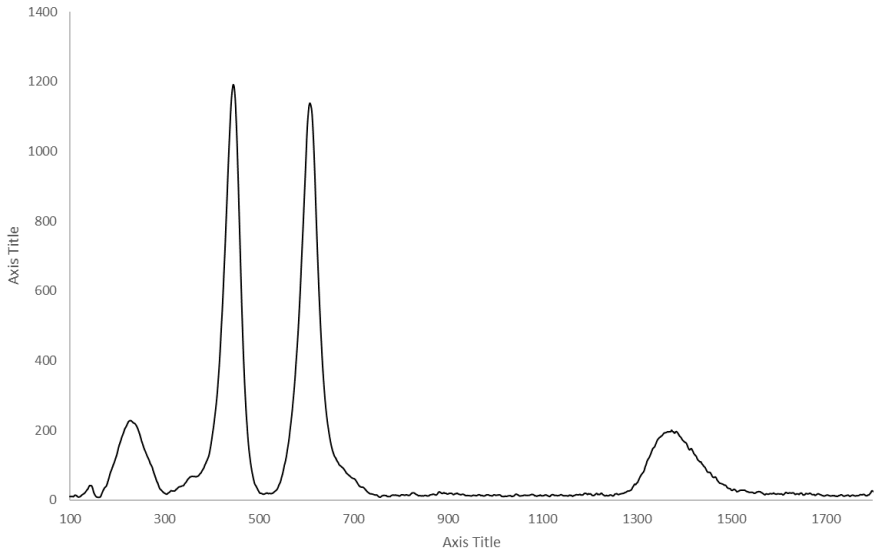

Figure S68. *Raman spectrum of Dynamic White*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 1 average, 1 boxcar, auto-baseline on. Major peaks appear at 608 cm^{-1}, 446 cm^{-1}, 230 cm^{-1}, with a small peak at 146 cm^{-1}. These are all evidence of Pigment White 6 (TiO_2) (see section 10).

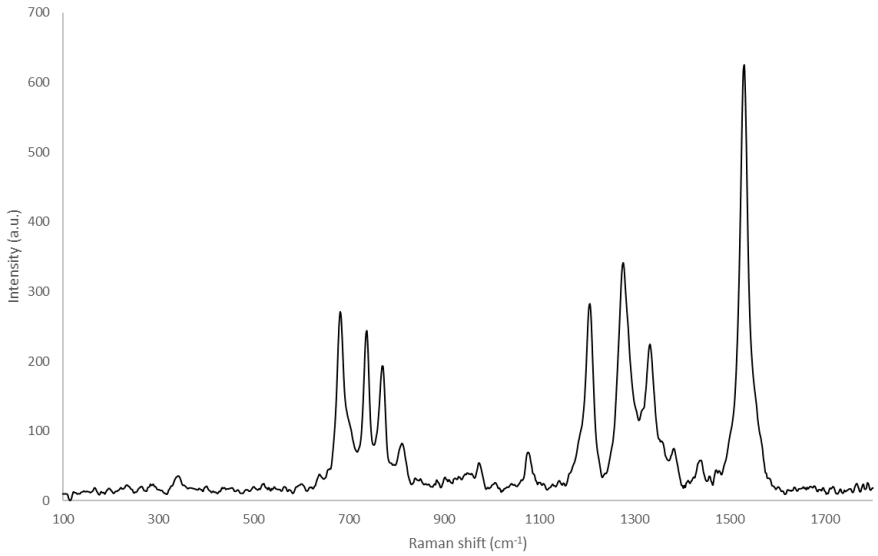

Figure S69. *Raman spectrum of Dynamic Green*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 1 average, 1 boxcar, auto-baseline on. Major peaks appearing at 1530 cm^{-1}, 1334 cm^{-1}, 1276 cm^{-1}, 1206 cm^{-1}, 772 cm^{-1}, 738 cm^{-1}, and 684 cm^{-1} matches with peaks in the Raman spectrum of Pigment Green 7 from the SOPRANO Raman spectrum database.[1]

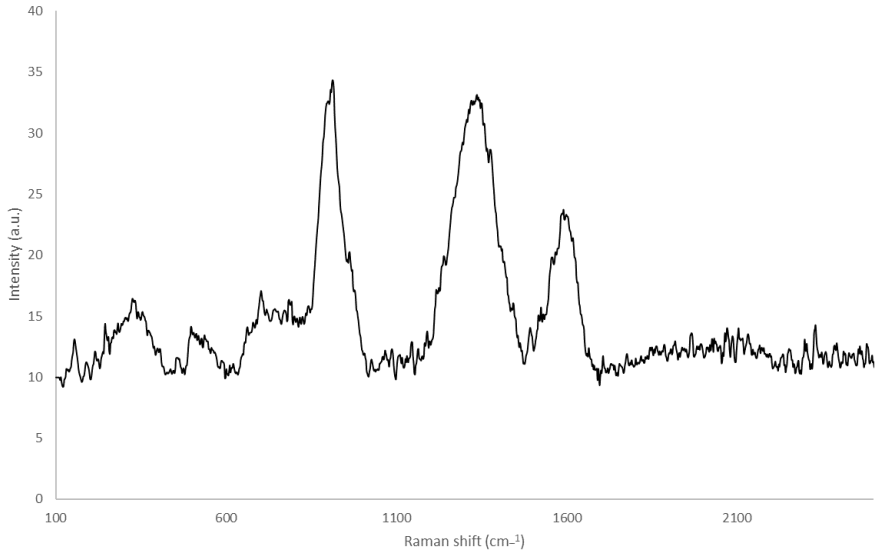

Figure S70. *Raman spectrum of Dynamic Black*

Parameters used to obtain this spectrum are as follows: 785 nm, 200 mW, 10 second integration, 3 average, 2 boxcar, auto-baseline on. Three major peaks occur at 1598 cm^{-1}, 1334 cm^{-1}, and 916 cm^{-1} corresponding to the presence of carbon black pigment (see section 10).

3.3 XRF

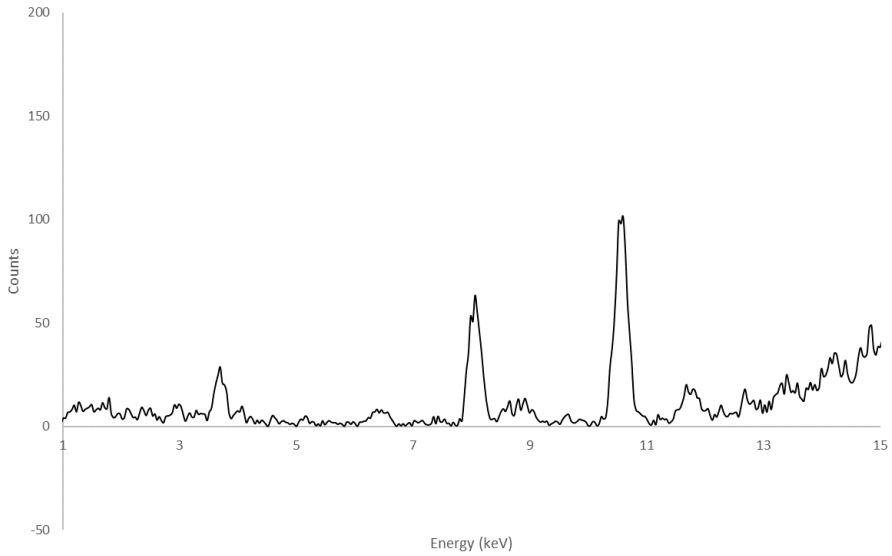

Figure S71. *X-ray fluorescence spectrum of Dynamic Blue*

Signals at 8.06 kEv and 8.81 keV are produced from copper, likely from the copper containing Pigment Blue 15. The signals at 10.60 keV and 11.68 keV are attributed to arsenic present in the microscope slide used to mount the sample.

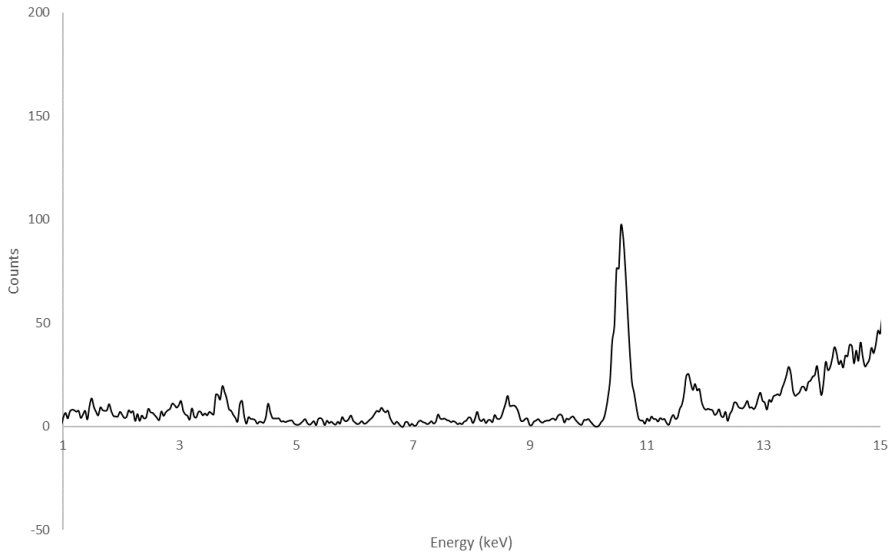

Figure S72. *X-ray fluorescence spectrum of Dynamic Yellow*

The only significant peaks present in the sample occur at 10.56 keV and 11.27 keV which occurs due to small amounts of arsenic present in the glass microscope slide used to dry the sample on. The lack of other signals indicates the absence of any inorganic pigments present in the sample.

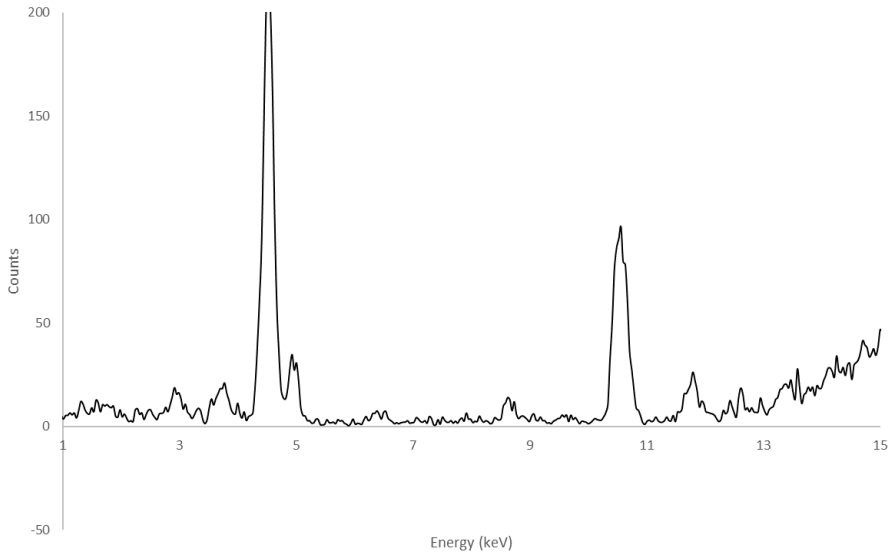

Figure S73. *X-ray fluorescence spectrum of Dynamic White*

Peak couples occurring at 4.52 keV and 5.00 keV, and 10.60 keV and 11.75 keV correspond to titanium and arsenic, respectively. The titanium signal is indicative of Pigment White 6, titanium dioxide, while the arsenic peaks originate from the glass microscope slide used to mount the sample on.

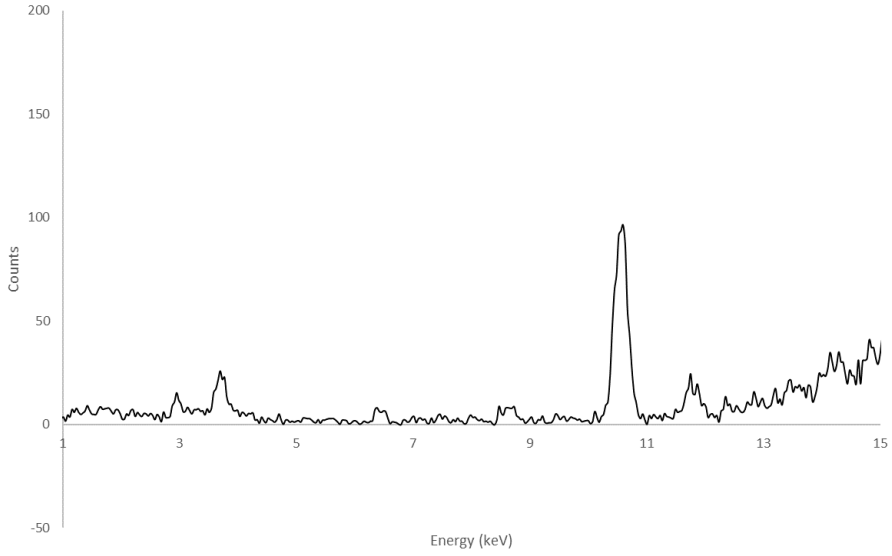

Figure S74. *X-ray fluorescence spectrum of Dynamic Fire Red*

The only major peaks occurring appear at 10.60 keV and 11.75 keV. This occurs due to small amounts of arsenic present in the glass microscope slide used to dry the sample on. The lack of other signals indicates the lack of any inorganic pigments present in the sample.

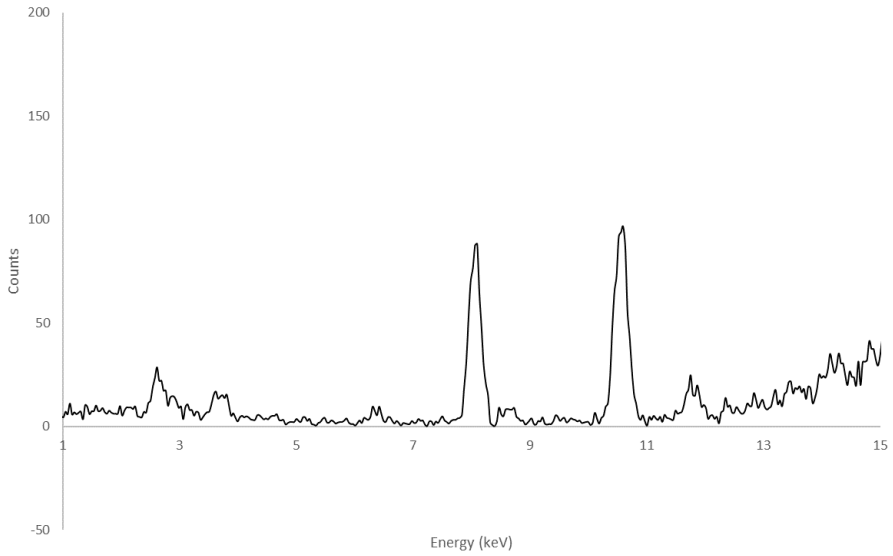

Figure S75. *X-ray fluorescence spectrum of Dynamic Green*

One major peak pair occurs at 8.10 keV and 8.95 keV. This is due to copper being present in Pigment Green 7. The peaks pair at 10.52 keV and 11.72 keV are due to arsenic present in the microscope slide used to dry the sample on.

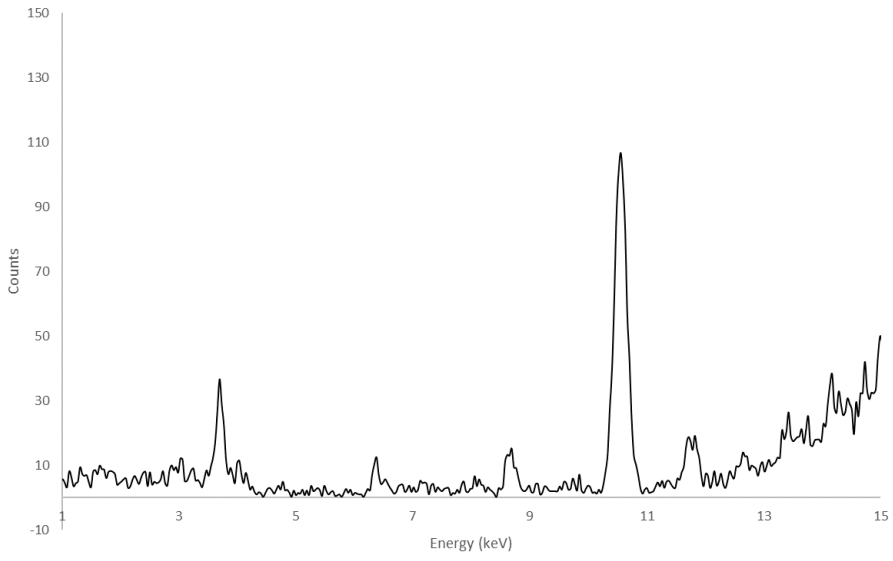

Figure S76. *X-ray fluorescence spectrum of Dynamic Black*

A major peak pair occurring at 10.56 keV and 11.73 keV appear due to arsenic in the microscope slide used to dry the sample on.

4. Solid Ink

4.1 NMR

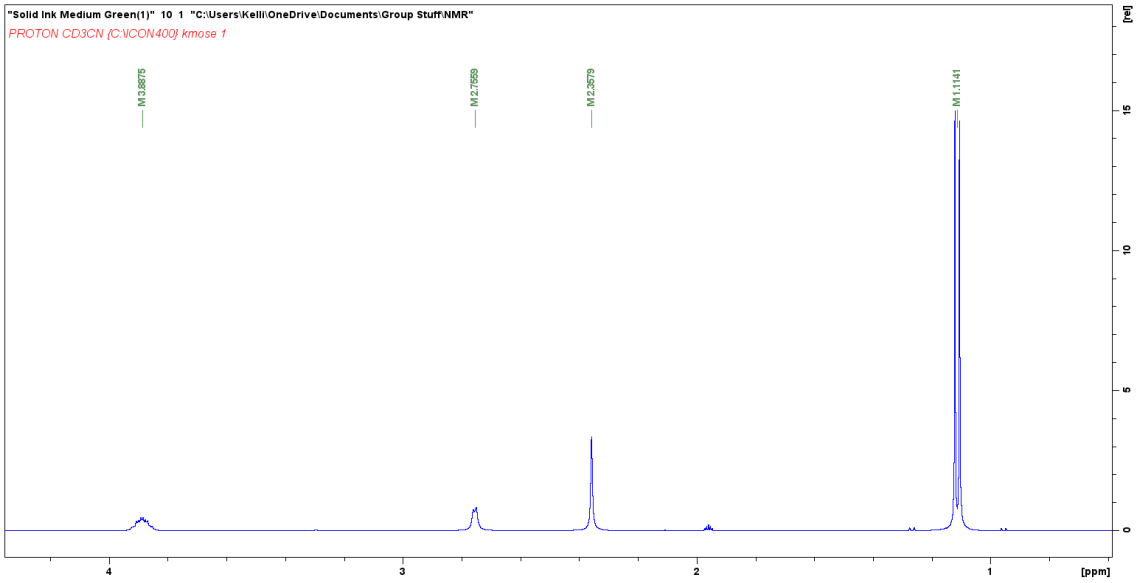

Figure S77. *^{1}H NMR spectrum of Solid Ink Medium Green distillate in acetonitrile-d3*

Major peaks appearing at δ3.8875 ppm (multiplet), δ2.7599 ppm (doublet), and δ1.1141 ppm (doublet) are produced by isopropanol. The singlet at δ2.3579 ppm is produced by water. The acetonitrile solvent peak is located at δ1.94 ppm.

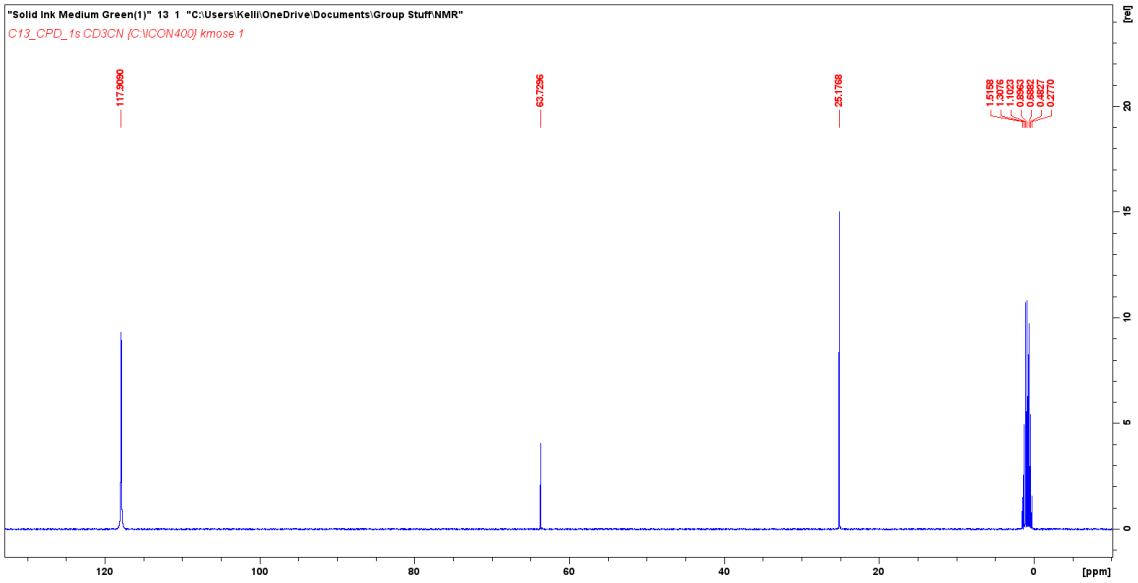

Figure S78. *^{13}C NMR spectrum of Solid Ink Medium Green distillate in acetonitrile-d3*

Two signals at δ25.1768 ppm and δ63.7296 ppm confirm the presence of isopropanol in this tattoo ink. The lack of other carbon signals confirms that the singlet (δ2.3579 ppm) from the ^{1}H NMR spectrum of this sample is water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

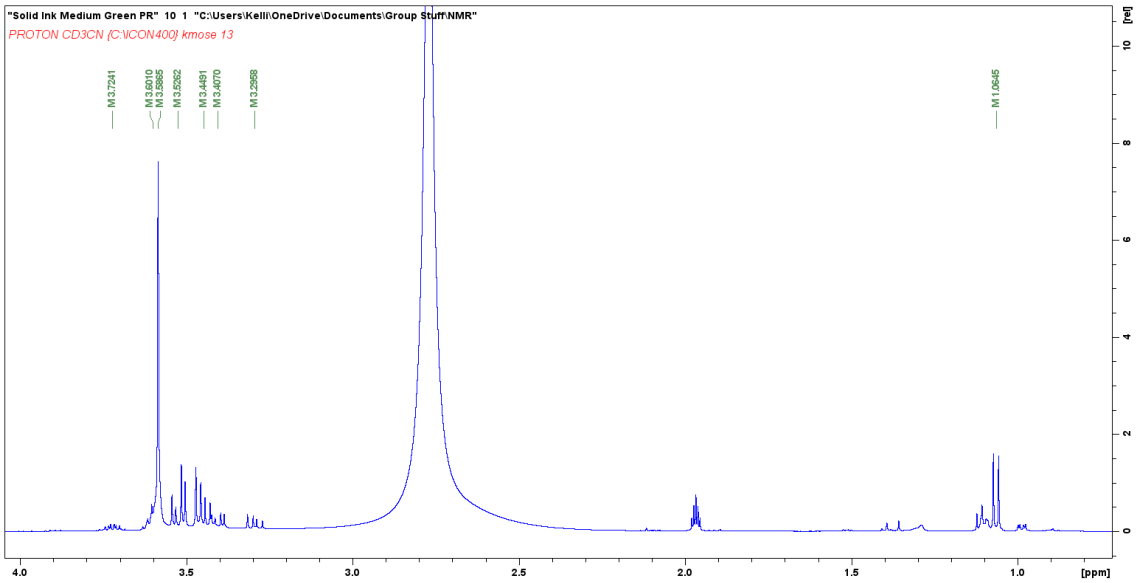

Figure S79. *^{1}H NMR spectrum of Solid Ink Medium Green pot residue in acetonitrile-d3*

Peaks at δ3.7241 ppm (multiplet), δ3.4070 ppm (multiplet), δ3.2958 ppm (multiplet) and δ1.0645 ppm (doublet) are likely produced by propylene glycol in the pot residue. Peaks at δ3.6010 ppm (multiplet), δ3.5262 ppm (multiplet), and δ3.4491 ppm (multiplet) correspond to glycerol being present. The singlet at δ3.5865 ppm is assigned to poly(ethylene glycol). The acetonitrile solvent peak is located at δ1.94 ppm.

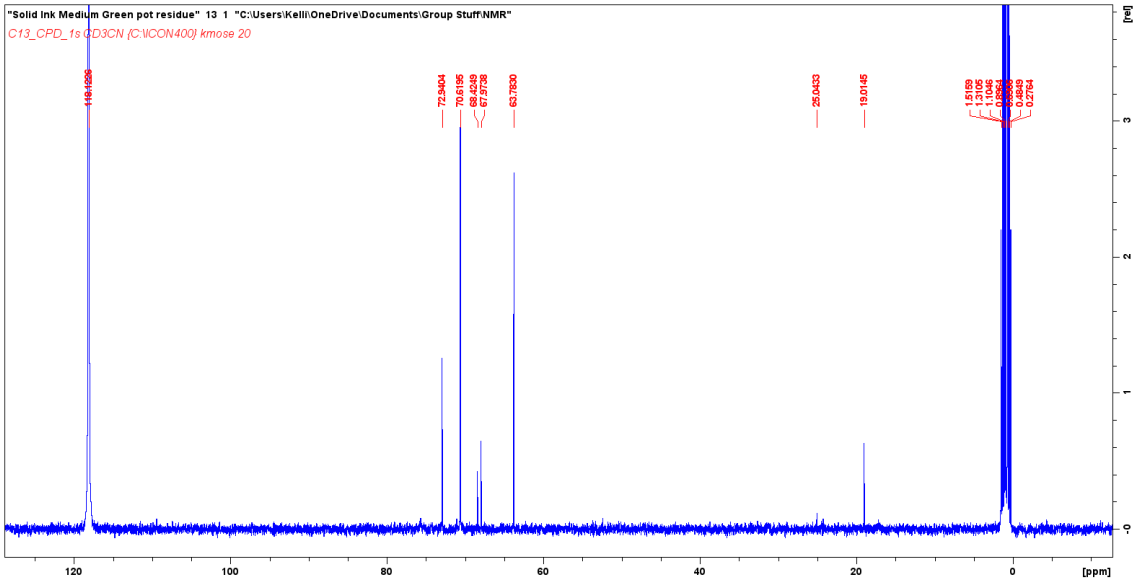

Figure S80. *^{13}C NMR spectrum of Solid Ink Medium Green pot residue in acetonitrile-d3*

Likely propylene glycol peaks appear at δ19.0154 ppm, δ67.9750 ppm, and δ68.4240 ppm. Glycerol peaks appear at δ63.7844 ppm and δ72.9408 ppm. The peak at δ70.6214 is assigned to poly(ethylene glycol). The small peak at δ25.0433 ppm likely results from a small amount of isopropanol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

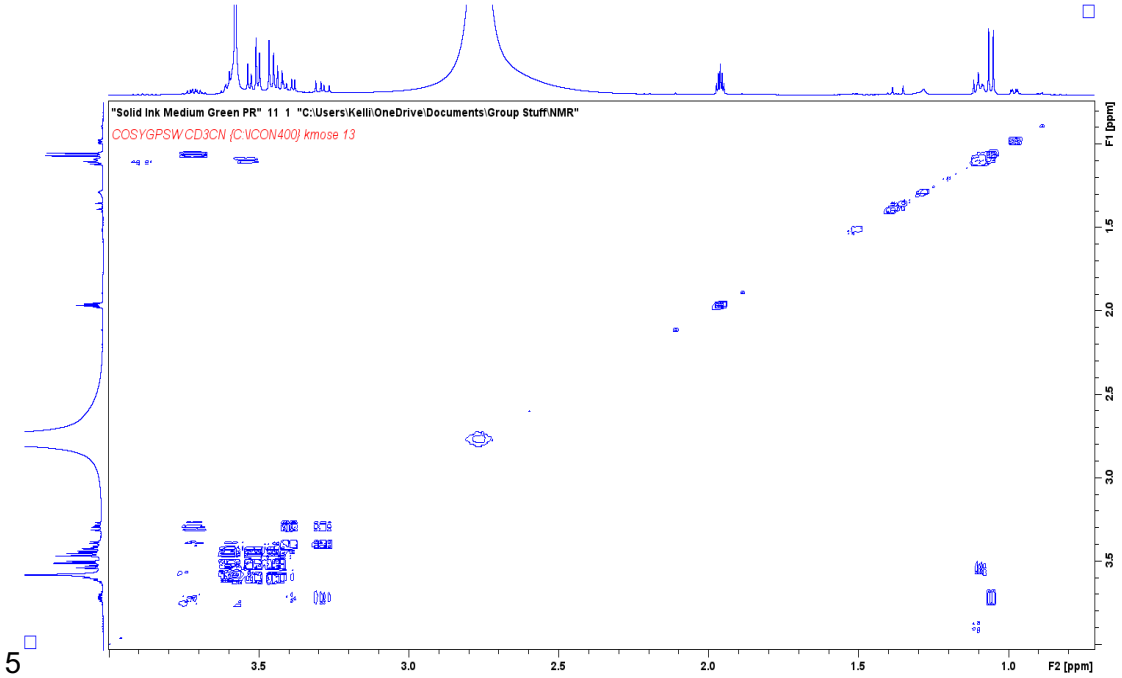

Figure S81. *^{1}H-^{1}H COSY NMR spectrum of Solid Ink Medium Green pot residue in acetonitrile-d3*

Coupling occurs between the doublet at δ1.0645 ppm, and multiplets at δ3.7241 ppm, δ3.4070 ppm, and δ3.2958 ppm which supports propylene glycol being present. Coupling also occurs between signals at δ3.6010 ppm, δ3.5262 ppm, and δ3.4491 ppm which supports glycerol being in this tattoo ink.

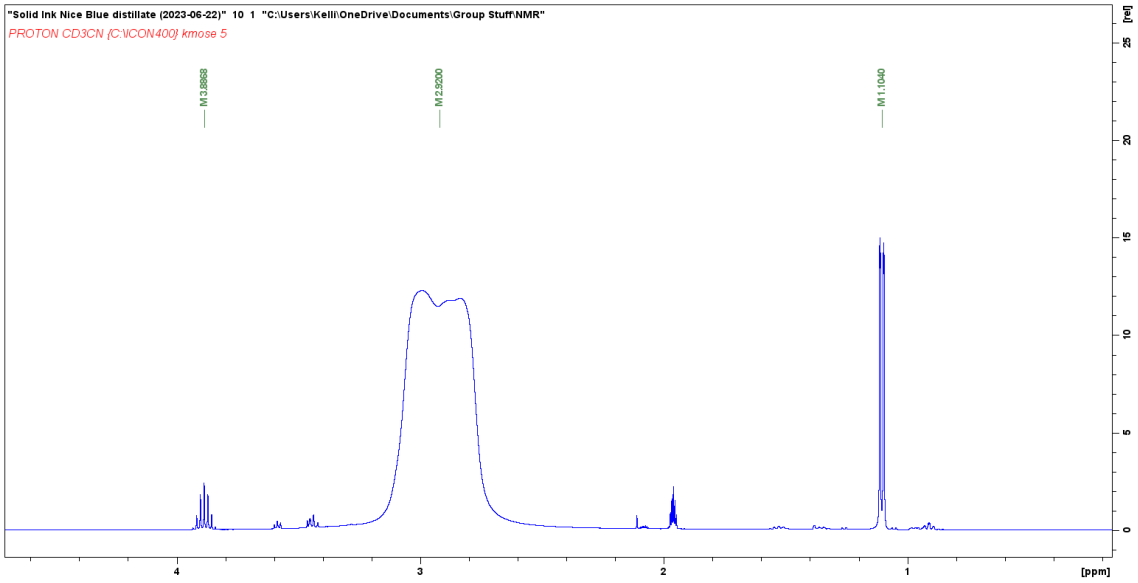

Figure S82. *^{1}H NMR spectrum of Solid Ink Nice Blue distillate in acetonitrile-d3*

Major peaks occurring at δ3.8868 ppm (septet) and δ1.1040 ppm (doublet) are attributed to isopropanol. The large peak at δ2.9200 ppm can be attributed to large amounts of water. The small peaks around δ3.5 ppm were not identified. The acetonitrile solvent peak is located at δ1.94 ppm.

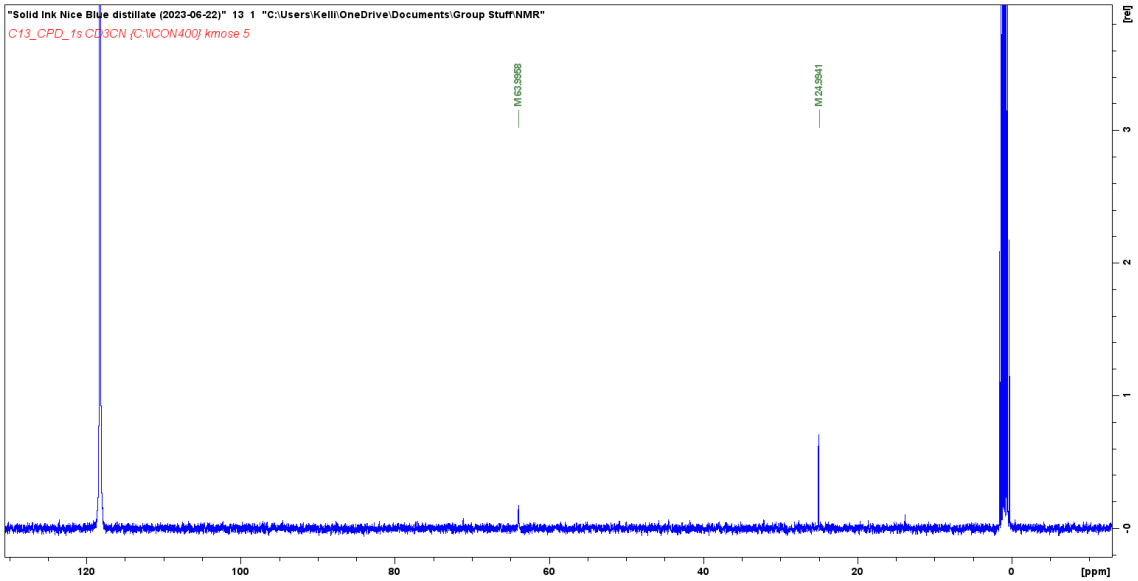

Figure S83. *^{13}C NMR spectrum of Solid Ink Nice Blue distillate in acetonitrile-d3*

Peaks occurring at δ24.9941 ppm and δ63.9958 ppm are attributed to isopropanol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

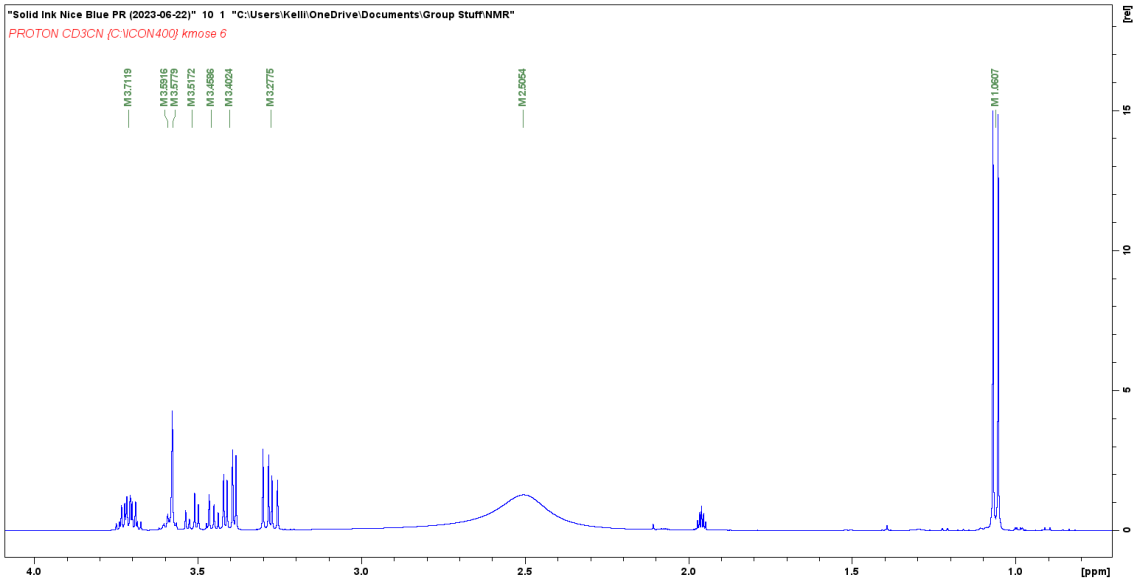

Figure S84. *^{1}H NMR spectrum of Solid Ink Nice Blue pot residue in acetonitrile-d3*

Signals from δ3.7119 ppm (multiplet), δ3.4024 ppm (multiplet), and δ1.0607 ppm (doublet) are consistent with propylene glycol while multiplets from δ3.5916 ppm, δ3.5172 ppm and δ3.3.4586 ppm are produced from glycerol. The peak at δ3.5779 ppm is assigned to poly(ethylene glycol). The acetonitrile solvent peak is located at δ1.94 ppm.

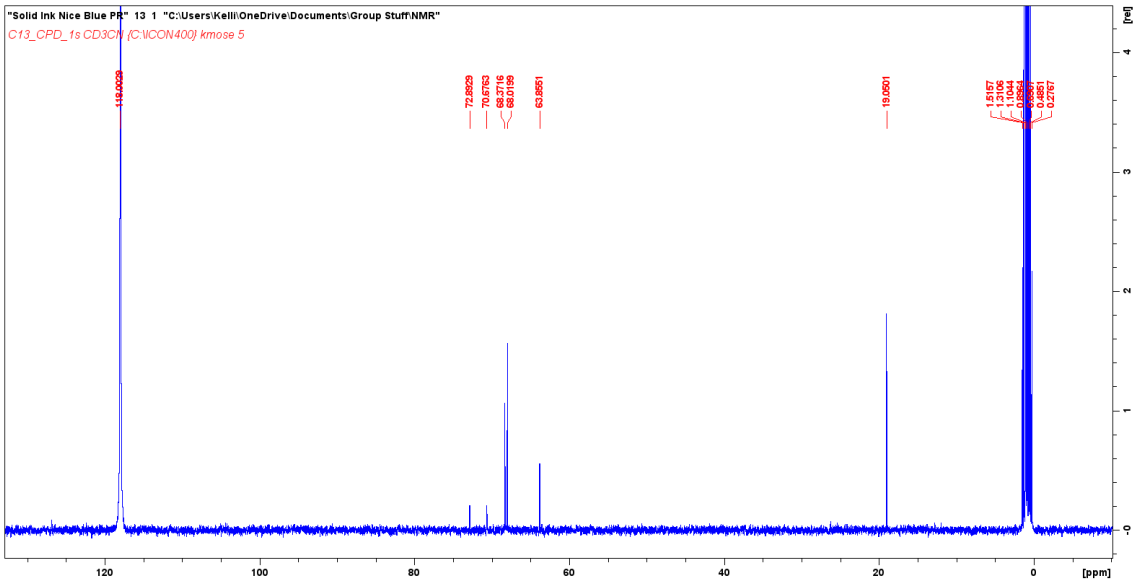

Figure S85. *^{13}C NMR spectrum of Solid Ink Nice Blue pot residue in acetonitrile-d3*

Peaks consistent with glycerol and propylene glycol are observed. Peaks at δ72.8843 ppm and δ63.8638 ppm belong to glycerol and peaks at δ68.3621 ppm, δ68.0272 ppm, and δ19.0555 ppm are consistent with propylene glycol. The peak at δ70.6763 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

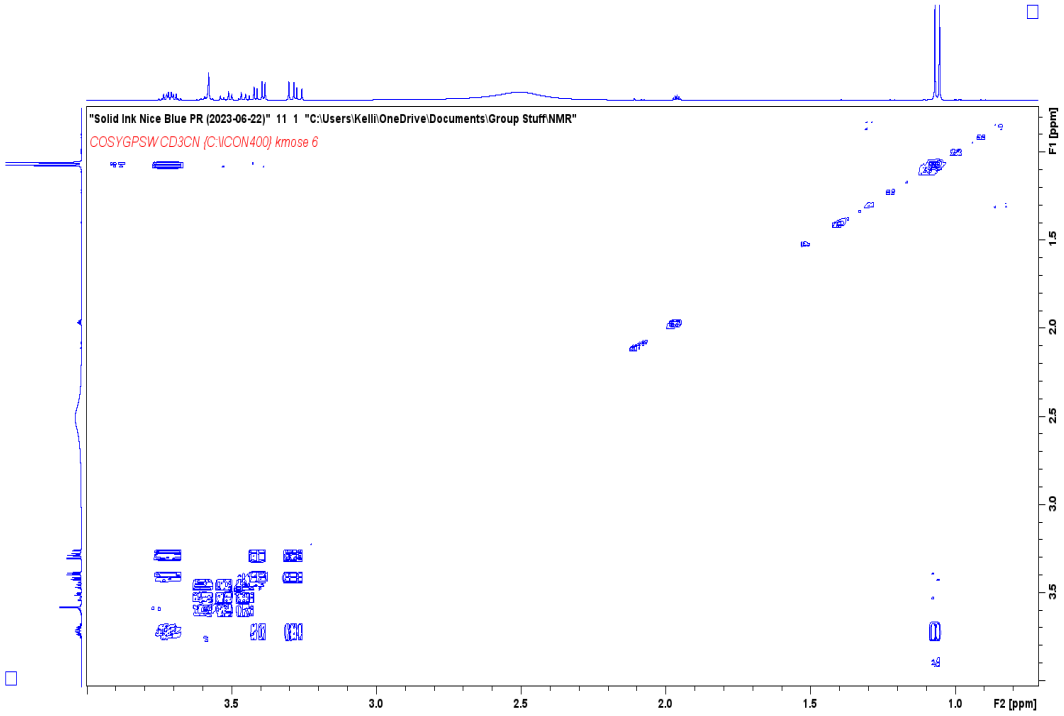

Figure S86. *^{1}H-^{1}H COSY spectrum of Solid Ink Nice Blue pot residue in acetonitrile-d3*

Coupling between peaks at δ3.7119 ppm (multiplet), δ3.4024 ppm (multiplet), and δ1.0607 ppm (doublet) strongly suggests the presence of propylene glycol in the tattoo ink. Additional coupling between δ3.5916 ppm, δ3.5172 ppm and δ3.3.4586 ppm confirm that glycerol is present.

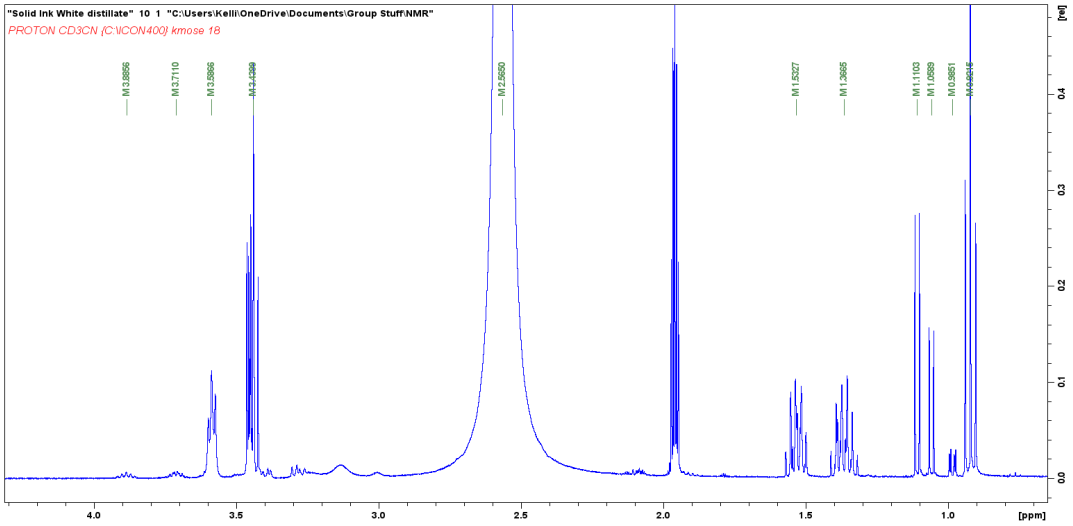

Figure S87. *^{1}H NMR spectrum of Solid Ink White distillate in acetonitrile-d3*

A doublet at δ1.1103 ppm and a multiplet at δ3.8856 ppm are produced by isopropanol and peaks at δ1.0589 ppm and δ3.7110 ppm are likely produced by propylene glycol. Small peaks at δ3.2825 ppm and δ3.3975 ppm (multiplets) support propylene glycol being present in small concentrations. 1-butanol also seems to be present in this solution with peaks appearing at δ0.9215 ppm (triplet), δ1.3665 ppm (multiplet), δ1.5327 ppm (multiplet), δ3.4522 ppm (multiplet), and δ3.5866 ppm (triplet). The peak at δ3.4399 ppm remains unidentified. The acetonitrile solvent peak is located at δ1.94 ppm.

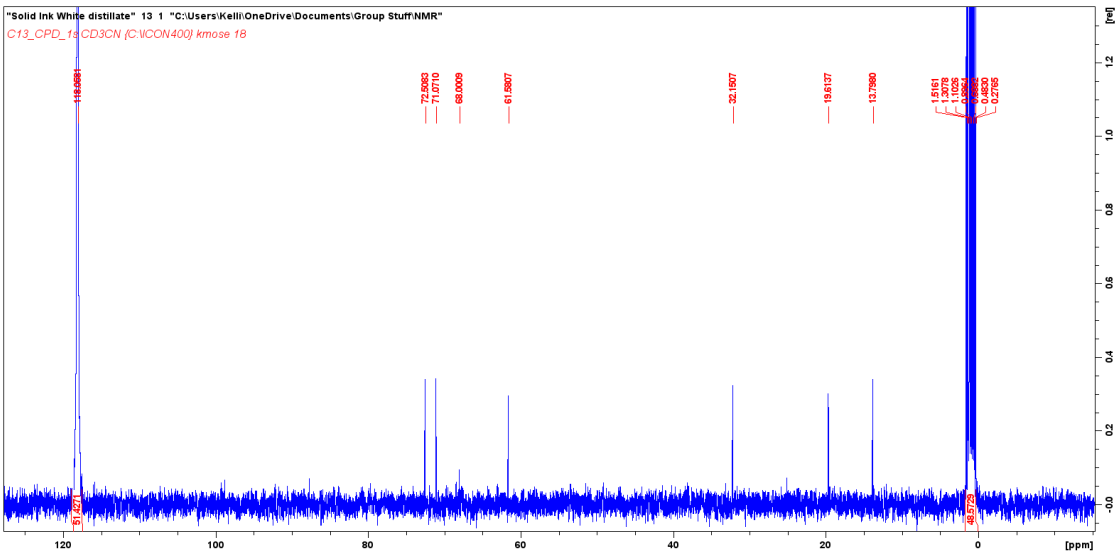

Figure S88. *^{13}C NMR spectrum of Solid Ink White distillate in acetonitrile-d3*

1-butanol peaks appear at δ13.7960 ppm, δ19.6137 ppm, δ32.1507 ppm, and δ61.5807 ppm. Similarly, a peak is observed at δ68.0009 ppm that could correspond to propylene glycol but the other peaks expected at around δ68 ppm and δ18 ppm are not observed, possibly due to low concentration and signal intensity. The peak at δ72.5083 ppm may be from small amounts of isopropanol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm

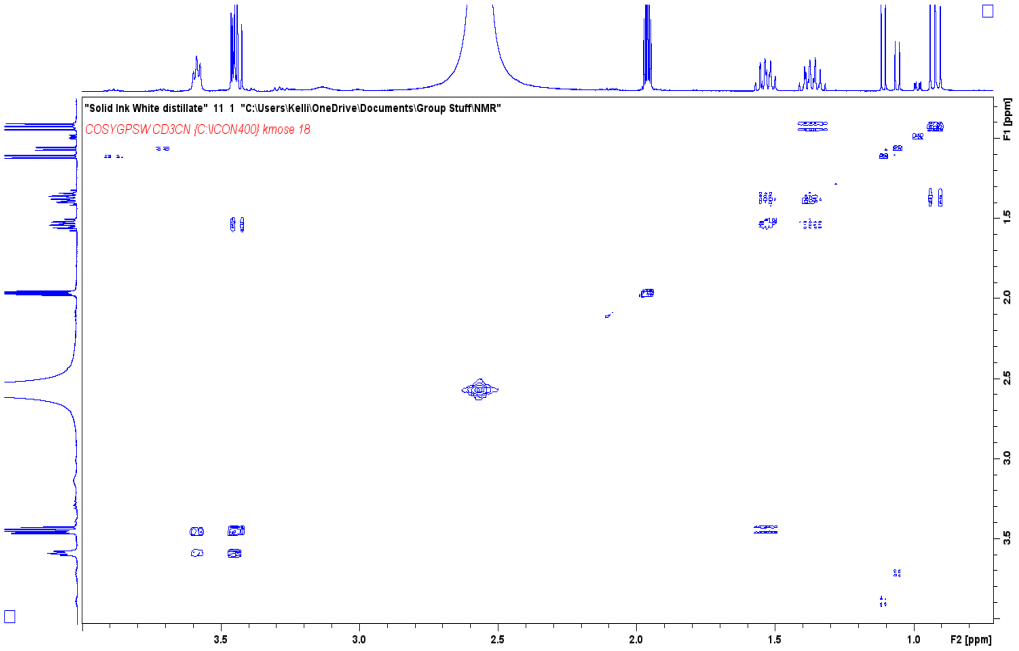

Figure S89. *^{1}H-^{1}H COSY NMR spectrum of Solid Ink White distillate in acetonitrile-d3*

Coupling between the doublet at δ1.1103 ppm and a multiplet at δ3.8856 ppm support isopropanol being present in the solution. Coupling also occurs between the triplets at δ0.9215 ppm, and δ3.5866 ppm and the multiplets at δ1.3665 ppm, δ1.5327 ppm, δ3.4522 ppm, and δ3.5866 ppm. This corresponds to 1-butanol being present. There is a small amount of coupling occurring between peaks at δ1.0589 ppm and δ3.7110 ppm, supporting propylene glycol being present in the tattoo ink.

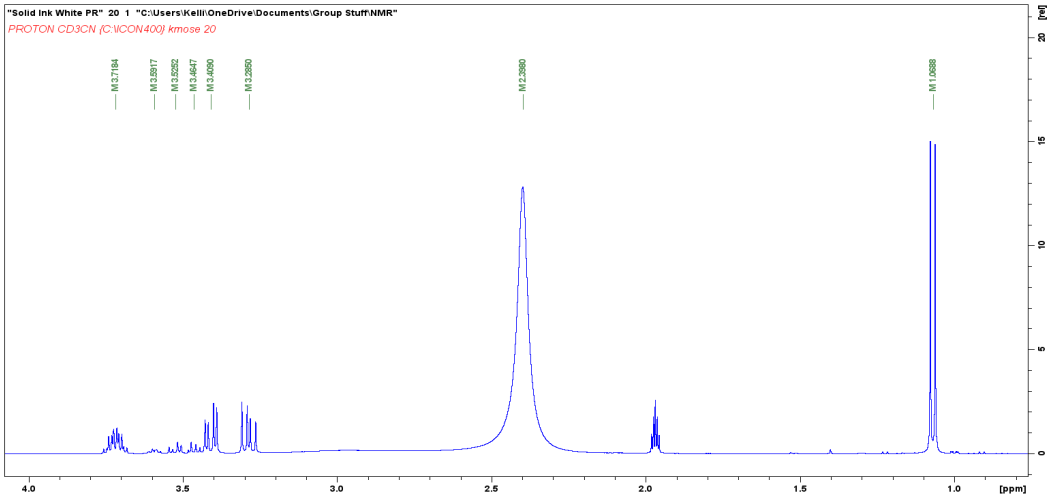

Figure S90. *^{1}H NMR spectrum of Solid Ink White pot residue in acetonitrile-d3*

Both propylene glycol and glycerol are likely shown in this spectrum. Probable propylene glycol peaks are present at δ1.0688 ppm (doublet), δ3.2850 ppm (multiplet), δ3.4090 ppm (multiplet), and δ3.7184 ppm (multiplet). Glycerol peaks are found at δ3.4647 ppm (multiplet), δ3.5252 ppm (multiplet), and δ3.5917 ppm (multiplet). The acetonitrile solvent peak is located at δ1.94 ppm.

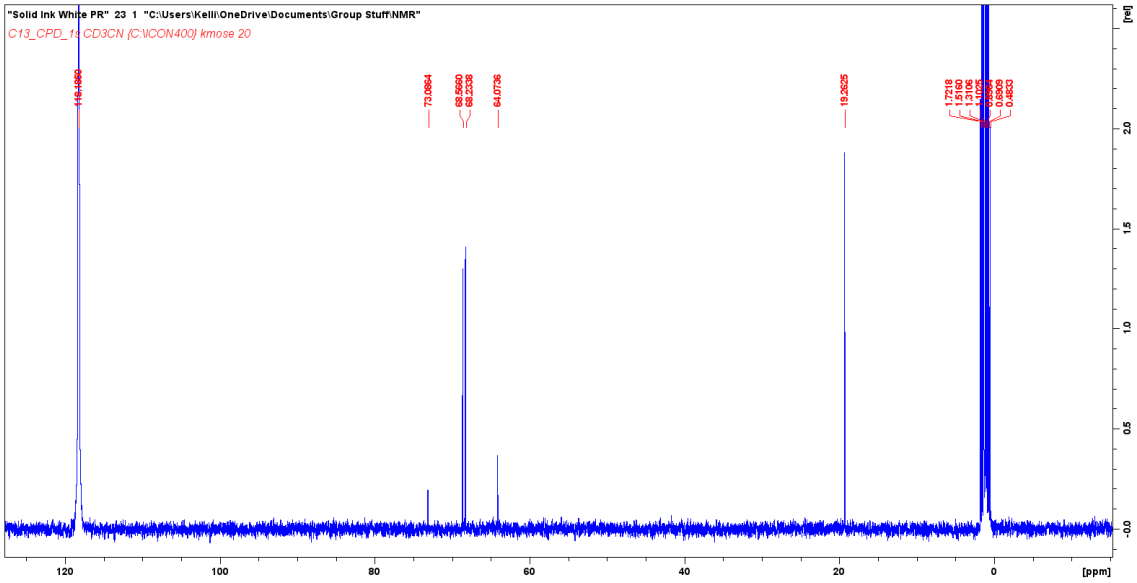

Figure S91. *^{13}C NMR spectrum of Solid Ink White pot residue in acetonitrile-d3*

Signals appearing at δ19.2625 ppm and δ68.2338 ppm and δ68.5560 ppm are all consistent with propylene glycol while signals appearing at δ64.0736 ppm and δ73.0864 ppm correspond to glycerol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

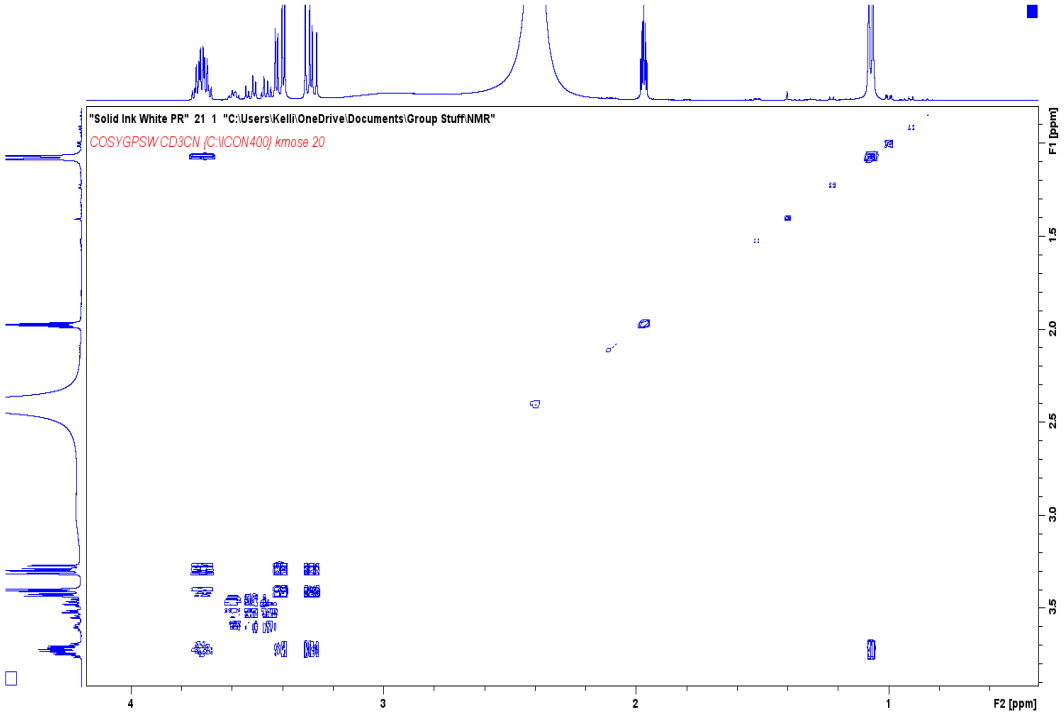

Figure S92. *^{1}H-^{1}H COSY NMR of Solid Ink White pot residue in acetonitrile-d3*

Coupling occurring between peaks at δ1.0688 ppm, δ3.2850 ppm, δ3.4090 ppm, and δ3.7184 ppm supports the presence of propylene glycol in the tattoo ink. Additionally, coupling occurs between peaks at δ3.4647 ppm, δ3.5252 ppm, and δ3.5917 ppm. This is consistent with glycerol being present.

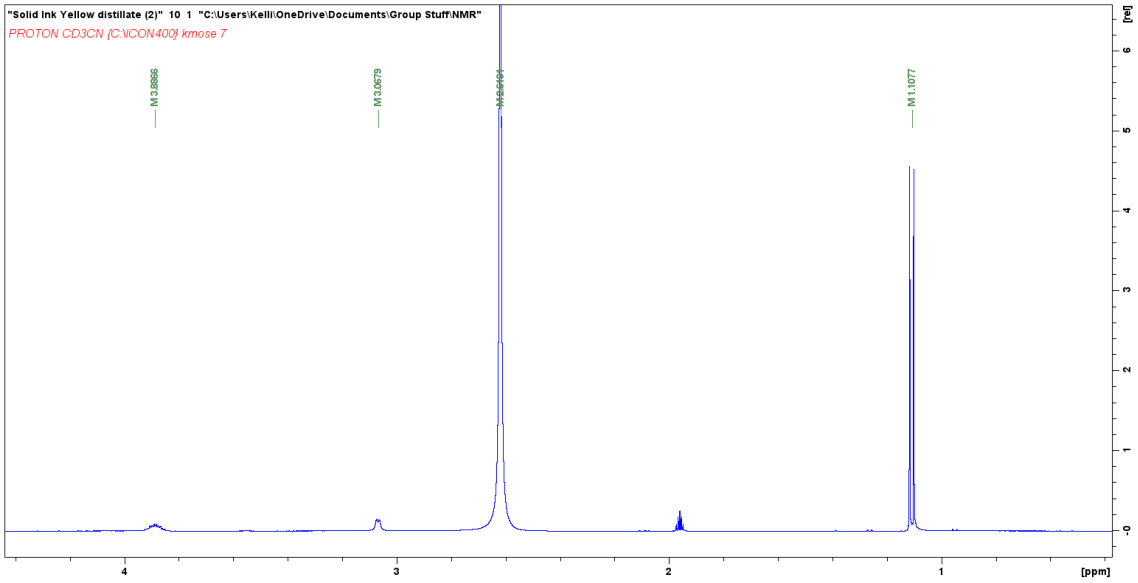

Figure S93. *^{1}H NMR spectrum of Solid Ink Yellow distillate in acetonitrile-d3*

The doublet at δ1.1077 ppm, doublet at δ3.0679 ppm, and multiplet at δ3.8866 ppm all belongs to isopropanol. The large singlet at δ3.6191 ppm is produced by water in solution. The acetonitrile solvent peak is located at δ1.94 ppm.

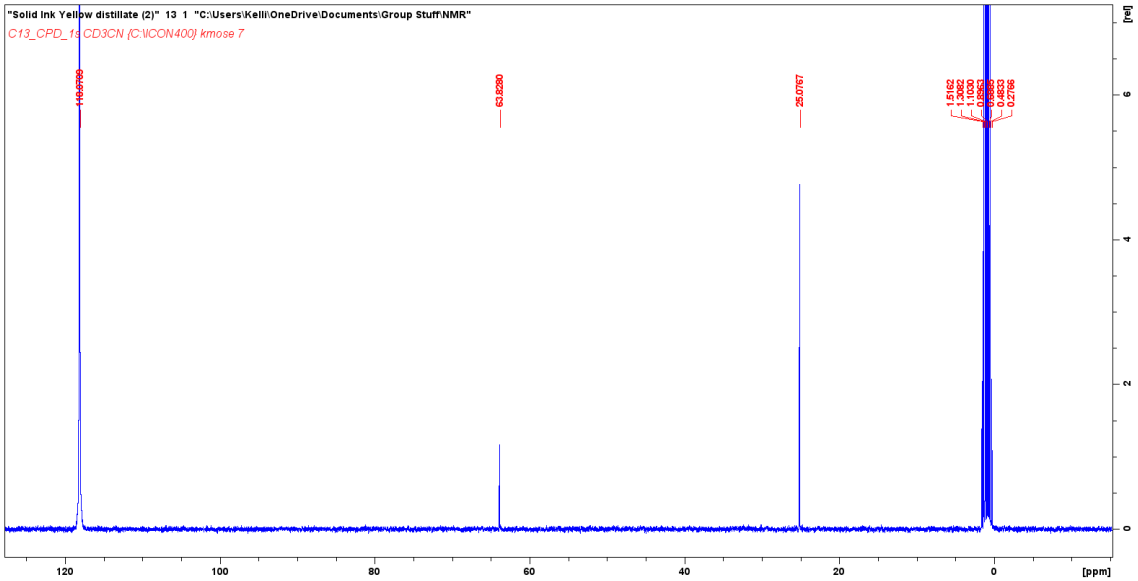

Figure S94. *^{13}C NMR spectrum of Solid Ink Yellow distillate in acetonitrile-d3*

Signals at δ25.0767 ppm and δ63.8280 ppm are created by isopropanol. The lack of other carbon signals confirms that the large singlet in the ^{1}H NMR spectrum is produced by water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

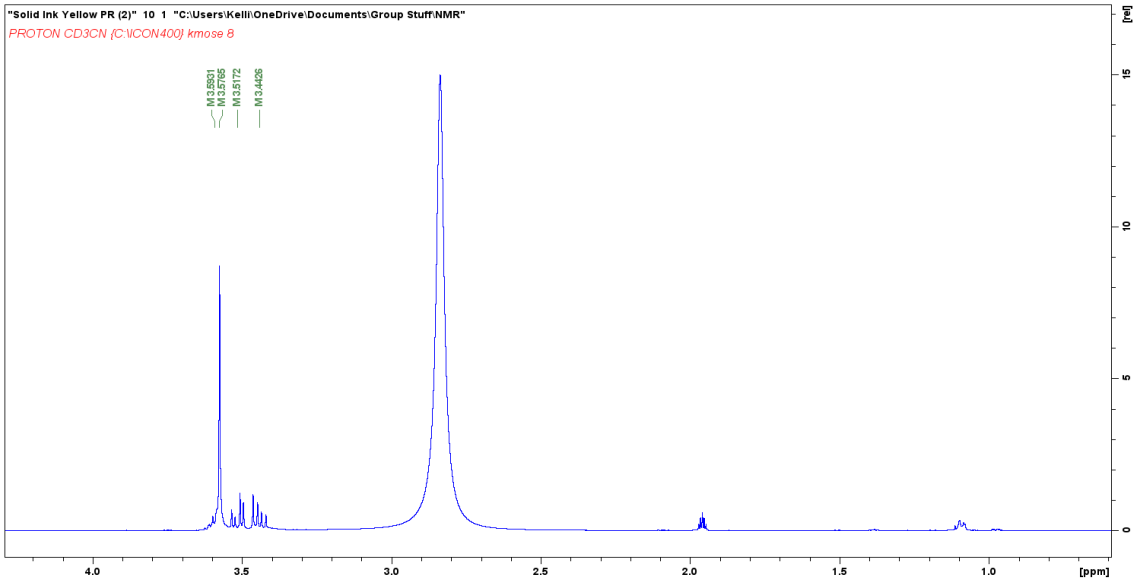

Figure S95. *^{1}H NMR spectrum of Solid Ink Yellow pot residue in acetonitrile-d3*

Multiplets at δ3.4426 ppm, δ3.5172 ppm, and δ3.5931 ppm are produced by glycerol while the overlapping signal at δ3.5765 ppm is assigned to poly(ethylene glycol). The acetonitrile solvent peak is located at δ1.94 ppm.

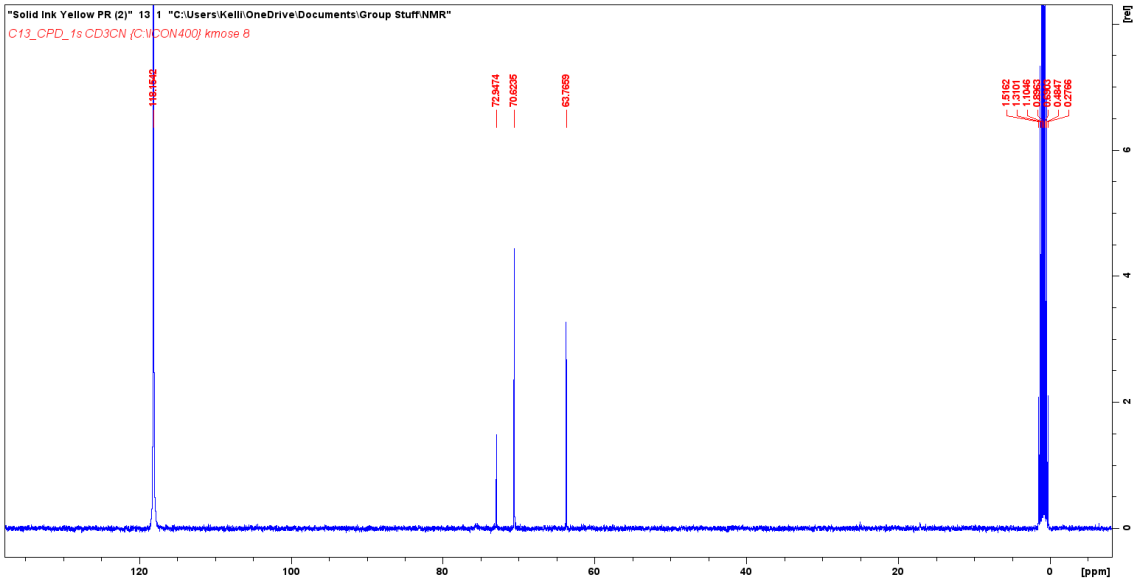

Figure S96. *^{13}C NMR spectrum of Solid Ink Yellow pot residue in acetonitrile-d3*

Peaks at δ63.7659 ppm and δ72.9474 ppm are consistent with glycerol being present while the peak at δ70.6235 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

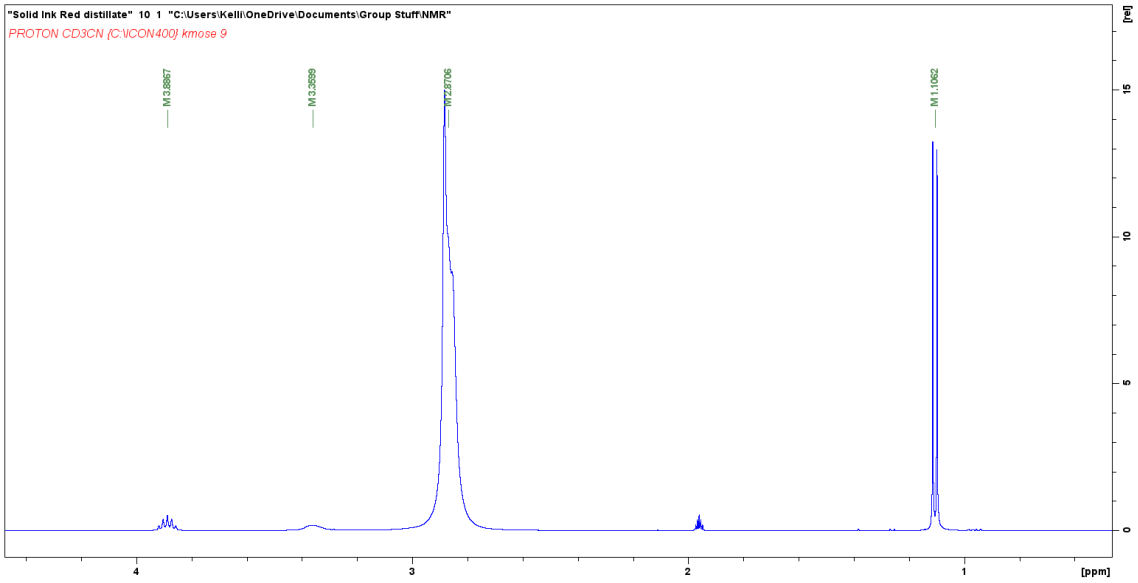

Figure S97. *^{1}H NMR spectrum of Solid Ink Red distillate in acetonitrile-d3*

Isopropanol shows peaks at δ1.1062 ppm (doublet), δ3.3599 ppm (broad singlet), and δ3.8867 ppm (septet). Water shows a peak at δ2.8706 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

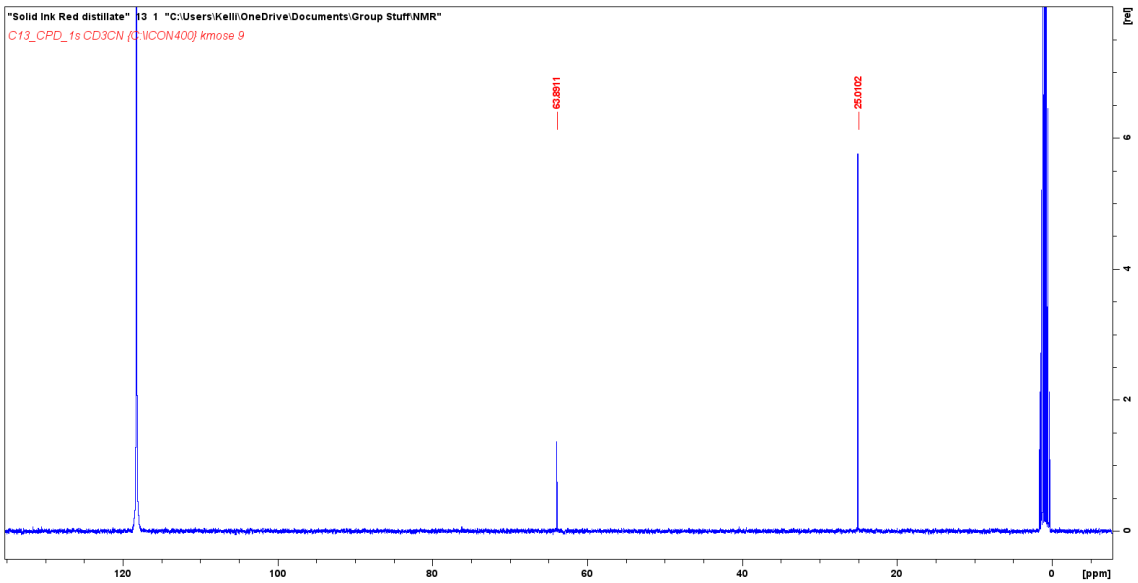

Figure S98. *^{13}C NMR spectrum of Solid Ink Red distillate in acetonitrile-d3*

Two peaks belonging to isopropanol appear in the spectrum at δ25.0102 ppm and δ63.8911 ppm. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

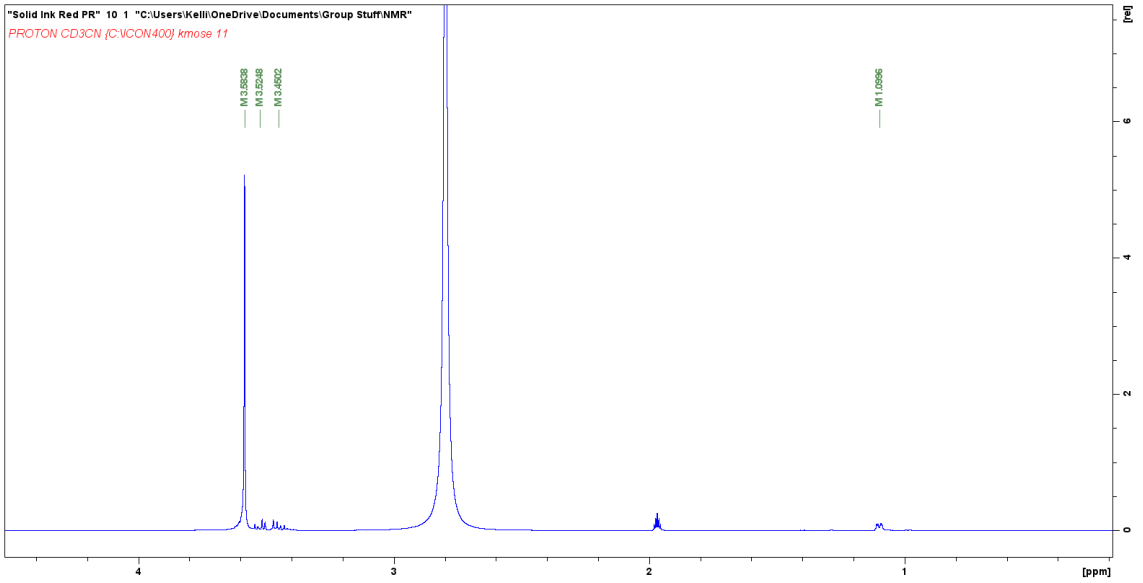

Figure S99. *^{1}H NMR spectrum of Solid Ink Red pot residue acetonitrile-d3*

There is evidence that glycerol is present in the sample. There are two small multiplets at δ3.4502 ppm and δ3.5248 ppm. Where there would normally be a multiplet slightly downfield of these signals, there is a large overlapping singlet at δ3.5838 ppm which is assigned to poly(ethylene glycol). A small doublet at δ1.0996 ppm may be from small amounts of propylene glycol, however, the other peaks that would be expected for propylene glycol are not observed. The acetonitrile solvent peak is located at δ1.94 ppm.

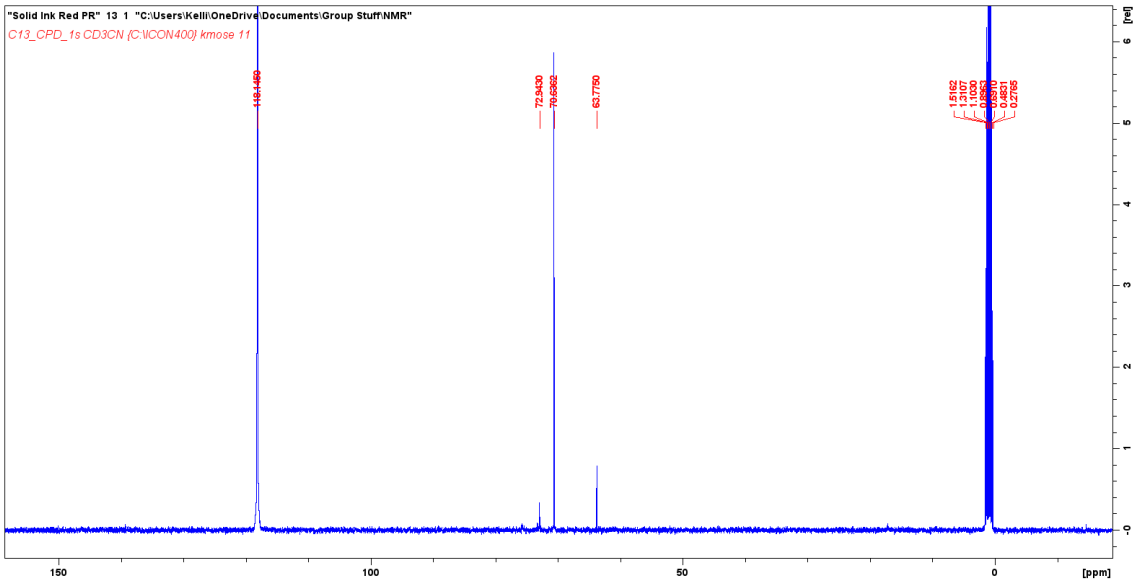

Figure S100. *^{13}C NMR spectrum of Solid Ink Red pot residue in acetonitrile-d3*

The two peaks at δ63.7750 ppm and δ72.9430 ppm are characteristic of glycerol while the large signal at δ70.6362 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

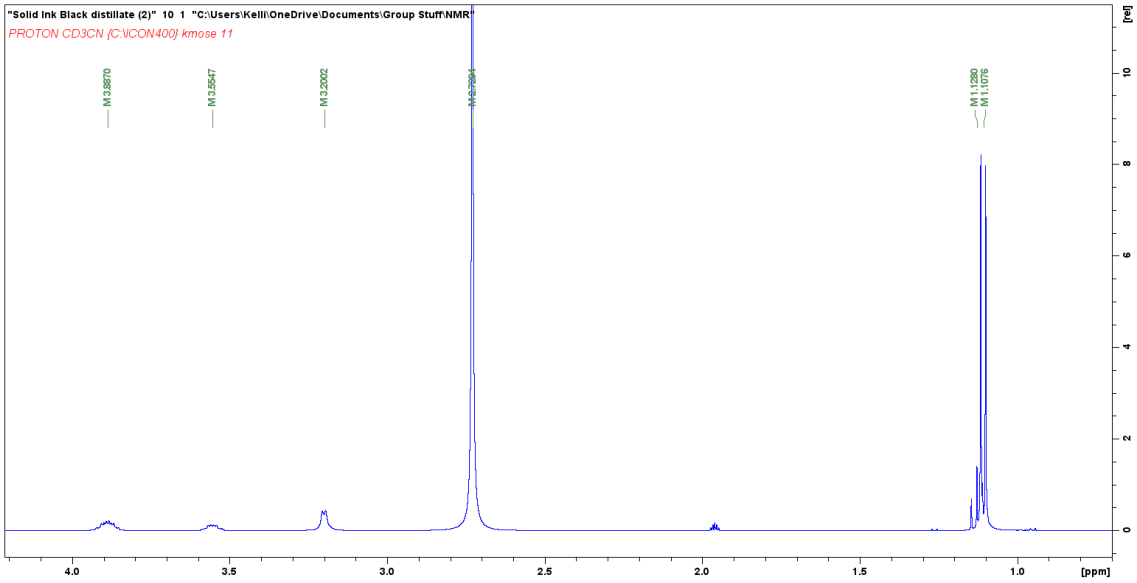

Figure S101. *^{1}H NMR spectrum of Solid Ink Black distillate in acetonitrile-d3*

Peaks at δ1.1076 ppm (doublet), δ3.2002 ppm (doublet) and δ3.8870 ppm (septet) are produced by isopropanol while peaks at δ1.1280 ppm (triplet) and δ3.5547 ppm (quartet) are produced by ethanol. J-coupling constants (6.10 Hz and 7.00 Hz for isopropanol and ethanol, respectively) were used to confirm that the overlapping upfield peaks couple with their respective downfield peaks. The acetonitrile solvent peak is located at δ1.94 ppm.

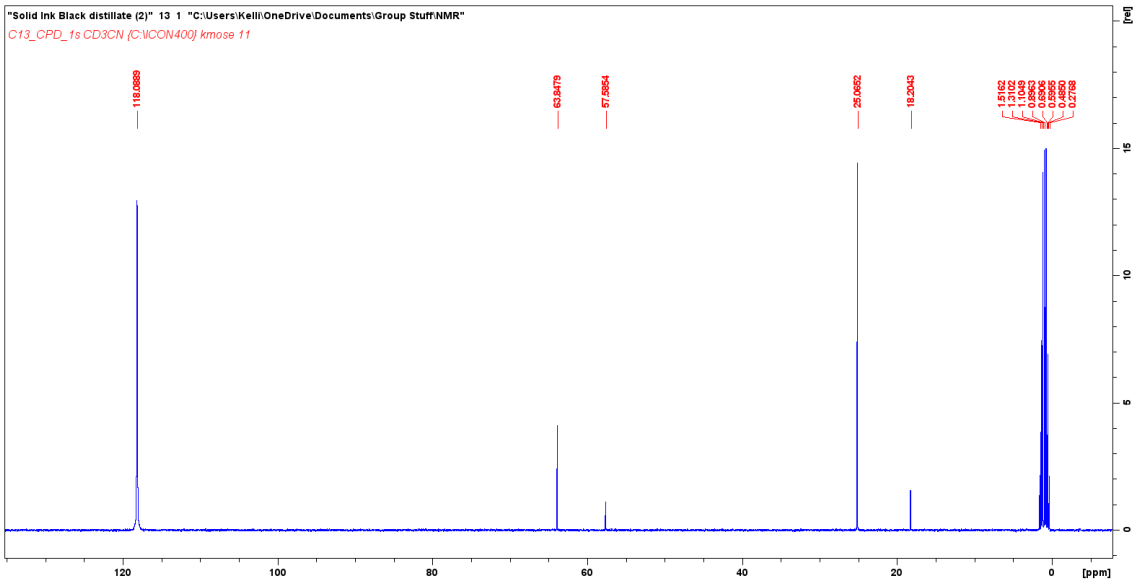

Figure S102. *^{13}C NMR spectrum of Solid Ink Black distillate in acetonitrile-d3*

Isopropanol produces the signals δ25.0652 ppm and δ63.8479 ppm while ethanol produces the signals at δ18.2043 ppm and δ57.5854 ppm. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

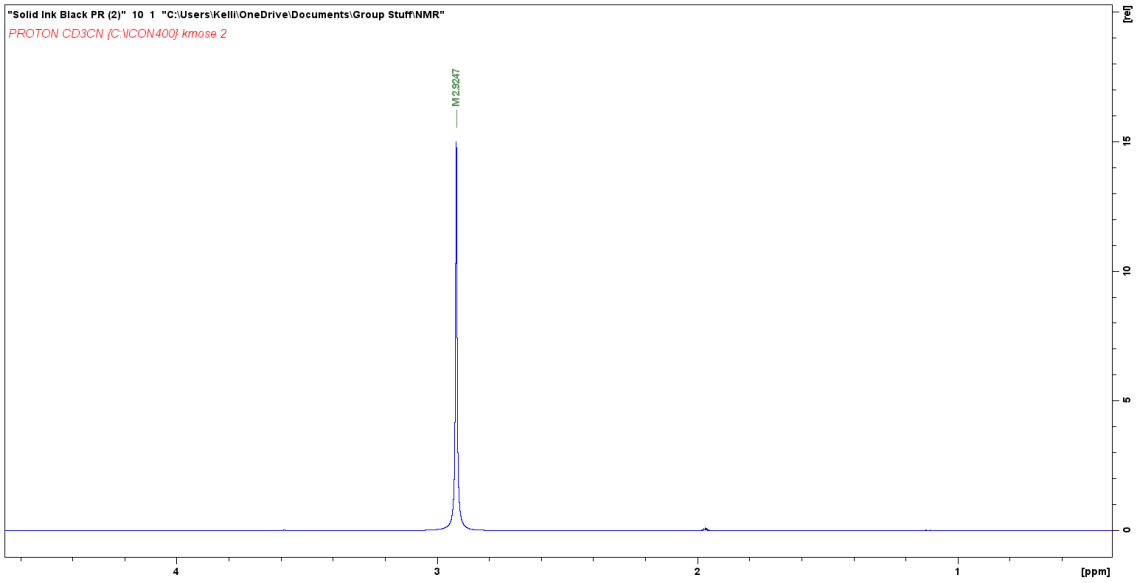

Figure S103. *^{1}H NMR spectrum of Solid Ink Black pot residue in acetonitrile-d3*

The only peak present at δ2.2947 ppm is indicative of water being the component in the sample.

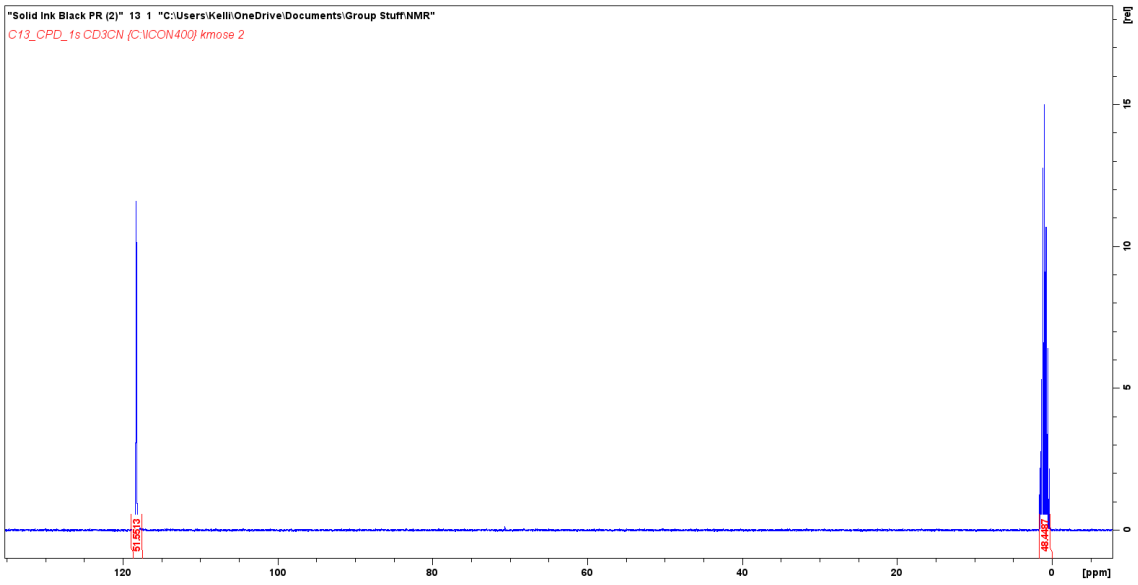

Figure S104. *^{13}C NMR spectrum of Solid Ink Black pot residue in acetonitrile-d3*

The lack of signals in this spectrum confirms the present water in the sample. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

4.2 Raman Data

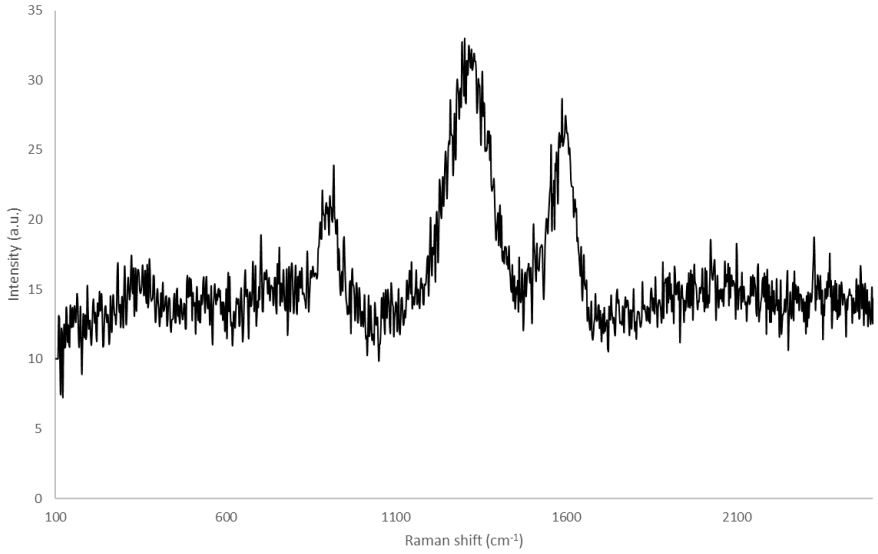

Figure S105. *Raman spectrum of Solid Ink Black*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 2 average, 0 boxcar, auto-baseline on. Signals occurring at 1588 cm^{-1}, 1316 cm^{-1}, and 906 cm^{-1} match the Raman spectrum of carbon black (see section 10).

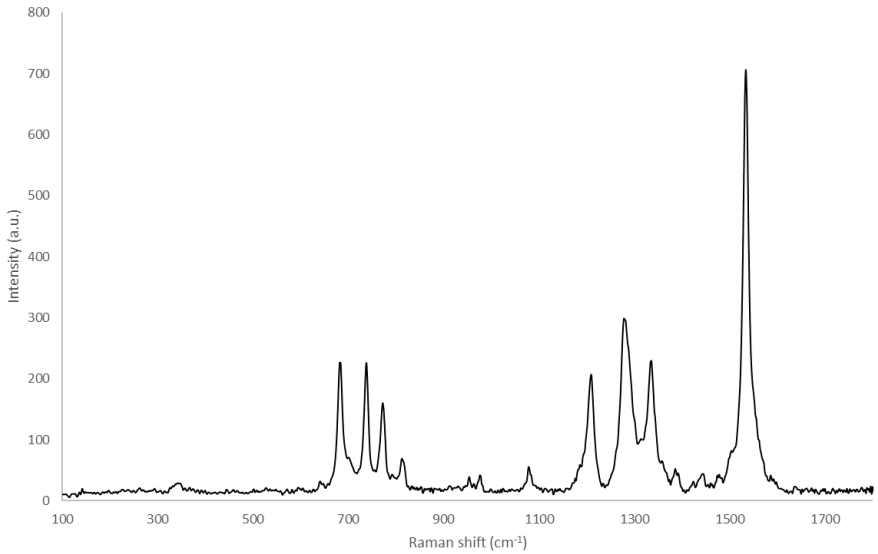

Figure S106. *Raman spectrum of Solid Ink Medium Green*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 2 average, 0 boxcar, auto-baseline on. Major peaks at 1534 cm^{-1}, 1336 cm^{-1}, 1288 cm^{-1}, 1210 cm^{-1}, 774 cm^{-1}, 738 cm^{-1}, and 682 cm^{-1} match the Raman spectrum of Pigment Green 7 from the SOPRANO spectra database.[1]

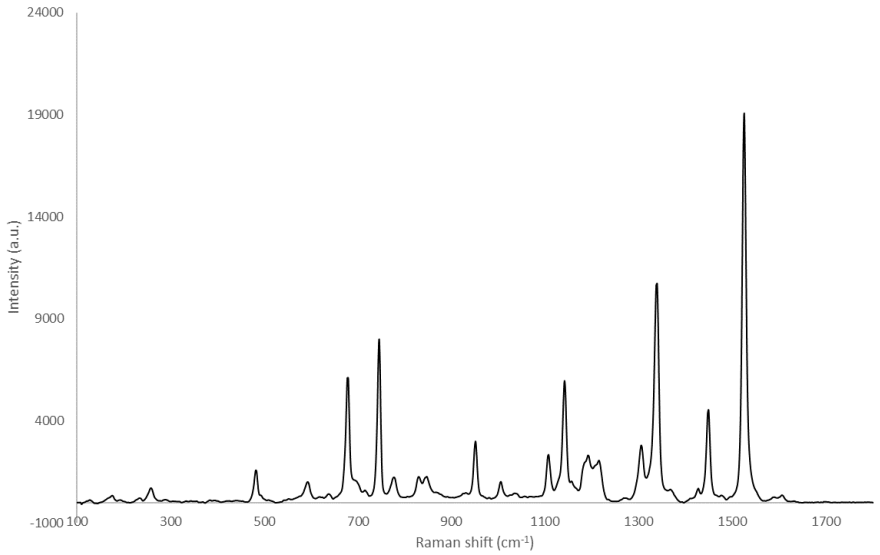

Figure S107. *Raman spectrum of Solid Ink Nice Blue*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 2 average, 0 boxcar, auto-baseline on. Major peaks at 1526 cm^{-1}, 1448 cm^{-1}, 1340 cm^{-1}, 1306 cm^{-1}, 1142 cm^{-1}, 952 cm^{-1}, 746 cm^{-1}, and 680 cm^{-1} match that of Pigment Blue 15 in the SOPRANO Raman spectra database.[1]

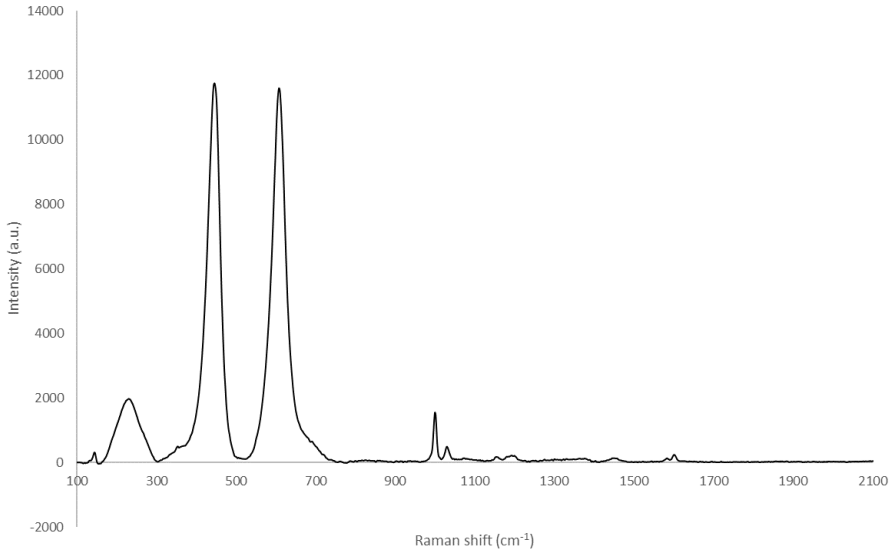

Figure S108. *Raman spectrum of Solid Ink White*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 2 average, 0 boxcar, auto-baseline on. There are major peaks at 610 cm^{-1}, 446 cm^{-1}, and 236 cm^{-1}. These all can be attributed to Pigment White 6 (TiO_2) being present (see section 10).

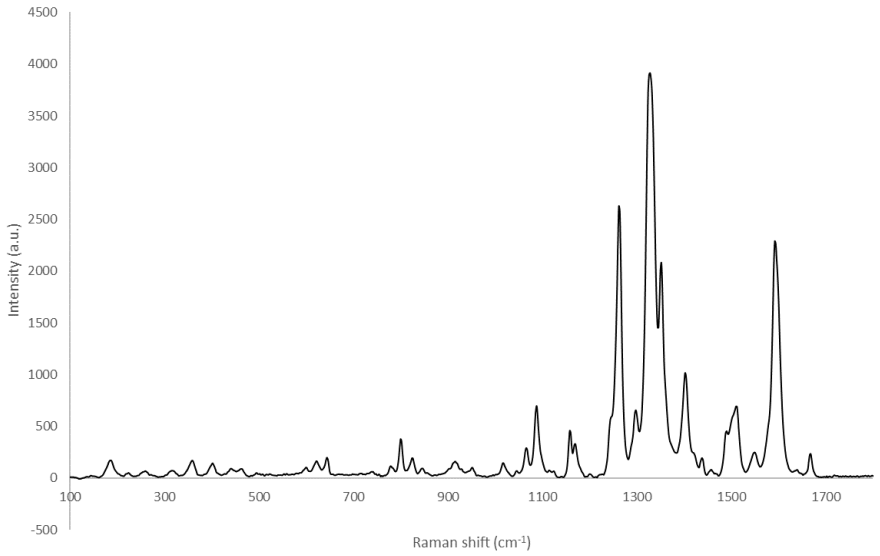

Figure S109. *Raman spectrum of Solid Ink Yellow*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 2 average, 0 boxcar, auto-baseline on. Major peaks appear at 1592 cm^{-1}, 1512 cm^{-1}, 1402 cm^{-1}, 1352 cm^{-1}, 1328 cm^{-1}, 1262 cm^{-1}, 1160 cm^{-1}, and 1088 cm^{-1} indicates the presence of Pigment Yellow 74, as it matched the reference spectrum from the SOPRANO Raman spectra database.[1]

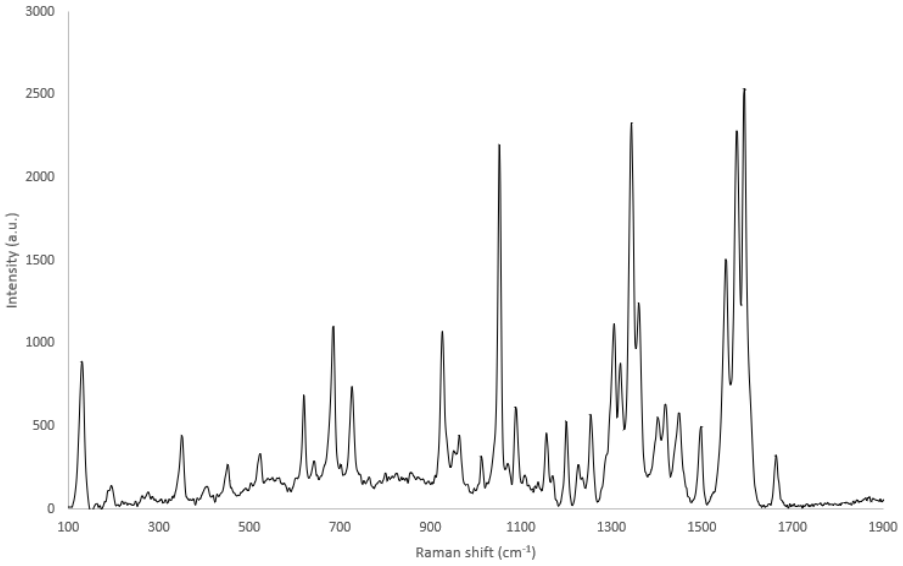

Figure S110. *Raman spectrum of Solid Ink Red*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 2 average, 0 boxcar, auto-baseline on. Major peaks occur at 1594 cm^{-1}, 1578 cm^{-1}, 1554 cm^{-1}, 1360 cm^{-1}, 1344 cm^{-1}, 1306 cm^{-1}, 1052 cm^{-1}, 926 cm^{-1}, 726 cm^{-1}, 686 cm^{-1}, 620 cm^{-1}, 130 cm^{-1}. These peaks match that of Pigment Red 254 from the SOPRANO Raman spectra database.[1]

4.3 XRF Data

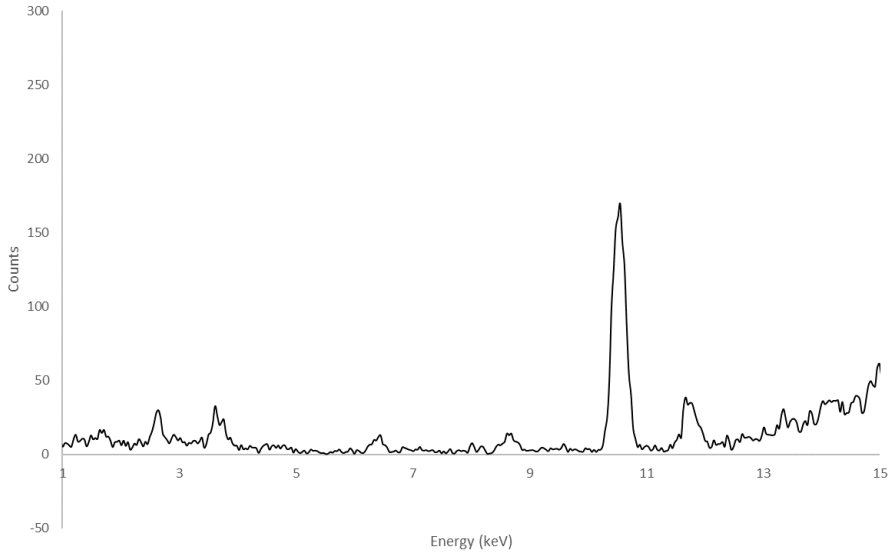

Figure S111. *X-ray fluorescence spectrum of Solid Ink Red*

One major peak pair at 10.56 keV and 11.68 keV can be attributed to arsenic present in the glass microscope slide used to dry the sample on.

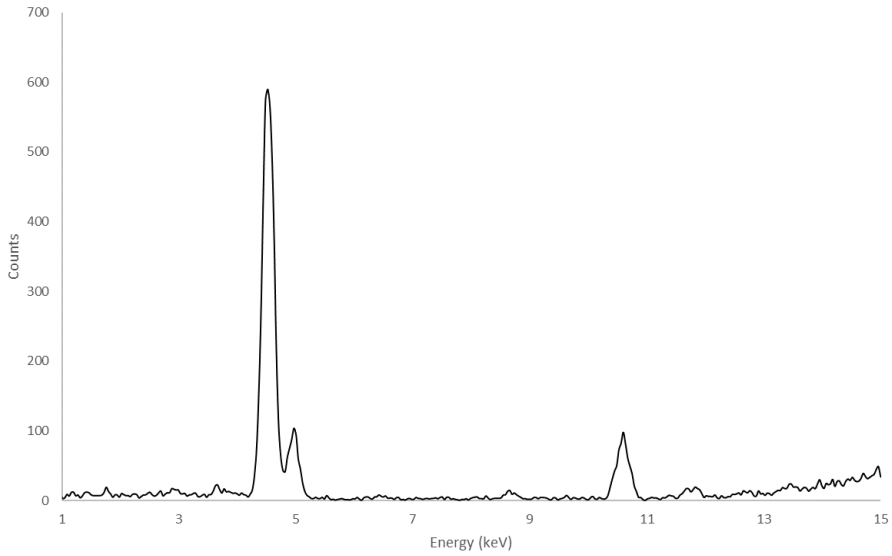

Figure S112. *X-ray fluorescence spectrum of Solid Ink White*

One peak pair at 4.52 keV and 5.00 keV can be attributed to titanium, due to the presence of titanium dioxide (Pigment White 6). The smaller peak pair at 10.60 keV and 11.75 is produced by arsenic contained within the glass slide used to dry the ink on.

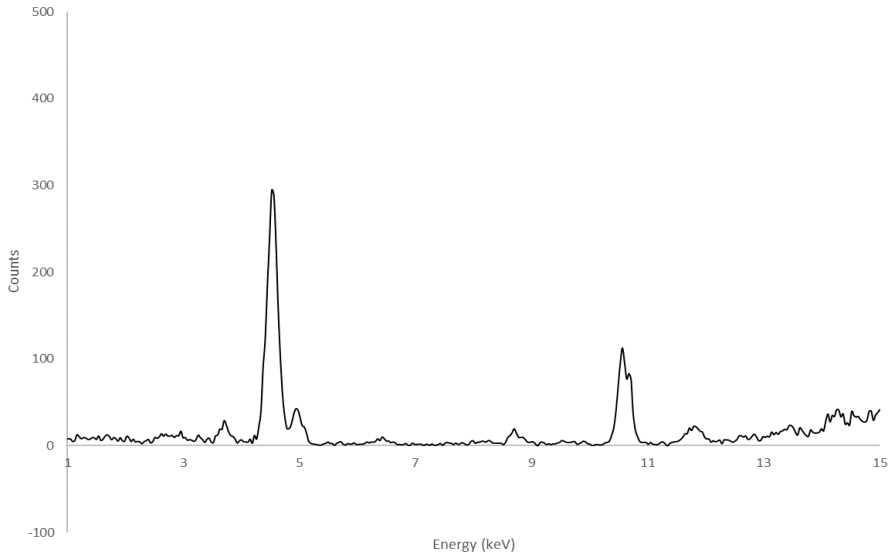

Figure S113. *X-ray fluorescence spectrum of Solid Ink Yellow*

One major peak pair occurs at 4.55 keV and 4.96 keV; this corresponds to the presence of titanium, produced by Pigment White 6. The smaller peak pair at 10.56 keV and 11.86 keV is due to arsenic in the microscope slide used to dry the sample on.

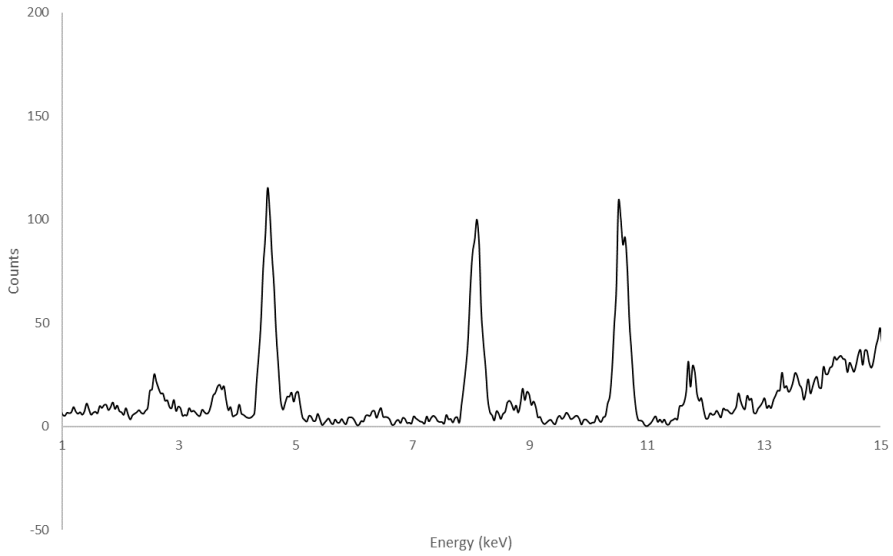

Figure S114. *X-ray fluorescence spectrum of Solid Ink Medium Green*

Three different peak pairs are present. The first, produced by the titanium in Pigment White 6, occurs at 4.52 keV and 5.03 keV. The second, produced by the copper in Pigment Green 7, occurs at 8.10 keV and 8.95 keV. The last pair occurs at 10.52 keV and 11.79 keV and is due to arsenic in the glass microscope slide used to mount the sample.

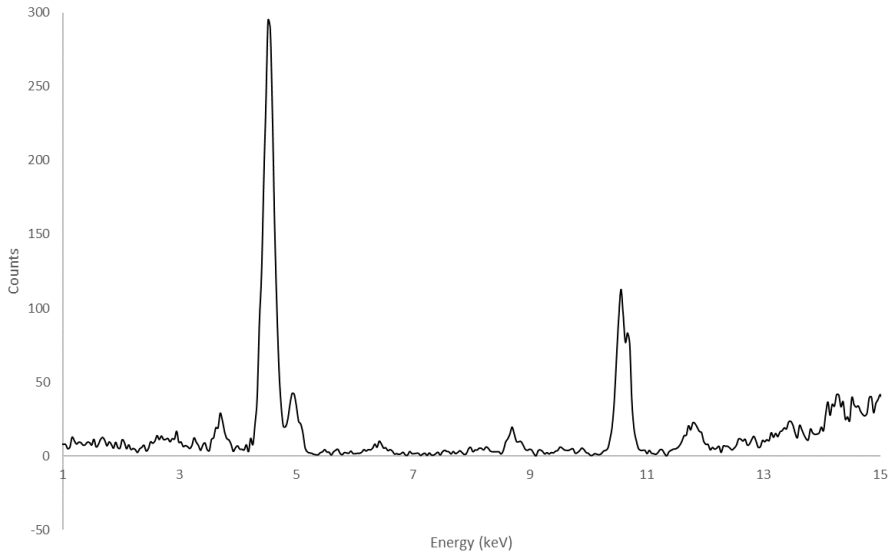

Figure S115. *X-ray fluorescence spectrum of Solid Ink Nice Blue*

One major peak pair, found at 4.52 keV and 4.96 keV, can be attributed to titanium in Pigment White 6. The only other major peak pair, appearing at 10.59 keV and 11.82 keV, comes from arsenic in the microscope the ink was dried on. There is a very small peak at 8.69 keV that may be attributed to copper in Pigment Blue 15, but the signal is too close to the baseline to confirm.

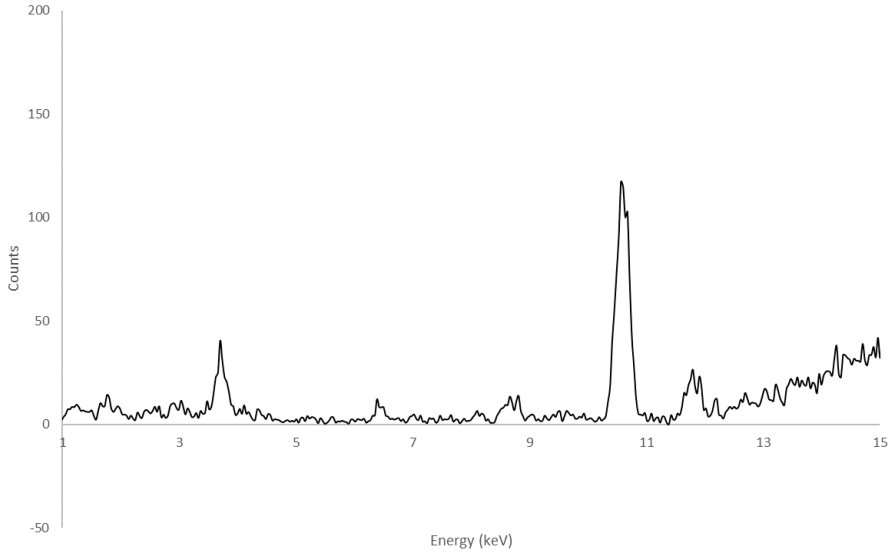

Figure S116. *X-ray fluorescence spectrum of Solid Ink Lining Black*

The only major peak pair, appearing at 10.50 keV and 11.78 keV, comes from the glass microscope slide containing small amounts of arsenic.

5. World Famous

5.1 NMR Data

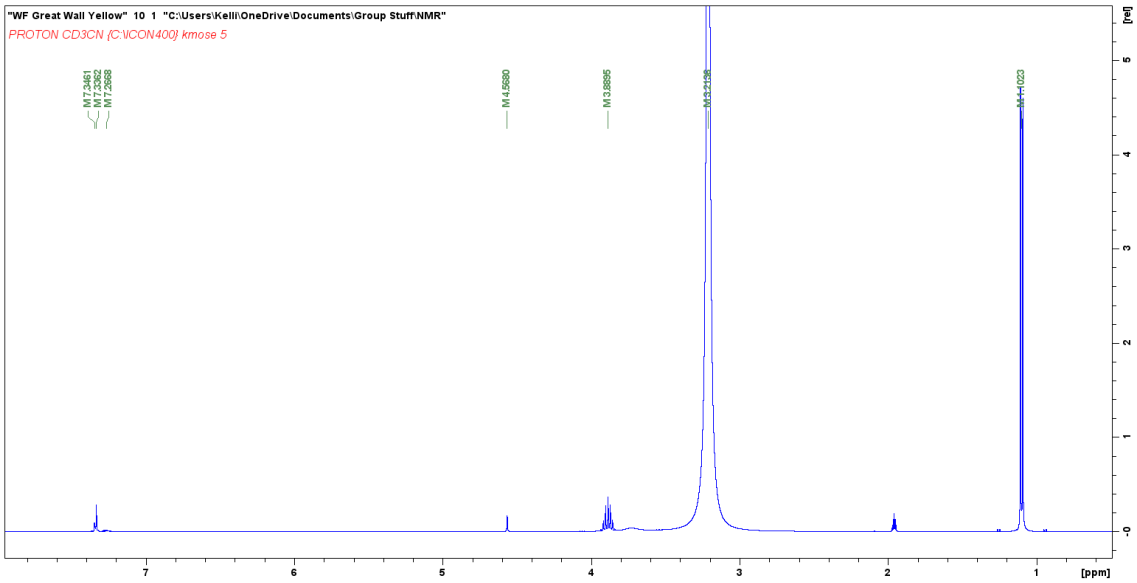

Figure S117. *^{1}H NMR spectrum of World Famous Great Wall Yellow distillate in acetonitrile-d3*

Isopropanol produces a septet at δ3.8895 ppm and a doublet at δ1.1023 ppm. Benzyl alcohol produces signals at a singlet at δ4.5680 ppm and multiplets at δ7.2668 ppm, δ 7.3362 ppm and δ7.3461 ppm. A very large singlet appearing at δ3.2136 ppm can be attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

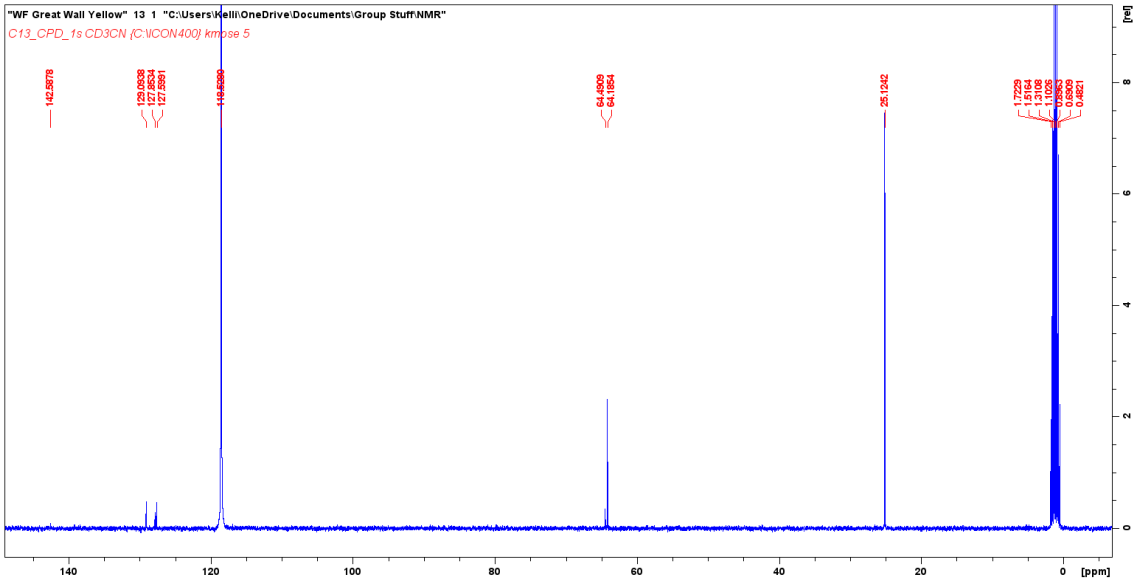

Figure S118. *^{13}C NMR spectrum of World Famous Great Wall Yellow distillate in acetonitrile-d3*

Signals at δ25.1242 ppm and δ64.1854 ppm are attributed to isopropanol. The remaining signals at δ64.4909 ppm, δ127.5991 ppm, δ127.8534 ppm, δ129.0938 ppm, and 142.5878 ppm correspond to benzyl alcohol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

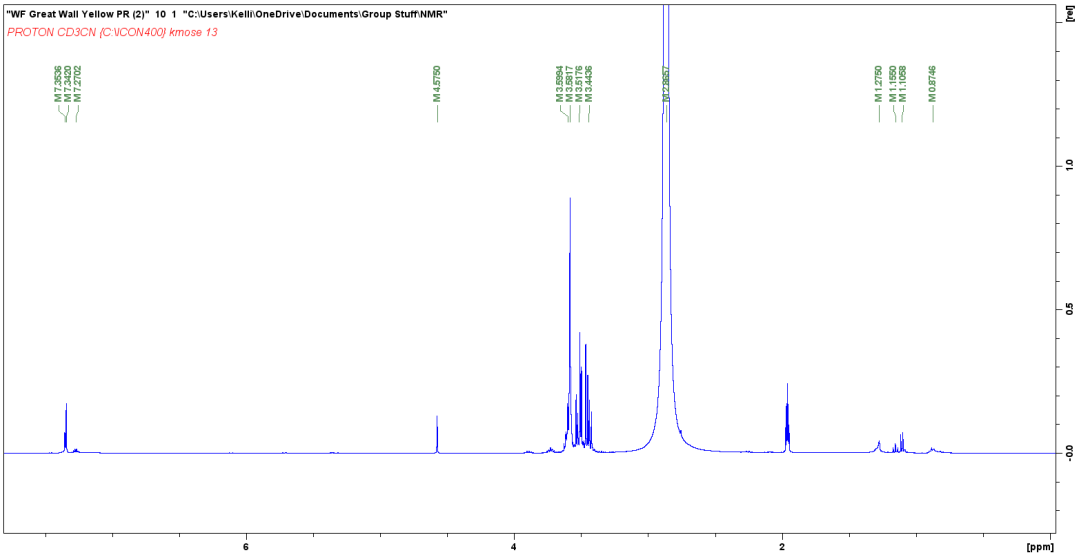

Figure S119. *^{1}H NMR spectrum of World Famous Great Wall Yellow pot residue in acetonitrile-d3*

Signals appearing at δ4.5750 ppm (singlet), δ7.2720 ppm (multiplet), δ7.3420 ppm (singlet) and δ7.3536 ppm (singlet) all correspond to benzyl alcohol. Multiplets appearing at δ3.4436 ppm and δ3.5176 ppm as well as a multiplet at δ3.5994 ppm indicates the presence of glycerol. A singlet at δ3.5817 ppm is assigned to poly(ethylene glycol). Upfield signals at δ0.8746 ppm and δ1.2750 ppm are likely from a long-chain hydrocarbon. The peak at δ1.1550 ppm remains unassigned. A doublet at δ1.1058 ppm is likely produced by small amounts of isopropanol. The acetonitrile solvent peak is located at δ1.94 ppm.

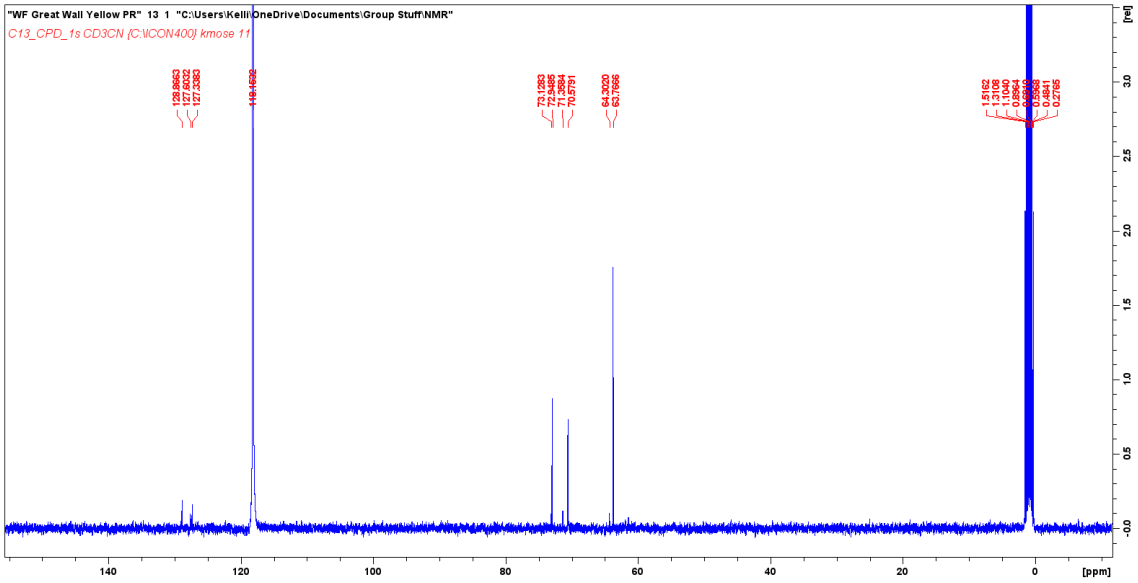

Figure S120. *^{13}C NMR spectrum of World Famous Great Wall Yellow pot residue in acetonitrile-d3*

Benzyl alcohol signals appear at δ64.3002 ppm, δ127.3411 ppm, δ127.6042 ppm, and δ128.8708 ppm. There should be a signal appearing around δ140 ppm but due to the low concentration, it cannot be detected. Glycerol peaks appear at δ72.9522 ppm and δ63.7250 ppm. The signal at δ70.5791 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

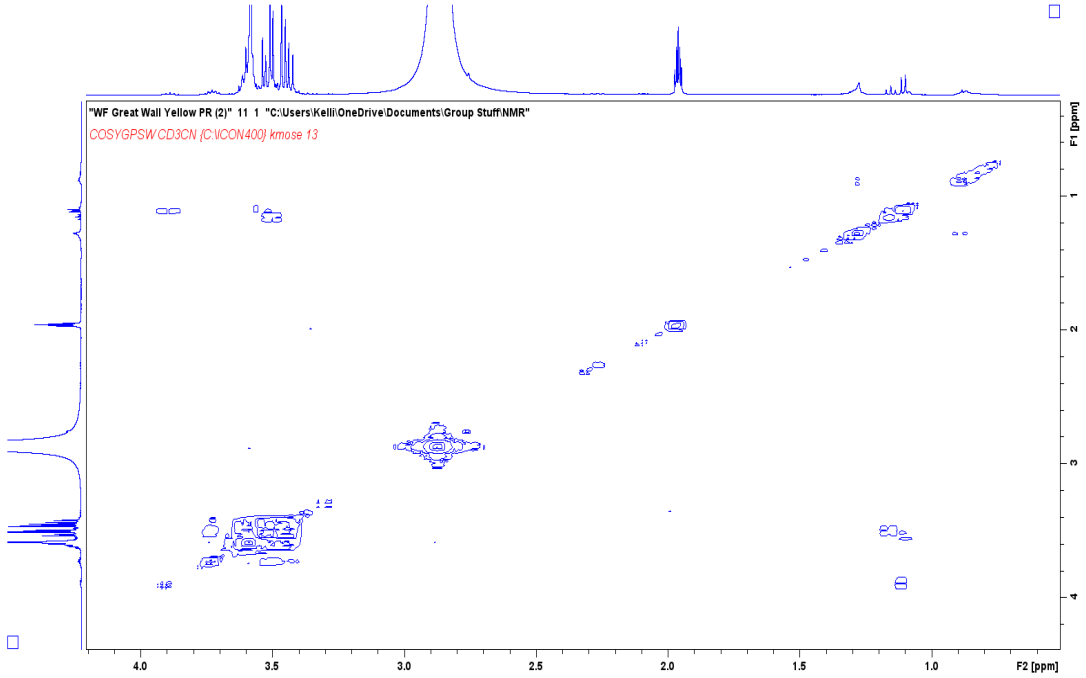

Figure S121. *^{1}H-^{1}H COSY spectrum of World Famous Great Wall Yellow pot residue in acetonitrile-d3*

1H-1H COSY analysis reveals that there are three different unidentified components. Peaks at δδ0.8746 ppm and δ1.2750 ppm show some coupling while the peak at δ1.1550 ppm does not show any coupling with other peaks. Additionally, the peak at δ3.5817 ppm overlaps with peaks for glycerol but does not show coupling in samples where there is not glycerol present.

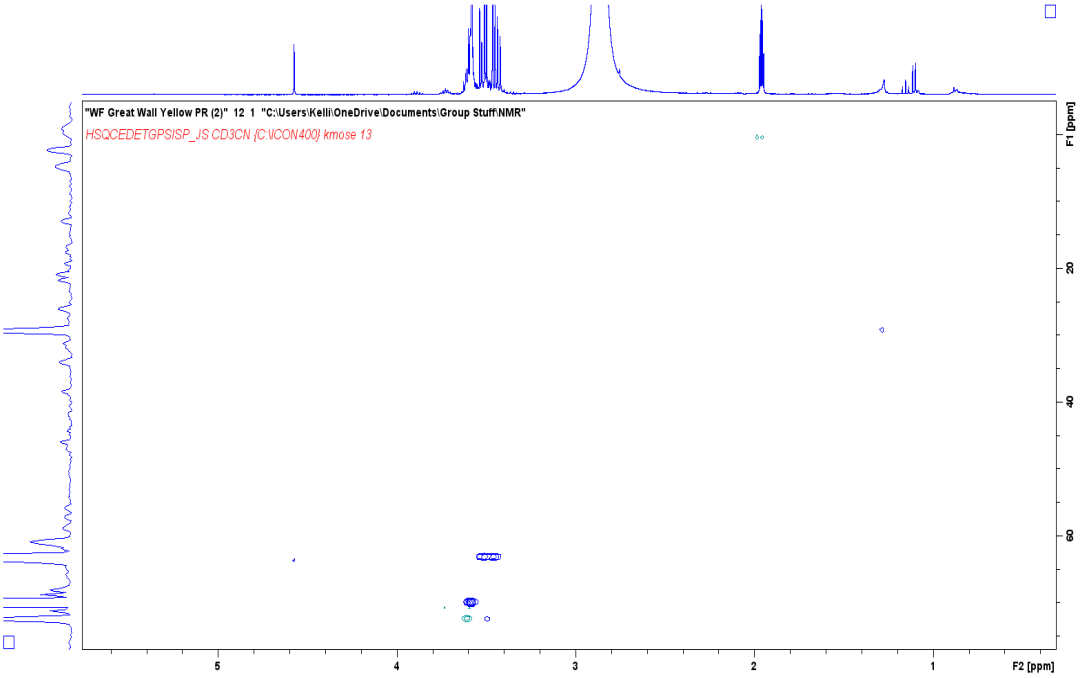

Figure S122. *^{1}H-^{13}C HSQC spectrum of World Famous Great Wall Yellow pot residue in acetonitrile-d3*

Coupling occurring between the ^{1}H peaks at δ3.4436 ppm and δ3.5176 ppm and the ^{13}C peak at δ63.7250 ppm as well as the coupling between the ^{1}H peak at δ3.5817 and the ^{13}C peak at δ72.9522 ppm indicate that glycerol is present. Additionally, some coupling occurs between the ^{1}H peak at δ1.2750 ppm and a ^{13}C peak at around δ29.1 ppm indicates a long-chain hydrocarbon being present.

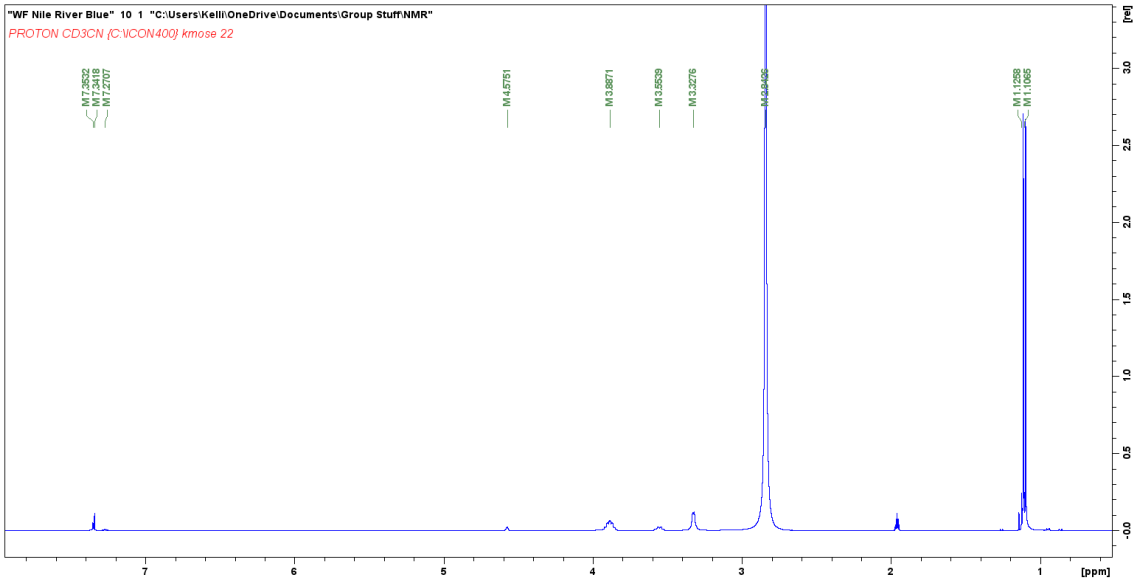

Figure S123. *^{1}H NMR spectrum of World Famous Nile River Blue distillate in acetonitrile-d3*

Singlets at δ4.5751 ppm, δ7.3418 ppm, and δ7.3552 ppm and the multiplet at δ7.2707 ppm all correspond to benzyl alcohol. Ethanol is present, as given by the quartet at δ3.5539 ppm and the triplet at δ1.1258 ppm. Isopropanol is also in the solution, as indicated by a multiplet at δ3.8871 ppm, and doublets at δ3.3276 ppm and δ1.1065 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

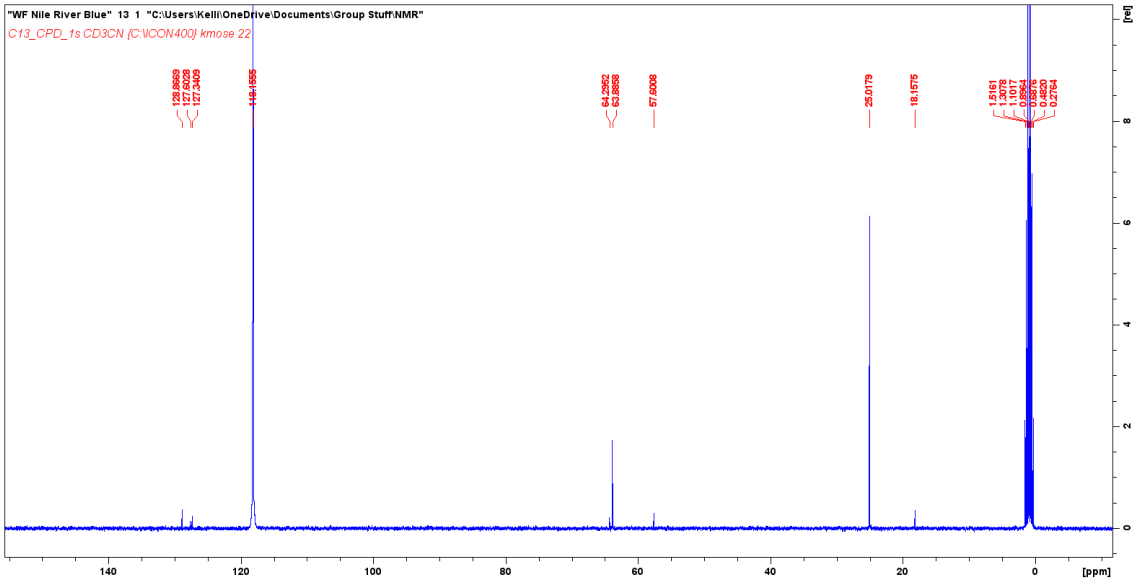

Figure S124. *^{13}C NMR spectrum of World Famous Nile River Blue distillate in acetonitrile-d3*

Benzyl alcohol signals appear at δ64.2952 ppm, δ127.3409 ppm, δ127.6028 ppm, and δ128.8669 ppm. There should be a signal appearing around δ140 ppm but it is not observed. This may be due to the low concentration. Isopropanol shows signals at δ63.8858 ppm and δ25.0179 ppm while ethanol shows signals at δ57.6008 ppm and δ18.1575 ppm. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

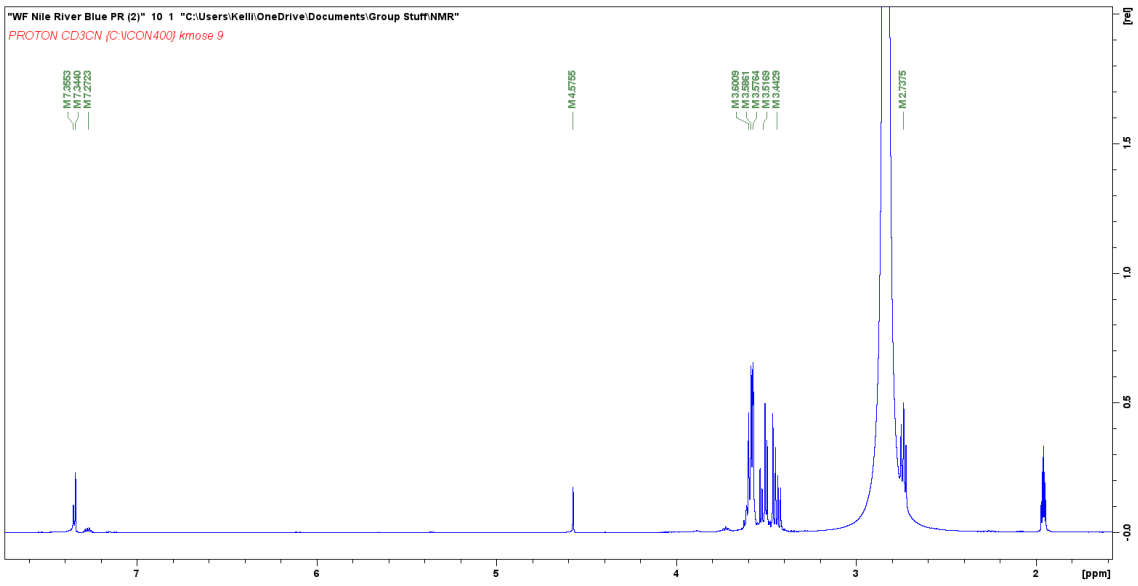

Figure S125. *^{1}H NMR spectrum of World Famous Nile River Blue pot residue in acetonitrile-d3*

Singlets at δ4.5755 ppm, δ7.3440 ppm, and δ7.3553 ppm and the multiplet at δ7.2723 ppm indicate the presence of benzyl alcohol. The peaks at δ3.5764 and δ3.5861 ppm are assigned to poly(ethylene glycol). Peaks at δ3.4429 ppm, δ3.5169 ppm, and δ3.5961 ppm are attributed to glycerol. The acetonitrile solvent peak is located at δ1.94 ppm.

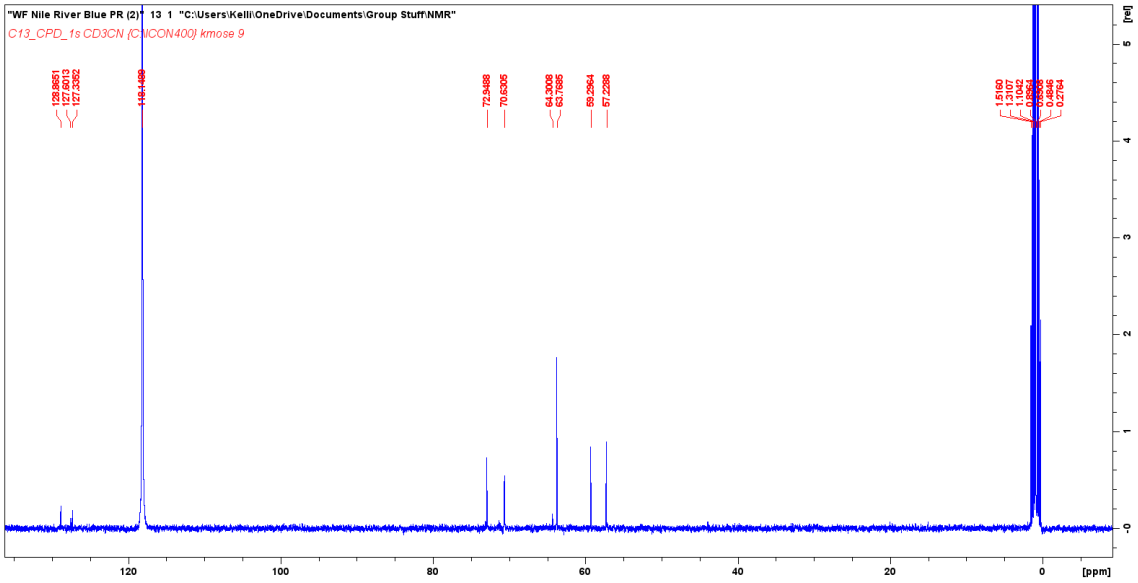

Figure S126. *^{13}C NMR spectrum of World Famous Nile River Blue pot residue in acetonitrile-d3*

Benzyl alcohol peaks appear at δ64.3008 ppm, δ127.3352 ppm, δ127.6013 ppm, and δ128.8651 ppm. There should be a signal appearing around δ140 ppm but due to the low concentration, it cannot be detected. Peaks at δ72.9488 ppm and δ63.7685 ppm are produced by glycerol. The signal at δ70.6305 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

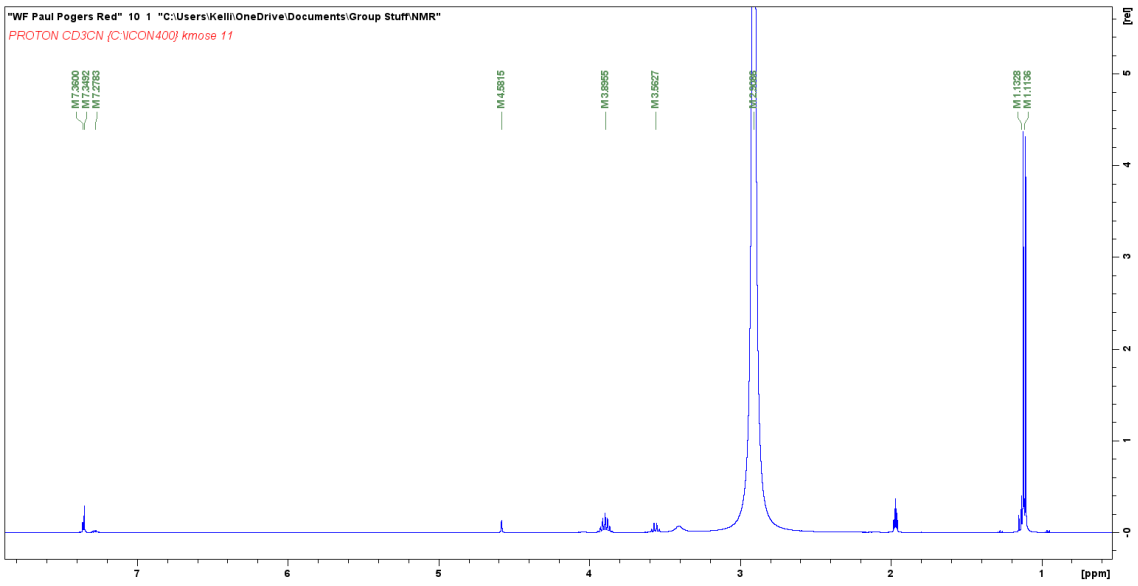

Figure S127. *^{1}H NMR spectrum of World Famous Paul Rogers Red distillate in acetonitrile-d3*

Peaks at δ4.5815 ppm (singlet), δ7.2783 ppm (multiplet), δ7.3492 ppm (singlet), and δ7.3600 ppm (singlet) can all be attributed to benzyl alcohol. Isopropanol give rise to peaks at δ3.8955 ppm (septet) and δ1.1136 pp (doublet) while ethanol produces signals at δ3.5627 ppm (quartet) and δ1.1328 ppm (triplet). The acetonitrile solvent peak is located at δ1.94 ppm.

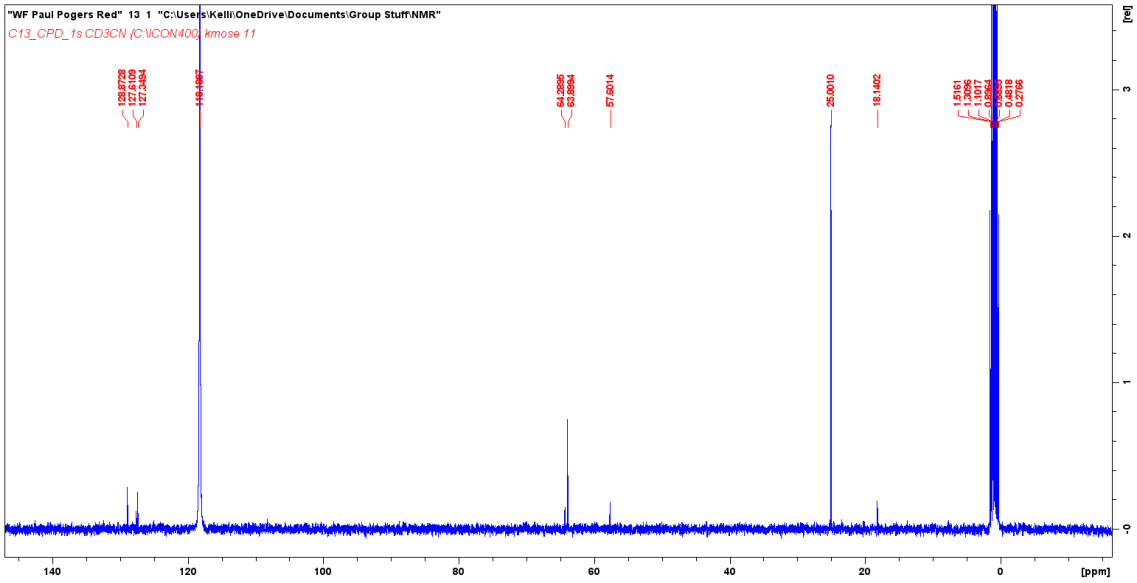

Figure S128. *^{13}C NMR spectrum of World Famous Paul Rogers Red distillate in acetonitrile-d3*

Benzyl alcohol peaks appear at δ64.2895 ppm, δ127.3494 ppm, δ127.6109 ppm, and δ128.8728 ppm. There should be a signal appearing around δ140 ppm but due to the low concentration, it cannot be detected. Peaks at δ18.1402 ppm and δ57.6014 ppm are produced by ethanol while peaks at δ25.0010 ppm and δ63.8994 ppm are produced by isopropanol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

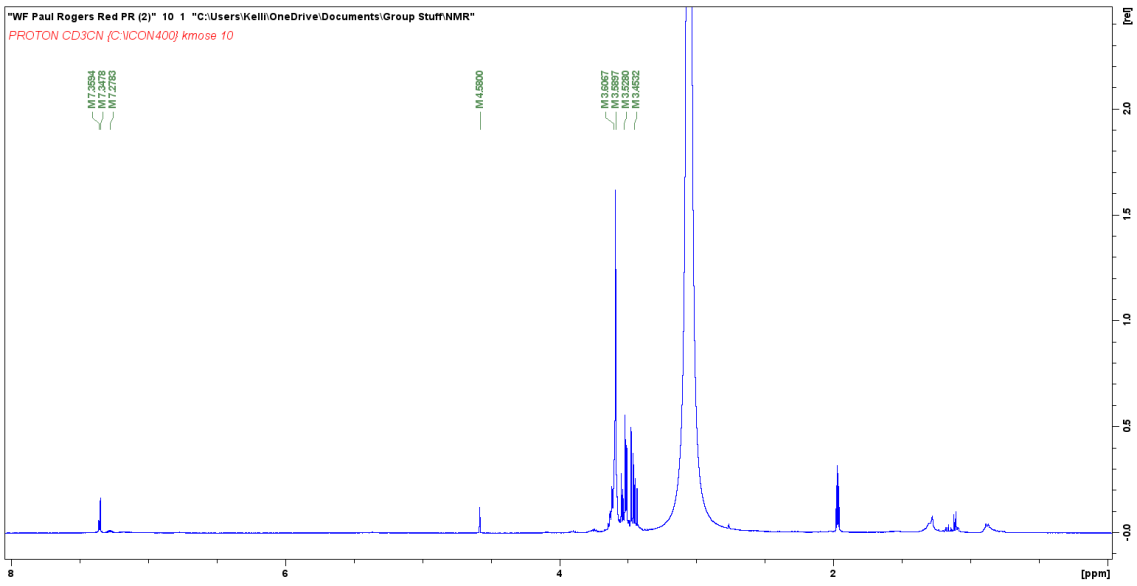

Figure S129. *^{1}H NMR spectrum of World Famous Paul Rogers Red pot residue in acetonitrile-d3*

Peaks at δ4.5800 ppm (singlet), δ7.2783 ppm (multiplet), δ7.3478 ppm (singlet), δ7.3594 ppm (singlet) are all produced by benzyl alcohol. Glycerol produces signals at δ3.4532 ppm (multiplet), δ3.5280 ppm (multiplet), and δ3.6067 ppm (multiplet). The singlet at δ3.5897 ppm is assigned to poly(ethylene glycol).The acetonitrile solvent peak is located at δ1.94 ppm.

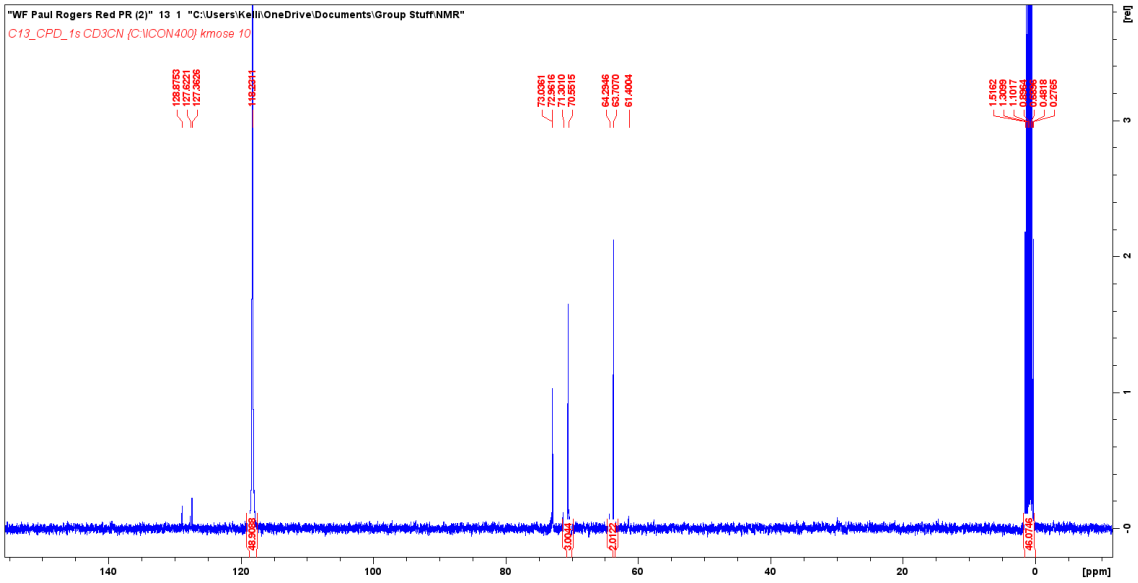

Figure S130. *^{13}C NMR spectrum of World Famous Paul Rogers Red pot residue in acetonitrile-d3*

Benzyl alcohol peaks appear at δ64.2946 ppm, δ127.3626 ppm, δ127.6221 ppm, and δ128.8753 ppm. There should be a signal appearing around δ140 ppm but due to the low concentration, it cannot be detected. Additionally, signals appearing at δ72.9616 ppm and δ63.7070 ppm are attributed to glycerol. The signal at δ70.5515 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

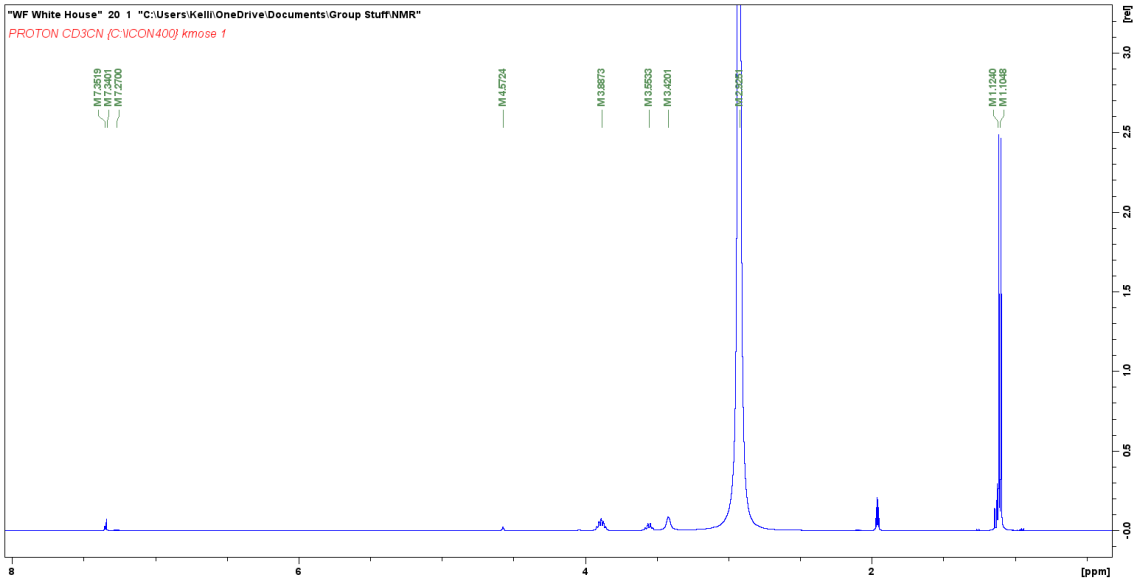

Figure S131. *^{1}H NMR spectrum of World Famous White House distillate House in acetonitrile-d3*

Isopropanol peaks appear at δ3.8873 ppm (septet), δ3.4201 ppm (singlet), and δ1.1048 ppm (doublet). Ethanol peaks appear at δ3.5533 ppm (quartet) and δ1.1240 ppm (triplet). Benzyl alcohol peaks appear at δ4.5724 ppm (singlet), δ7.2700 ppm (multiplet), δ7.3401 ppm (singlet), and δ7.3519 ppm (singlet). The large signal at δ2.9251 ppm is attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

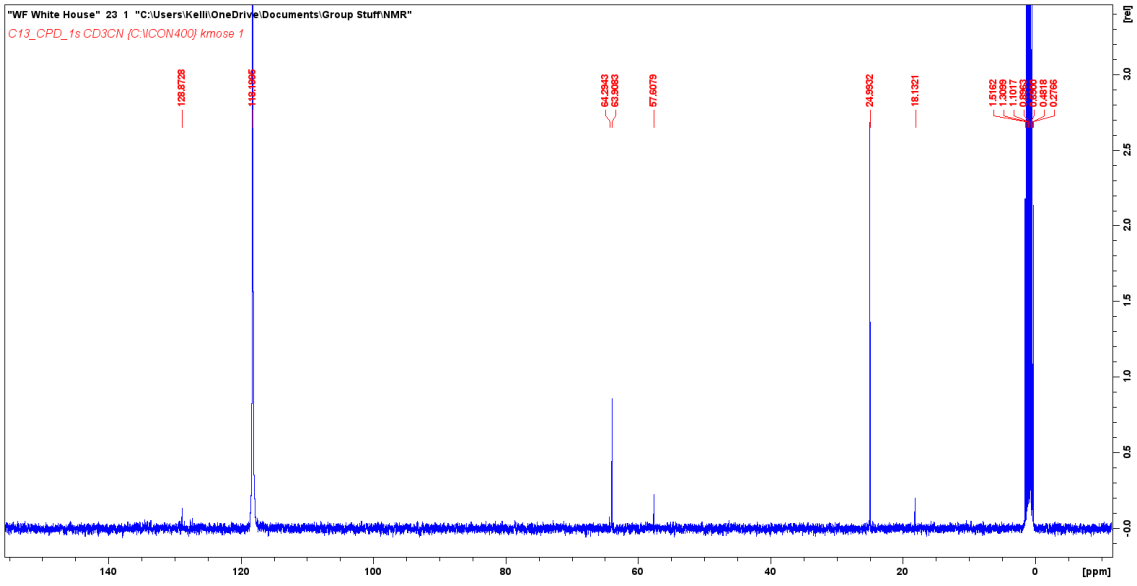

Figure S132. *^{13}C NMR spectrum of World Famous White House distillate in acetonitrile-d3*

Benzyl alcohol peaks appear at δ64.2943 ppm and δ128.8728 ppm. More peaks are expected around δ140 and δ127 ppm but are not detected due to the low concentration of benzyl alcohol. Peaks for ethanol appear at δ18.1321 ppm and δ57.6079 ppm and peaks for isopropanol appear at δ24.9932 ppm and δ63.9083. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

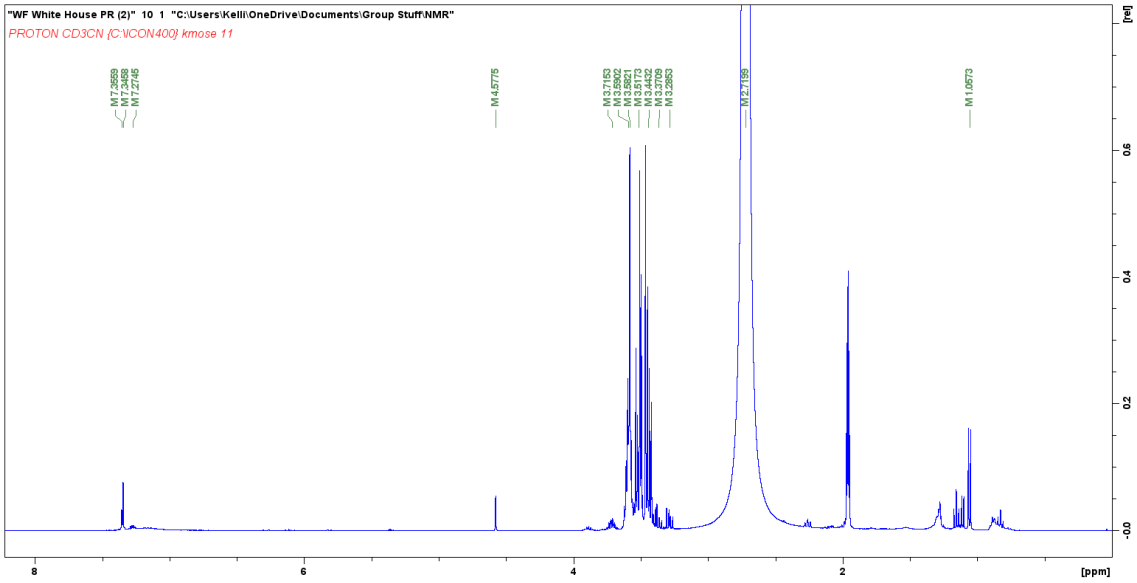

Figure S133. *^{1}H NMR spectrum of World Famous White House pot residue in acetonitrile-d3*

Peaks consistent with benzyl alcohol, glycerol, propylene glycol, and an unidentified component are present in this sample. Benzyl alcohol peaks appear at δ4.5775 ppm (singlet), δ7.2745 ppm (multiplet), δ7.3458 ppm (singlet) and δ7.3559 ppm (singlet). Glycerol produces a multiplet at δ3.5902 ppm and a multiplet at δ3.4432 ppm and δ3.5173 ppm. Peaks consistent with propylene glycol, although small, are found at δ1.0573 ppm (doublet), δ3.2853 ppm (multiplet), δ3.3709 ppm (multiplet), and δ3.7153 ppm (multiplet). Residual isopropanol can be found in solution, producing peaks at δ3.8914 ppm (septet) and δ1.1073 ppm (doublet). The signal appearing at δ3.5821 ppm is assigned to poly(ethylene glycol). The acetonitrile solvent peak is located at δ1.94 ppm.

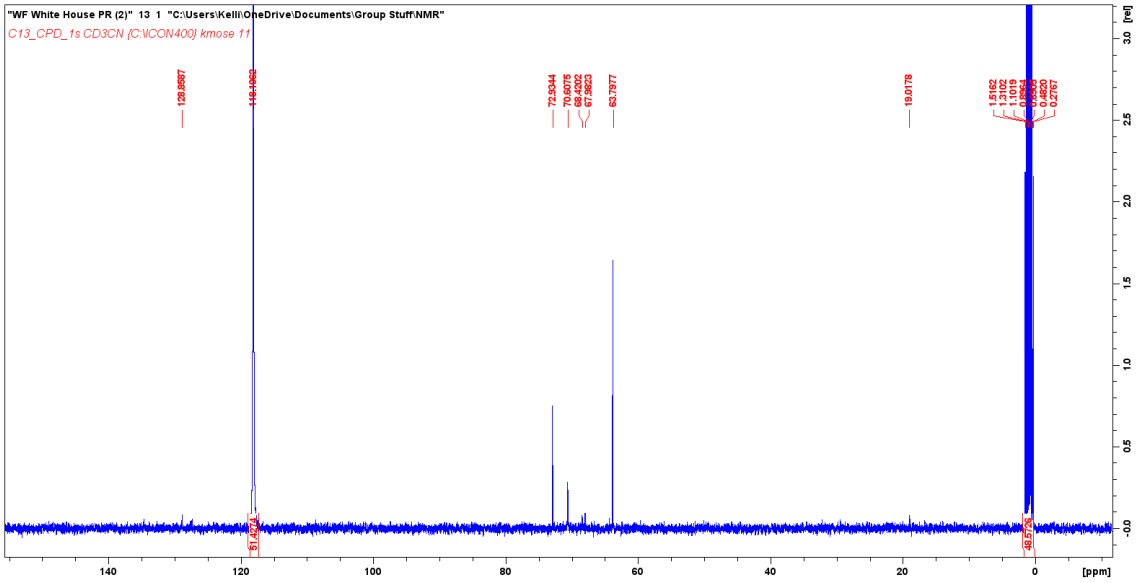

Figure S134. *^{13}C NMR spectrum of World Famous White House pot residue in acetonitrile-d3*

A signal occurring at δ128.8587 ppm is attributed to benzyl alcohol. Peaks would be expected at δ64 ppm, δ126 ppm, δ127 ppm, and δ140 ppm but due to the low concentration, they are undetectable. Glycerol peaks appear at δ63.7977 ppm and δ729344 ppm. Peaks consistent with propylene glycol peaks appear at δ19.0178 ppm, δ67.9823 ppm, and δ68.4022 ppm. The signal appearing at δ70.6075 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

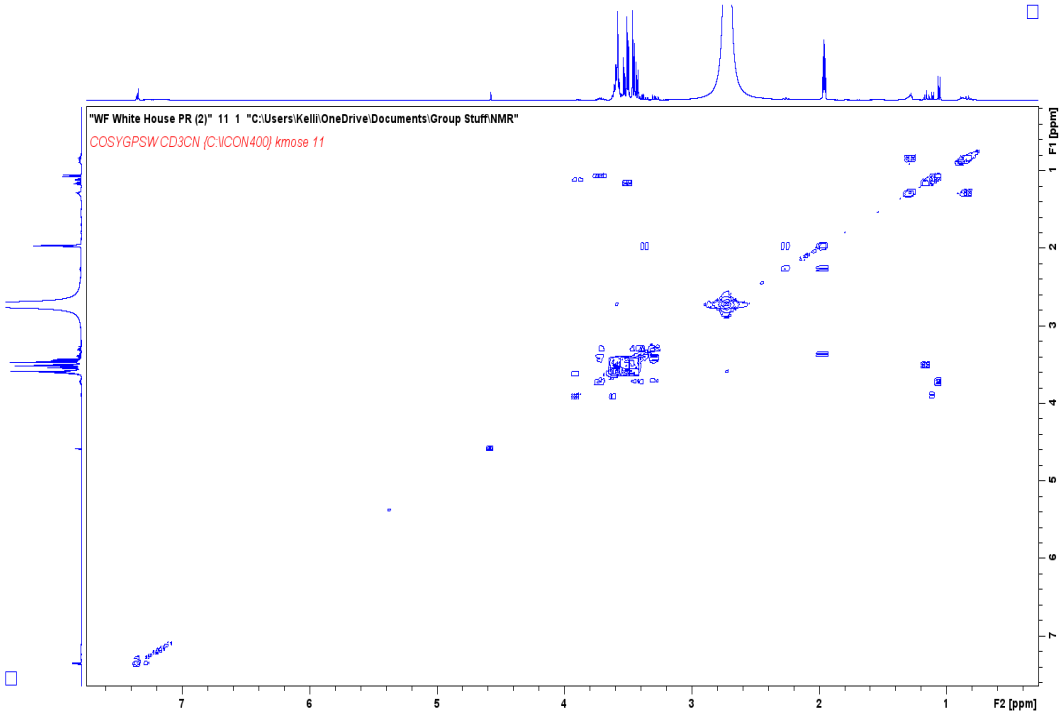

Figure S135. *^{1}H-^{1}H COSY NMR spectrum of World Famous White House pot residue in acetonitrile-d3*

Coupling occurs between the doublet at δ1.0573 ppm, and the multiplets at δ3.2853 ppm and δ3.3709 ppm which is characteristic of propylene glycol. Glycerol peaks at δ3.44432 ppm, δ3.5173 ppm, and δ3.5802 ppm also strongly couple. There also appears to be coupling between residual isopropanol peaks at δ 1.1073 ppm and δ3.8914 ppm. Residual ethanol shows coupling between peaks at δ1.1562 ppm and a quartet around δ3.5ppm which is overlapping with signals from glycerol. Coupling occurs between the downfield signals at δ0.8268 ppm and δ1.2766 ppm, though this component remains unidentified.

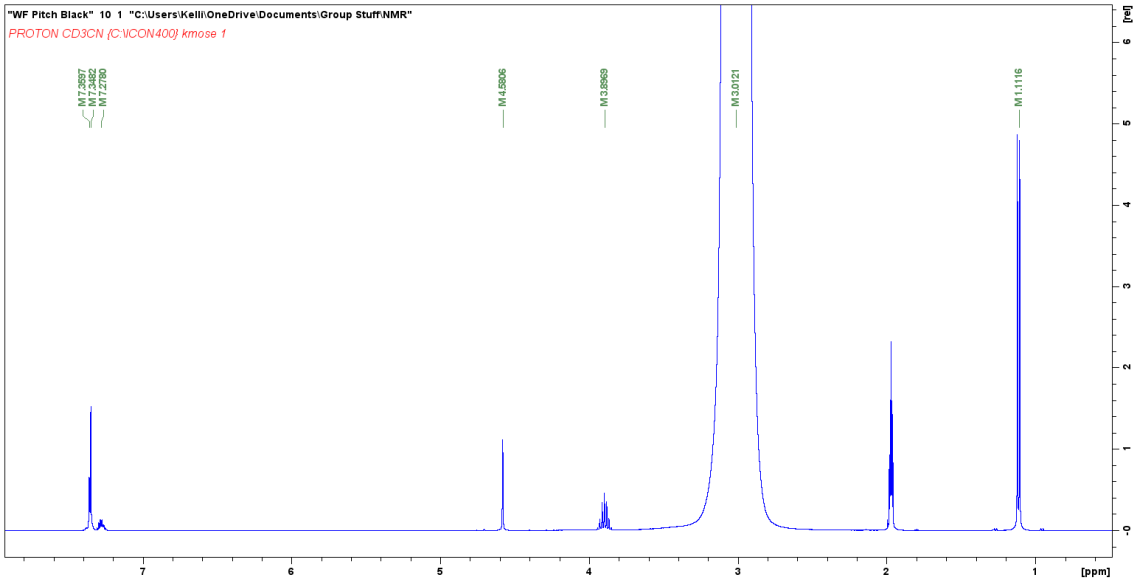

Figure S136. *^{1}H NMR spectrum of World Famous Pitch Black distillate in acetonitrile-d3*

Water, benzyl alcohol, and isopropanol are present in this sample. Isopropanol produces a septet at δ3.8969 and a doublet at δ1.1116 ppm. Benzyl alcohol produces a singlet at δ4.5806 ppm, a multiplet at δ7.2780 ppm, and singlets at δ7.3482 ppm and δ7.3597 ppm. Water produces a large, broad singlet at δ3.0121 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

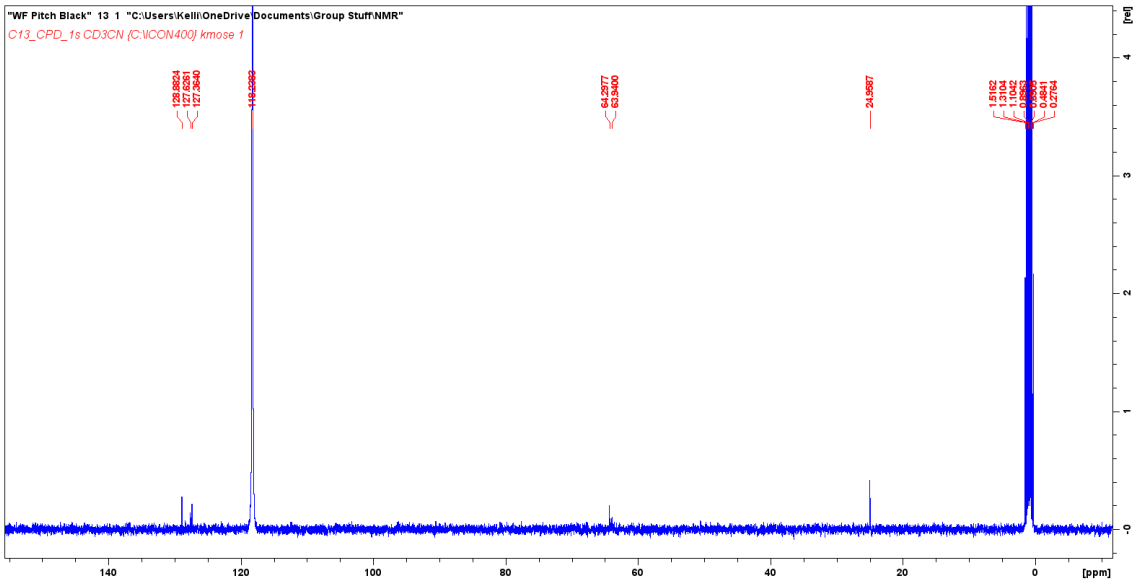

Figure S137. *^{13}C NMR spectrum of World Famous Pitch Black distillate in acetonitrile-d3*

Peaks for benzyl alcohol appear at δ64.2977 ppm, δ127.3640 ppm, δ127.6261 ppm, and δ128.8824 ppm. There should be a signal appearing around δ140 ppm but due to the low concentration, it cannot be detected. Isopropanol peaks appear at δ24.9587 ppm and δ63.9400 ppm. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

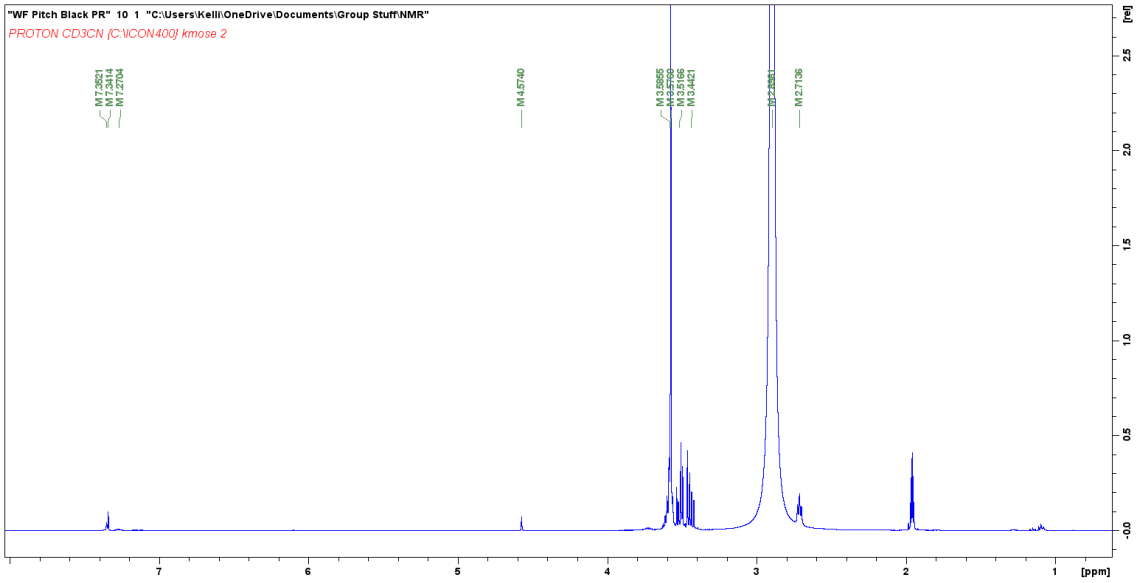

Figure S138. *^{1}H NMR spectrum of World Famous Pitch Black pot residue in acetonitrile-d3*

Small peaks appearing at δ4.5740 ppm (singlet), δ7.2704 ppm (multiplet), δ7.3414 ppm and δ7.3521 ppm (singlets) are produced by benzyl alcohol. Glycerol peaks appear as multiplets at δ3.4421 ppm and δ3.5166 ppm as well as a multiplet at δ3.5855 ppm. The signals at δ3.5700 ppm is assigned to poly(ethylene glycol). The peak δ 2.7136 ppm remains unidentified. The acetonitrile solvent peak is located at δ1.94 ppm.

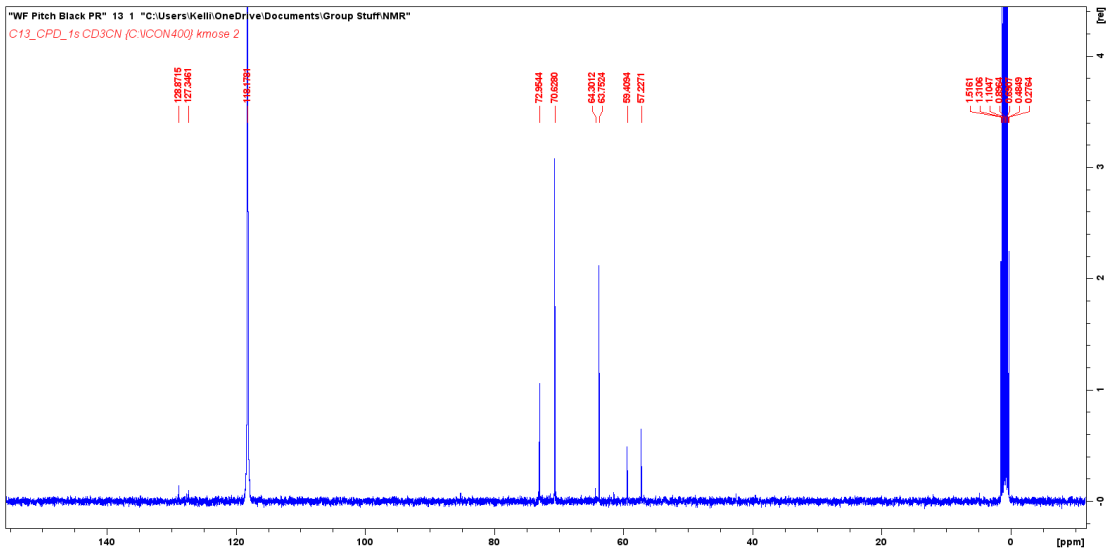

Figure S139. *^{13}C NMR spectrum of World Famous Pitch Black pot residue in acetonitrile-d3*

Benzyl alcohol peaks are found at δ64.3012 ppm, δ127.3461 ppm, and δ128.8715 ppm. Peaks are expected at δ126 and δ140 ppm but are not present due to the low concentration. Glycerol peaks are found at δ63.7524 ppm and δ72.9554 ppm. Additionally, the signal at δ70.6280 ppm is assigned to poly(ethylene glycol). The signals at δ59.4096 ppm, and δ57.2271 ppm remain unidentified. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

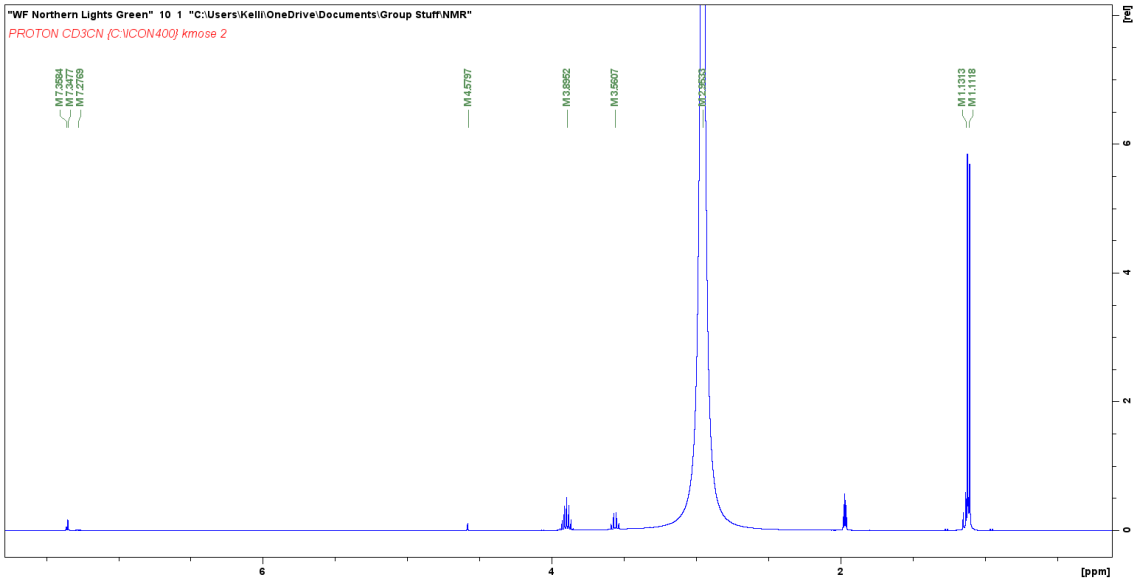

Figure S140. *^{1}H NMR spectrum of World Famous Northern Lights Green distillate in acetonitrile-d3*

Peaks at δ1.1118 ppm (doublet), and δ3.8952 ppm (septet) are produced by isopropanol in solution. Ethanol produced signals at δ1.1313 ppm (triplet) and δ3.5607 ppm (quartet). Peaks at δ4.5797 ppm (singlet), δ7.2769 ppm (multiplet), δ7.3477 ppm and δ7.3584 ppm (singlets) are produced by benzyl alcohol. The acetonitrile solvent peak is located at δ1.94 ppm.

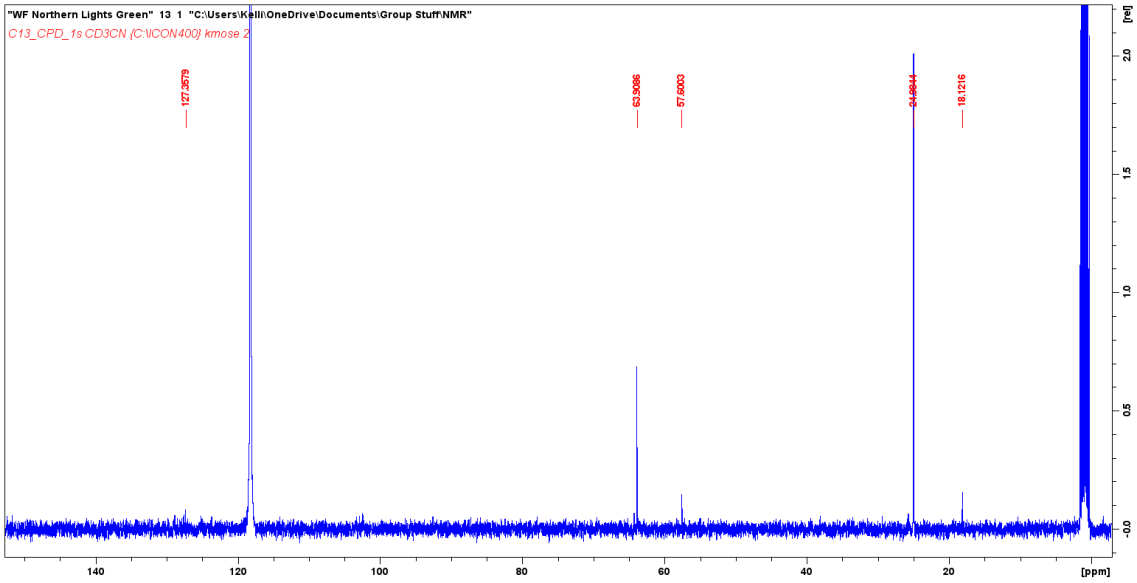

Figure S141. *^{13}C NMR spectrum of World Famous Northern Lights Green distillate in acetonitrile-d3*

A peak at δ127.3579 ppm is produced by benzyl alcohol. Peaks should also be found at δ64 ppm, δ126 ppm, δ128 ppm, and δ104 ppm but due to very low concentrations, they are not detected. Isopropanol produces the signals appearing at δ24.9844 ppm and δ63.9086 ppm. Ethanol produces the signals found at δ18.1216 ppm and δ57.6003 ppm. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

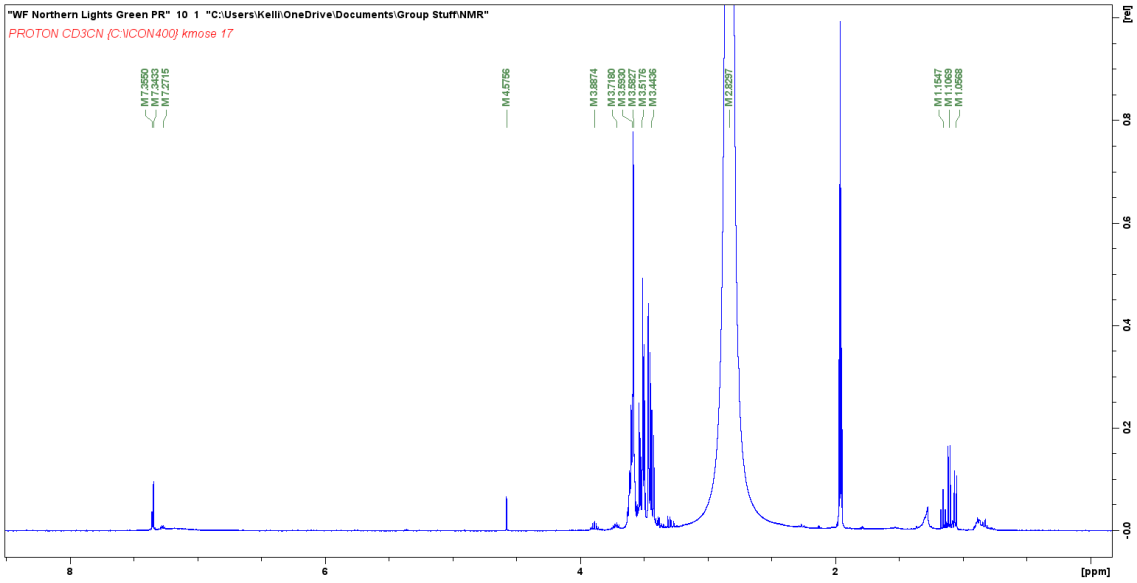

Figure S142. *^{1}H NMR spectrum of World Famous Northern Lights Green pot residue in acetonitrile-d3*

There are small signals downfield at δ4.5756 ppm (singlet), δ7.2715 ppm (multiplet), δ7.3433 ppm and δ7.3550 ppm (singlets) that can be attributed to benzyl alcohol. Glycerol peaks present at δ3.4436 ppm (multiplet), δ3.5176 ppm (multiplet), and δ3.5930 ppm (multiplet). A singlet appears at δ2.8297 ppm which corresponds to water. The singlet at δ3.5827 ppm is assigned to poly(ethylene glycol). Isopropanol produced a septet at δ3.8874 and doublet at δ1.0568 ppm. Peak consistent with propylene glycol are found at δ1.1069 ppm and δ3.8874 ppm. Small peaks centered around δ 3.37 ppm are also observed, supporting the presence of propylene glycol. The acetonitrile solvent peak is located at δ1.94 ppm.

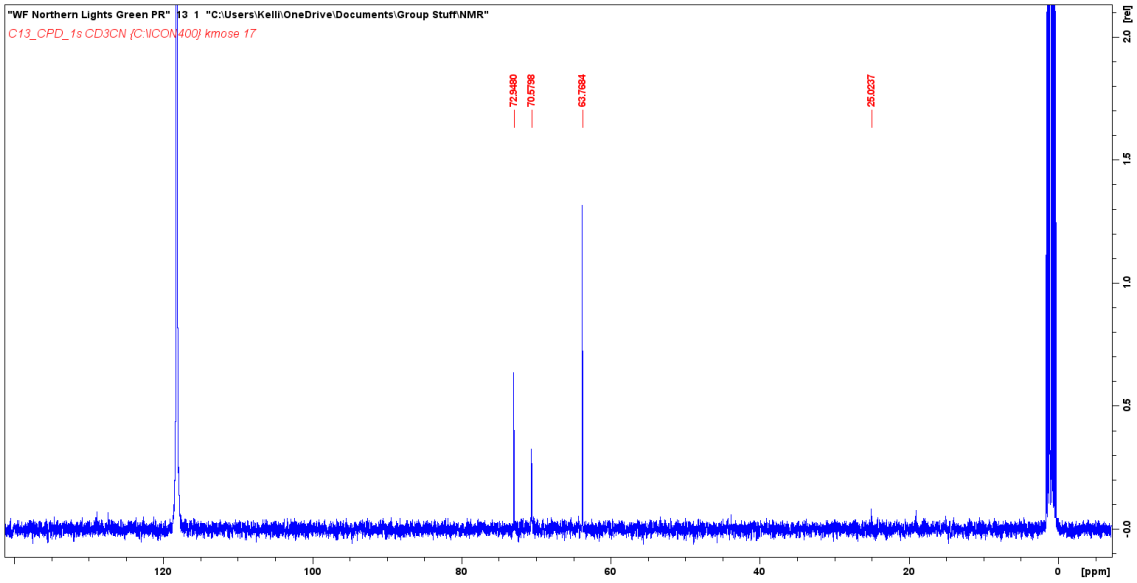

Figure S143. *^{13}C NMR spectrum of World Famous Northern Lights Green pot residue in acetonitrile-d3*

Peaks at δ63.7684 ppm and δ72.9480 ppm are produced by glycerol. The small peak at δ25.0237 ppm is likely due to a small amount of isopropanol. The corresponding peak, around δ64 ppm, does not appear given the low concentration. Peaks for benzyl alcohol are not observed due to low concentration. The peak at δ70.5798 ppm is assigned to poly(ethylene glycol).The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

5.2 Raman Data

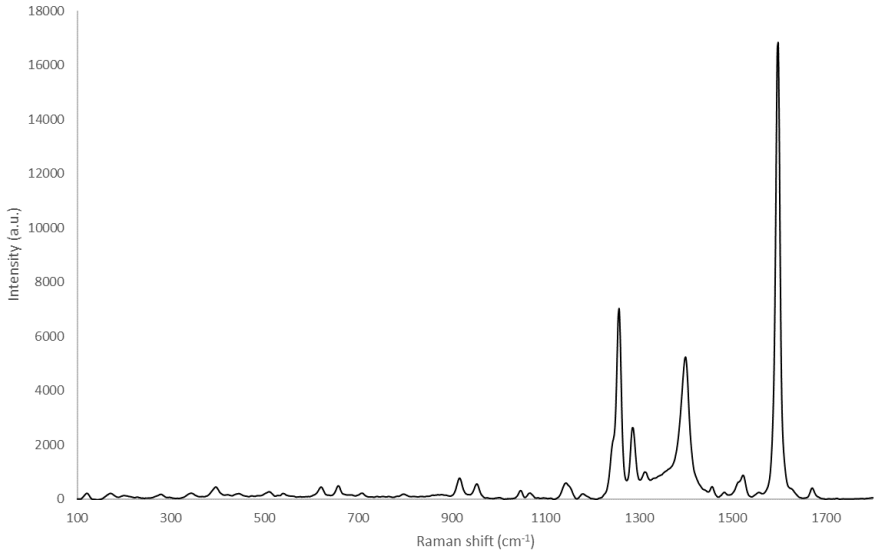

Figure S144. *Raman spectrum of World Famous Great Wall Yellow*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 1 average, 1 boxcar, auto-baseline on. The major signals produced at 1598 cm^{-1}, 1398 cm^{-1}, 1288 cm^{-1}, and 1258 cm^{-1} correspond to the presence of Pigment Yellow 14. This matches the Raman spectrum of Pigment Yellow 14 from the SOPRANO Raman spectra database.[1]

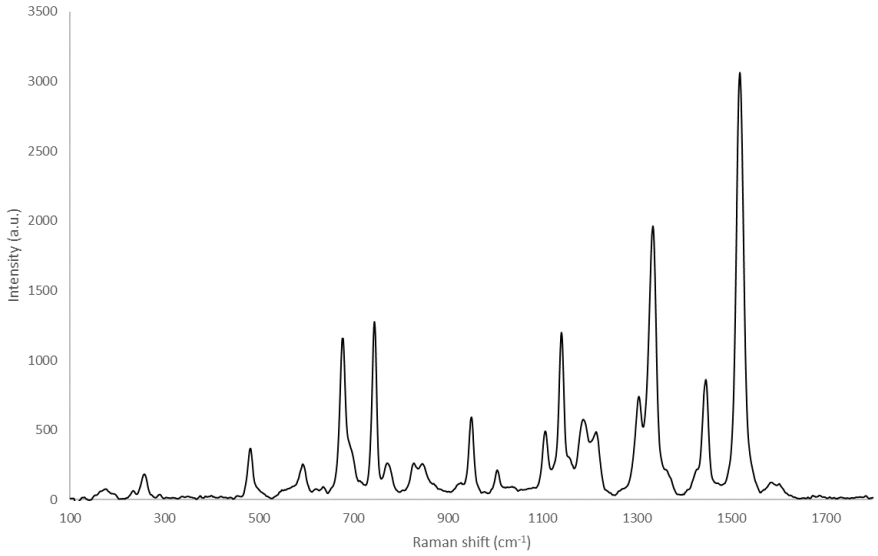

Figure S145. *Raman spectrum of World Famous Nile River Blue*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 1 average, 1 boxcar, auto-baseline on. Major peaks occurring at 1518 cm^{-1}, 1444 cm^{-1}, 1332 cm^{-1}, 1306 cm^{-1}, 1140 cm^{-1}, 1106 cm^{-1}, 948 cm^{-1}, 744 cm^{-1}, and 678 cm^{-1} are attributed to Pigment Blue 15. This matches the spectrum of Pigment Blue 15 in the SOPRANO Raman spectra database.[1]

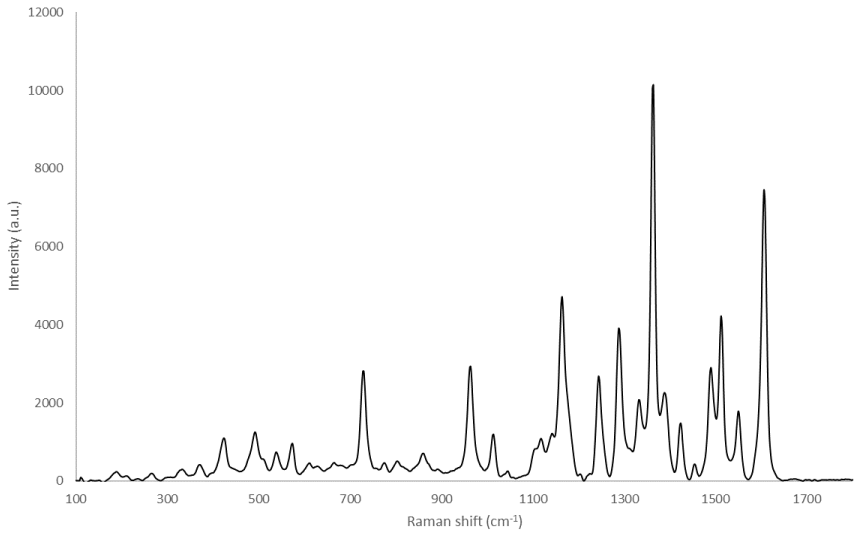

Figure S146. *Raman spectrum of World Famous Paul Rogers Red*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 1 average, 1 boxcar, auto-baseline on. The major peaks in this spectrum occur at 1606 cm^{-1}, 1512 cm^{-1}, 1490 cm^{-1}, 1364 cm^{-1}, 1288 cm^{-1}, 1244 cm^{-1}, 1166 cm^{-1}, 964 cm^{-1}, and 728 cm^{-1}. This matches closely with both Pigment Red 210 and Pigment Red 170 in the SOPRANO Raman spectrum database.[1] Upon looking at the smaller wavenumbers, there are two smaller signals at 538 cm^{-1} and 574 cm^{-1}; these peaks confirm that Pigment Red 170 is present.[1]

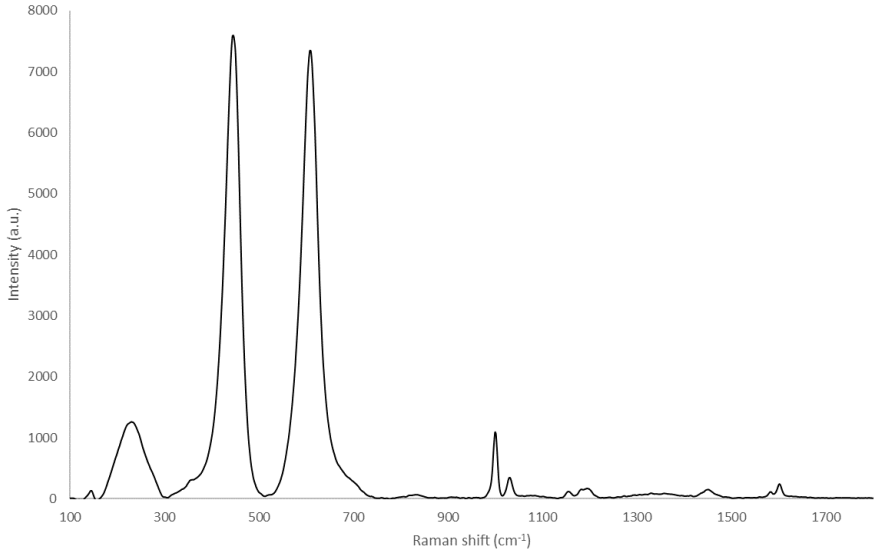

Figure S147. *Raman spectrum of World Famous White House*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 1 average, 1 boxcar, auto-baseline on. Major peaks appearing at 606 cm^{-1}, 446 cm^{-1}, and 232 cm^{-1} are produced by Pigment White 6 (titanium dioxide). A small peak at 1002 cm^{-1} may indicate a small presence of barium sulfate (see section 10).

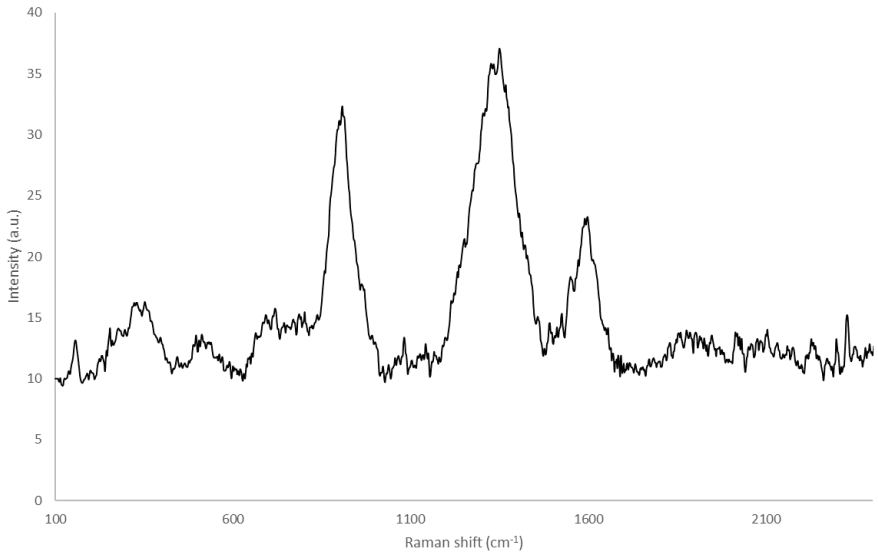

Figure S148. *Raman spectrum of World Famous Pitch Black*

Parameters used to obtain this spectrum are as follows: 785 nm, 200 mW, 10 second integration, 3 average, 2 boxcar, auto-baseline on. Major peaks appearing at 1600 cm^{-1}, 1354 cm^{-1}, and 908 cm^{-1} match those of a carbon black Raman spectrum (see section 10).

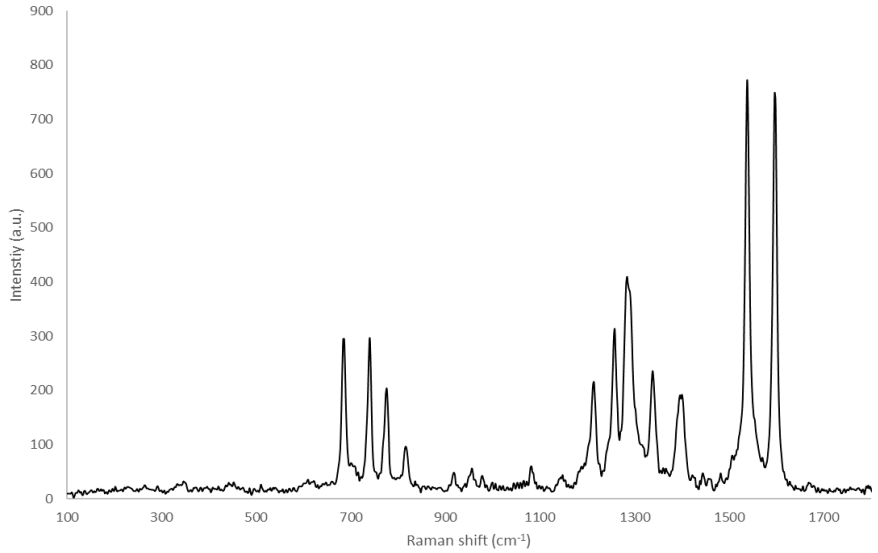

Figure S149. *Raman spectrum of World Famous Northern Lights Green*

Parameters used to obtain this spectrum are as follows: 785 nm, 300 mW, 3 second integration, 1 average, 0 boxcar, auto-baseline on. Major peaks that occur at 1596 cm^{-1}, 1538 cm^{-1}, 1400 cm^{-1}, 1338 cm^{-1}, 1284 cm^{-1}, 1258 cm^{-1}, 1214 cm^{-1}, 776 cm^{-1}, 740 cm^{-1}, and 686 cm^{-1} matches the spectrum produced by Pigment Green 7 from the SOPRANO Raman spectra database.[1]

5.3 XRF Data

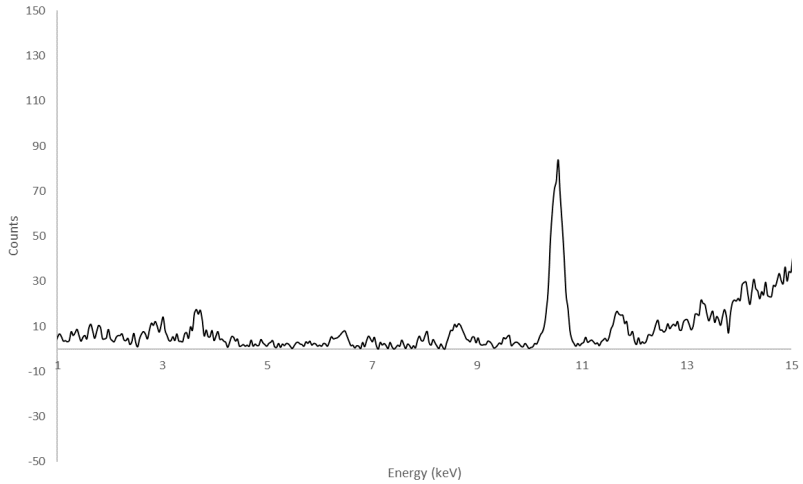

Figure S150. *X-ray fluorescence spectrum of World Famous Great Wall Yellow*

There is only one major peak pair from this sample at 10.56 keV and 11.68 keV which can be attributed to the glass microscope slide used to hold the sample. The lack of other notable peak pairs indicates that there are no inorganic pigments present in this ink.

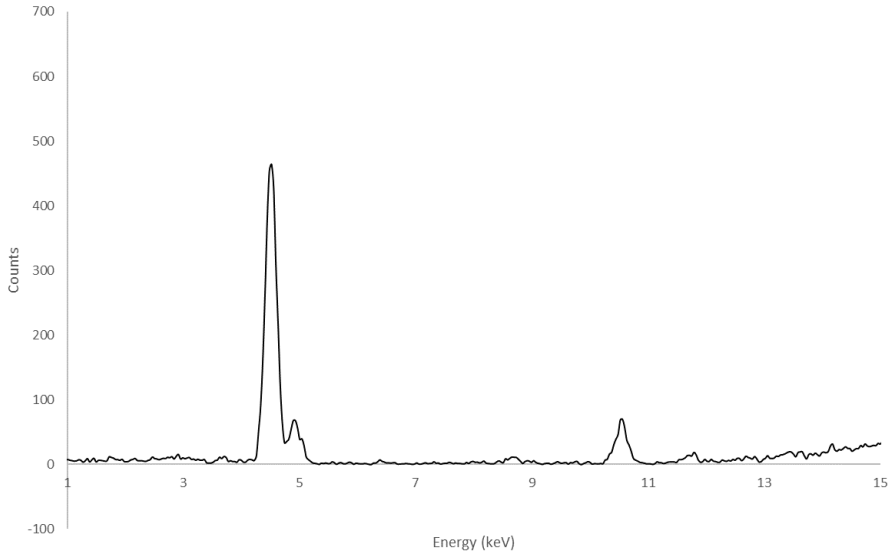

Figure S151. *X-ray fluorescence spectrum of World Famous White House*

One major peak pair, located at 4.52 keV and 4.96 keV, can be attributed to titanium; this confirms the presence of Pigment White 6 in the ink. The other peak pair, 10.56 keV and 11.82 keV occurs due to arsenic in the glass microscope slide used to dry the sample on.

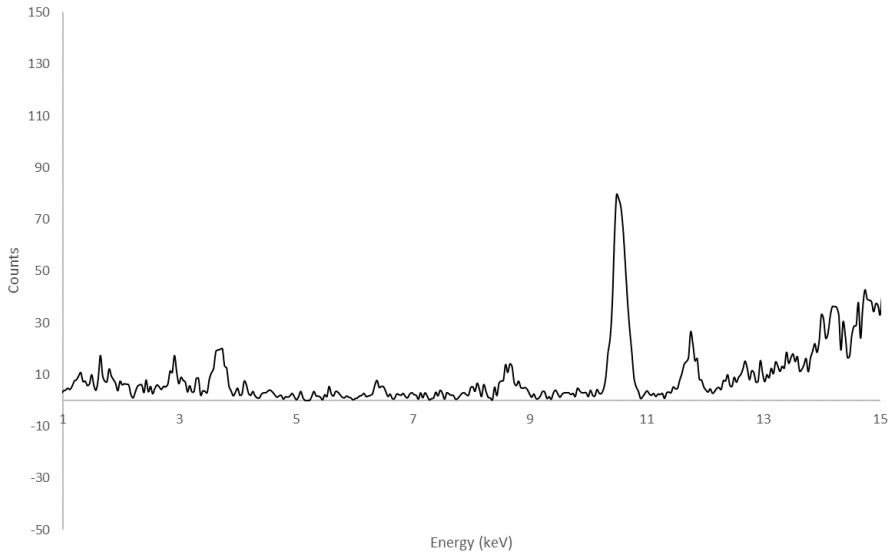

Figure S152. *X-ray fluorescence spectrum of World Famous Pitch Black*

There is only one major peak pair from this sample at 10.52 keV and 11.75 keV which can be attributed to the glass microscope slide used to hold the sample. The lack of other notable peak pairs indicates that there are no inorganic pigments present in this ink.

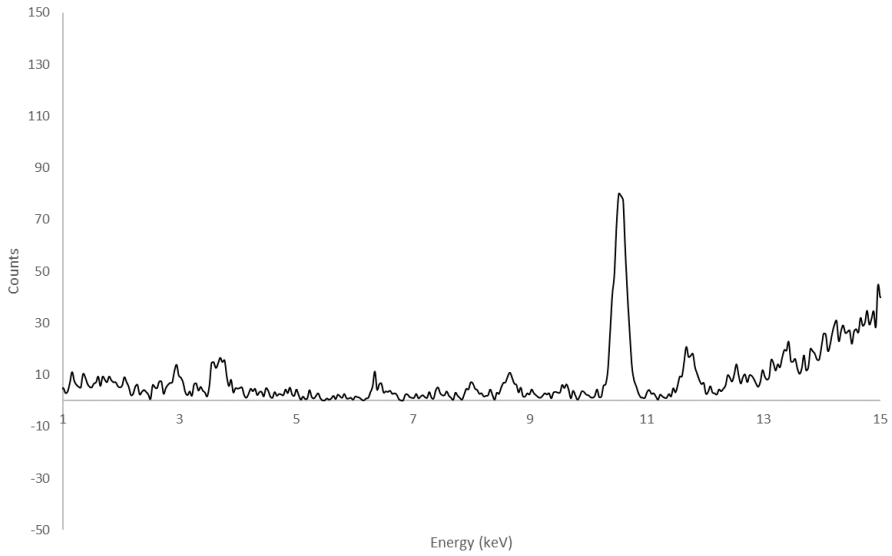

Figure S153. *X-ray fluorescence spectrum of World Famous Paul Rogers Red*

There is only one major peak pair from this sample at 10.56 keV and 11.68 keV which can be attributed to the glass microscope slide used to hold the sample. The lack of other notable peak pairs indicates that there are no inorganic pigments present in this ink.

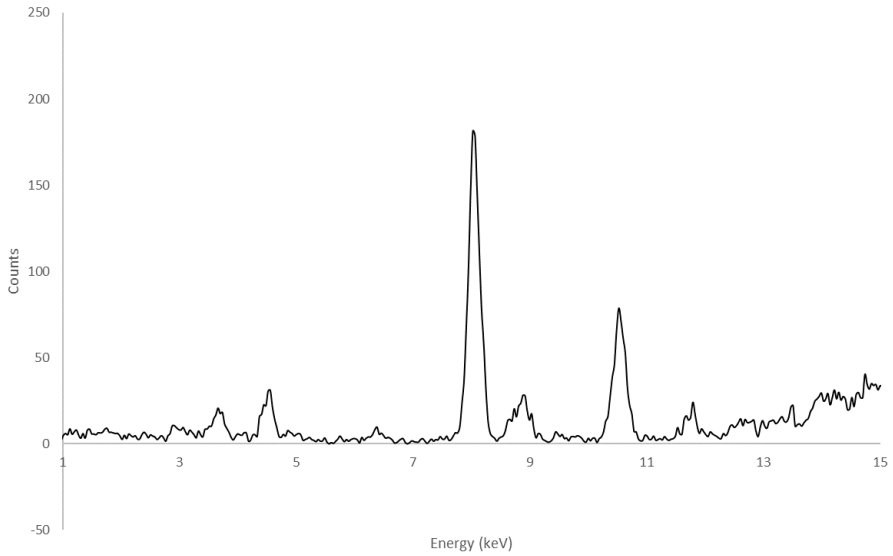

Figure S154. *X-ray fluorescence spectrum of World Famous Nile River Blue*

Large signals at 8.02 keV and 8.92 keV are attributed to copper and confirm the presence of the copper containing Pigment Blue 15. Other large signals at 10.52 keV and 11.79 keV are attributed to arsenic present in the glass microscope slide used to mount the sample.

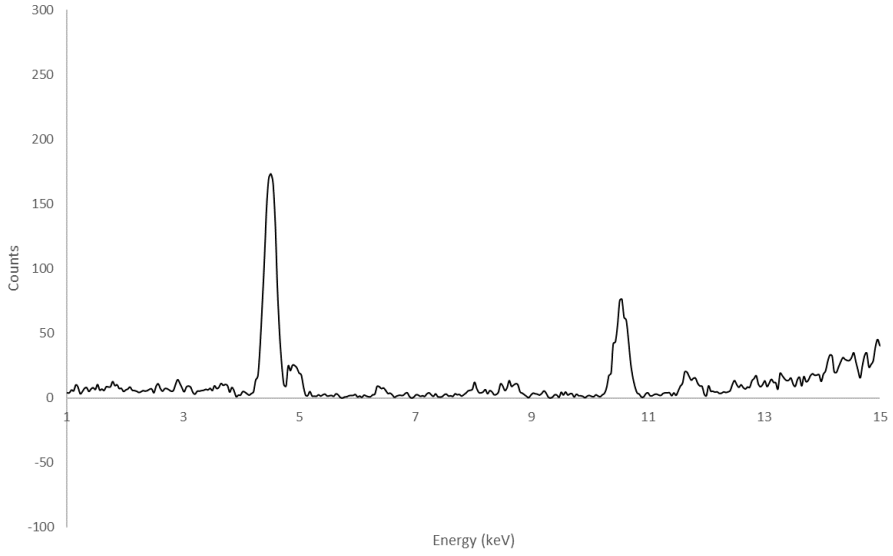

Figure S155. *X-ray fluorescence spectrum of World Famous Northern Lights Green*

Peaks at 4.52 keV and 4.93 keV are attributed to titanium, likely from Pigment White 6. Peaks at 10.56 keV and 11.68 keV are produced from the arsenic present in the glass microscope slide used to dry the sample on.

6. Starbrite

6.1 NMR and Mass Spectrometry Data

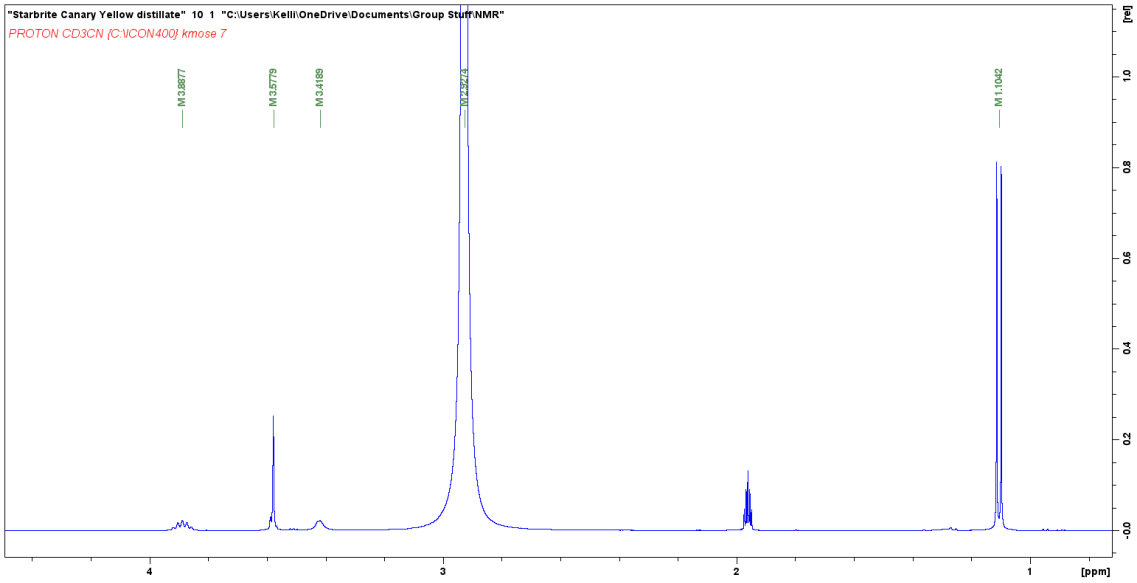

Figure S156. *^{1}H NMR spectrum of Starbrite Canary Yellow distillate in acetonitrile-d3*

Peaks at δ1.1042 ppm (doublet), δ3.4189 ppm (broad singlet), and δ3.8877 ppm (septet) are produced by isopropanol. Water produced the large singlet at δ2.9274 ppm. An unidentified component produced the singlet at δ3.5779 ppm, which may be poly(ethylene glycol). The acetonitrile solvent peak is located at δ1.94 ppm.

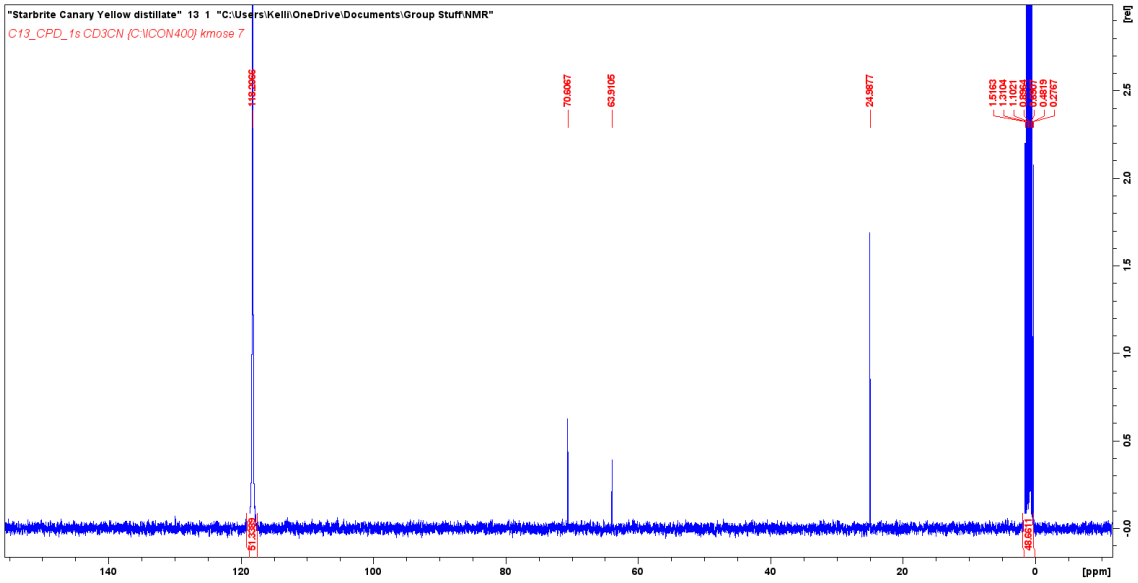

Figure S157. *^{13}C NMR spectrum of Starbrite Canary Yellow distillate in acetonitrile-d3*

Isopropanol peaks can be found at δ24.9877 ppm and δ63.915 ppm. The signal appearing at δ70.6067 ppm may correspond to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

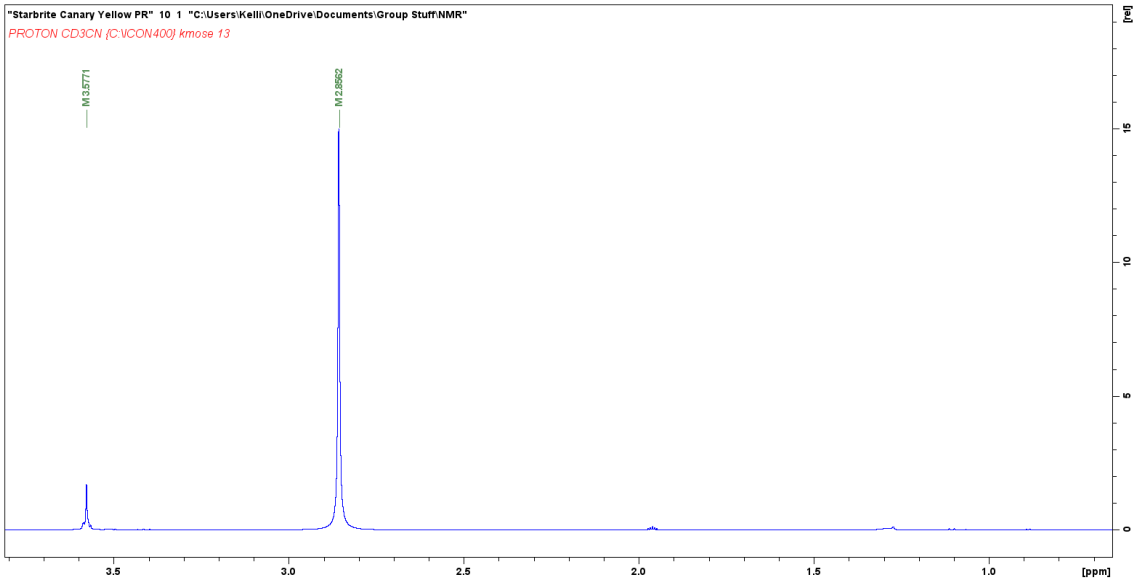

Figure S158. *^{1}H NMR spectrum of Starbrite Canary Yellow pot residue in acetonitrile-d3*

A peak appearing at δ3.5771 ppm is assigned to poly(ethylene glycol). There are no other signals present, besides water at δ2.8562 ppm.

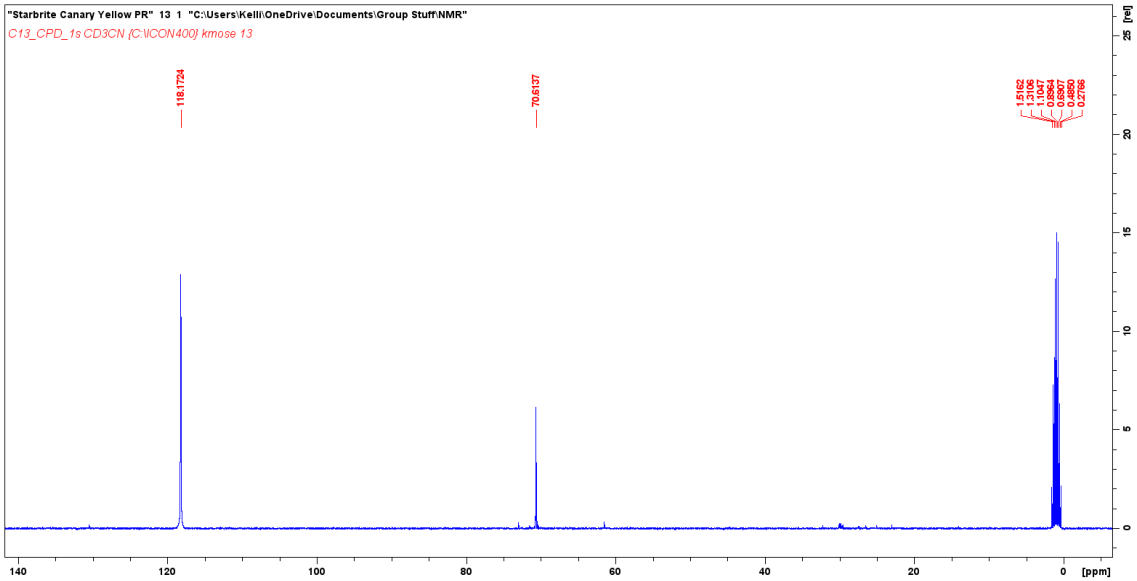

Figure S159. *^{13}C NMR spectrum of Starbrite Canary Yellow pot residue in acetonitrile-d3*

The peak appearing at δ70.6137 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

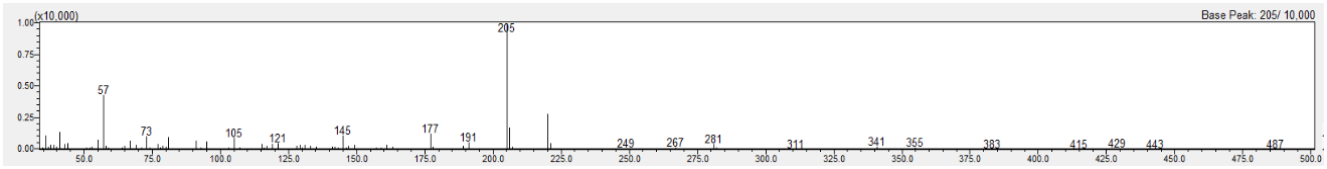

Figure S160. *Mass spectrum of Starbrite Canary Yellow*

Mass spectrum of this chromatogram peak indicates the presence of butylated hydroxytoluene in this sample.

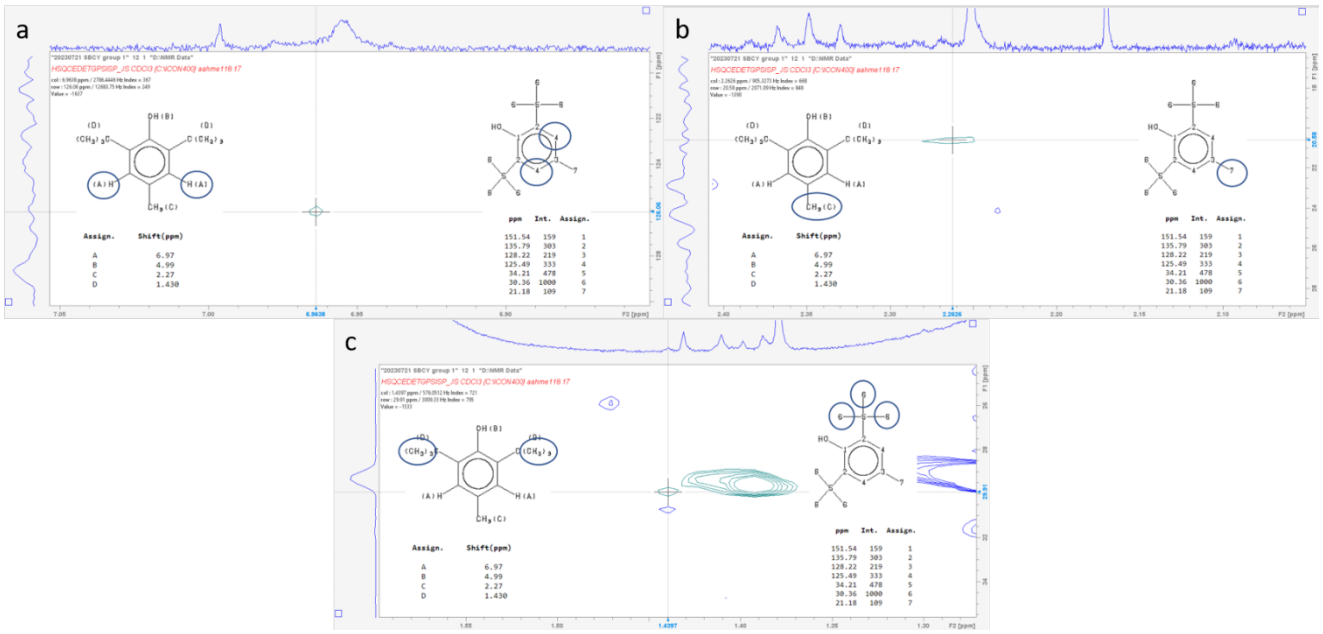

Figure S161. *NMR spectrum of isolated butylated hydroxytoluene from Starbrite Canary Yellow in chloroform-d3*

Coupling occurs between signals at (a) δ6.96 ppm and δ126.06 ppm, (b) δ2.26 ppm and δ20.58 ppm, and (c) δ1.44 ppm and δ29.91 ppm which indicates the presence of butylated hydroxytoluene in this sample.

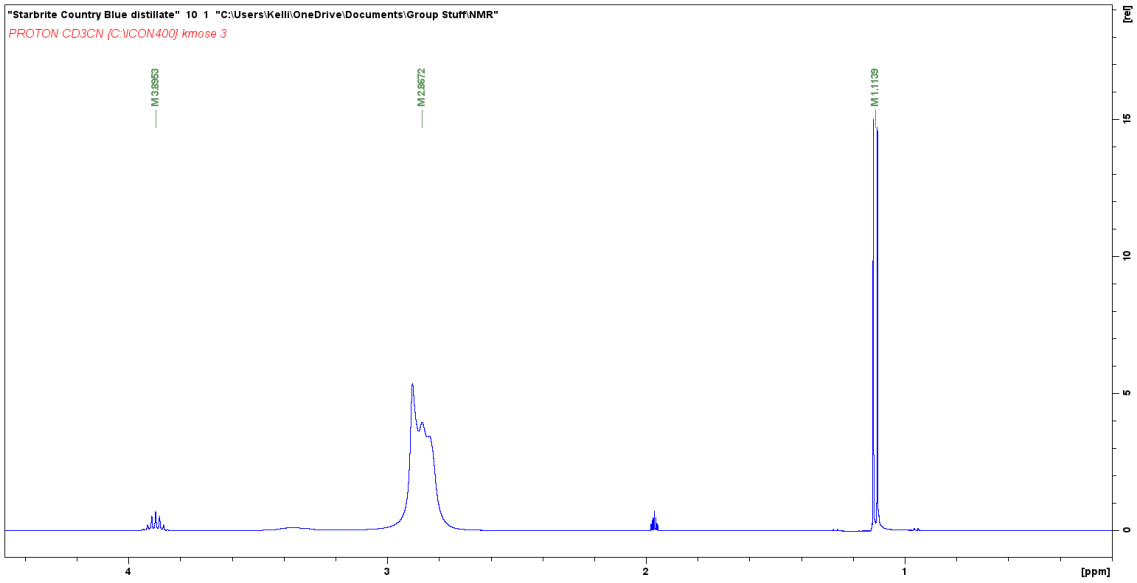

Figure S162. *^{1}H NMR spectrum of Starbrite Country Blue distillate in acetonitrile-d3*

Peaks at δ1.1139 ppm (doublet) and δ3.8953 ppm (septet) are produced by isopropanol. The misshapen peak at δ2.8672 ppm can be attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

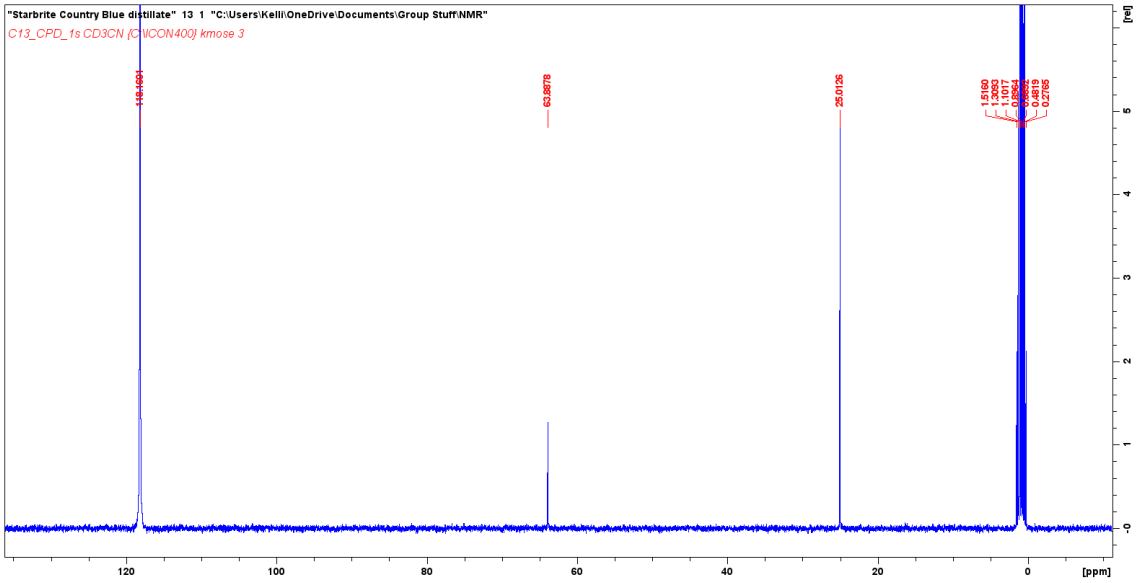

Figure S163. *^{13}C NMR spectrum of Starbrite Country Blue distillate in acetonitrile-d3*

Peaks at δ25.0126 ppm and δ63.8878 ppm can be attributed to isopropanol. The lack of other carbon signals supports water being present. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

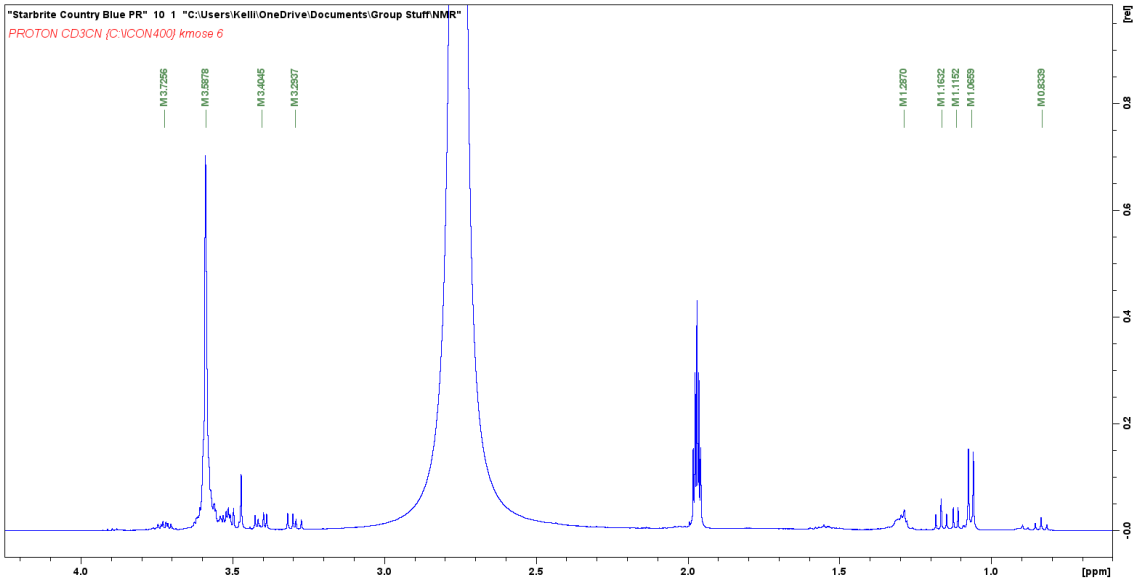

Figure S164. *^{1}H NMR spectrum of Starbrite Country Blue pot residue in acetonitrile-d3*

A singlet at δ3.5878 ppm is produced by. Possible small amounts of propylene glycol could explain the doublet at δ1.0659 ppm, and multiplets at δ3.2937 ppm, δ3.4045 ppm, and δ3.7256 ppm. Residual amounts of isopropanol appear at the small doublet at δ1.1152 ppm. The peaks at δ3.5878 ppm is assigned to poly(ethylene glycol). The peaks at δ0.8339 ppm, δ1.1632 ppm, and δ1.2870 ppm remain unidentified. The acetonitrile solvent peak is located at δ1.94 ppm.

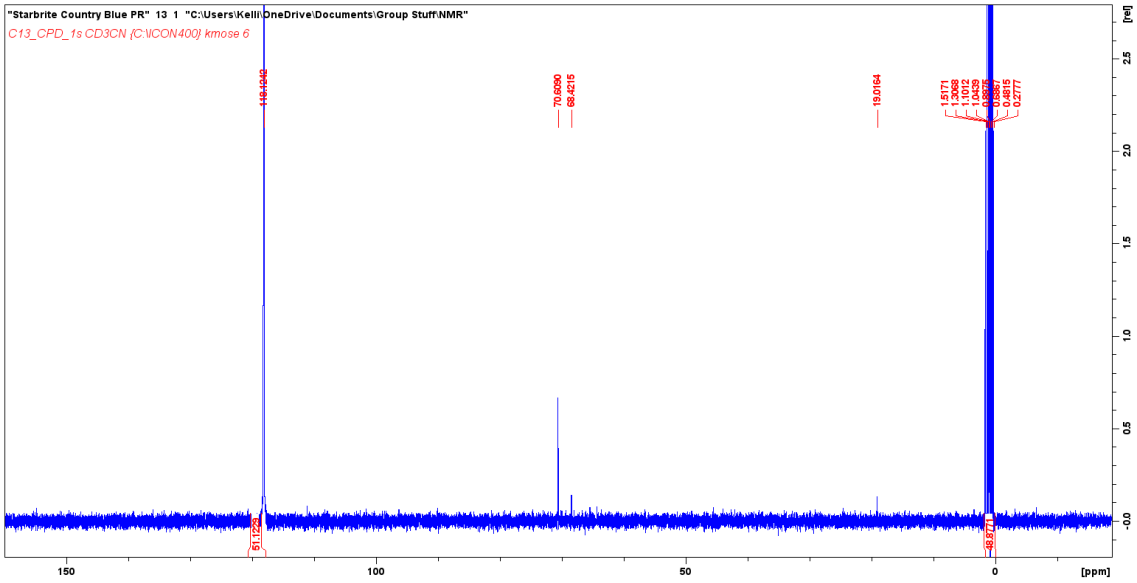

Figure S165. *^{13}C NMR spectrum of Starbrite Country Blue pot residue in acetonitrile-d3*

Peaks at δ19.0164 ppm and δ68.4215 ppm likely correspond to propylene glycol; an additional peak is expected at δ68.0 but is not present due to low concentration. A peak at δ70.6090 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

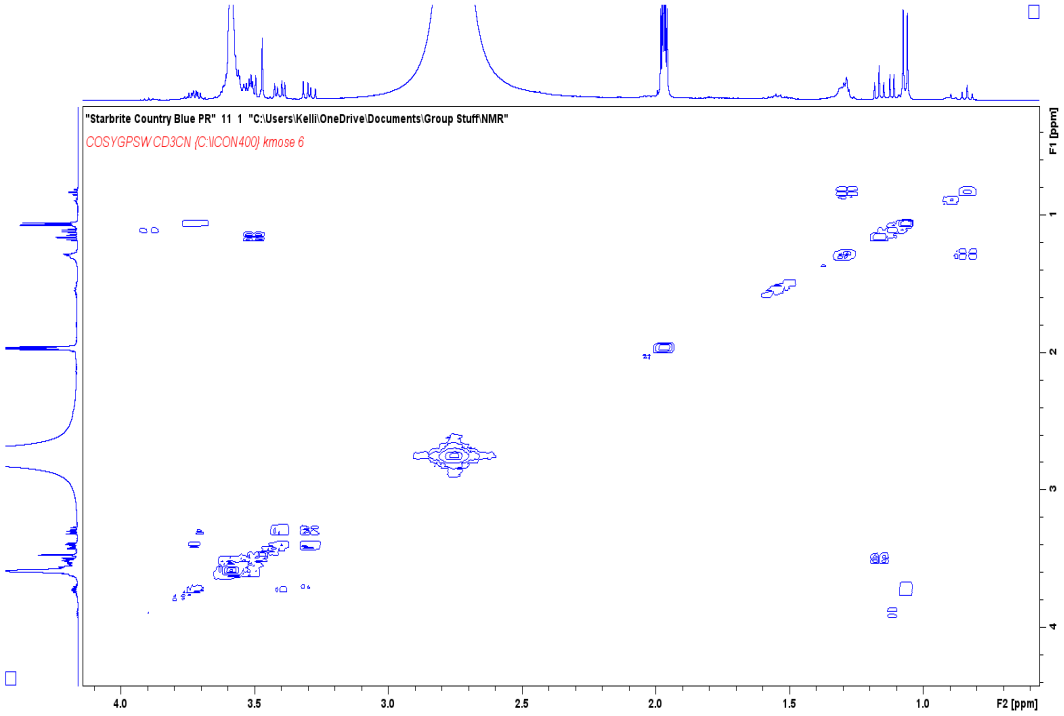

Figure S166. *^{1}H-^{1}H COSY spectrum of Starbrite Country Blue pot residue acetonitrile-d3*

Coupling can be seen between signals at δ1.0659 ppm, and multiplets at δ3.2937 ppm, δ3.4045 ppm, and δ3.7256 ppm, indicating propylene glycol. Additionally, isopropanol peaks at δ 1.1152 ppm and δ3.895 ppm show some coupling. The peaks at δ0.8339 ppm and δ1.2870 ppm show coupling, indicating they are produced by the same unidentified component. Lastly, the triplet at δ1.1632 ppm seems to couple with a peak around δ 3.507 ppm though this component could not be identified due to other peaks occurring in this area.

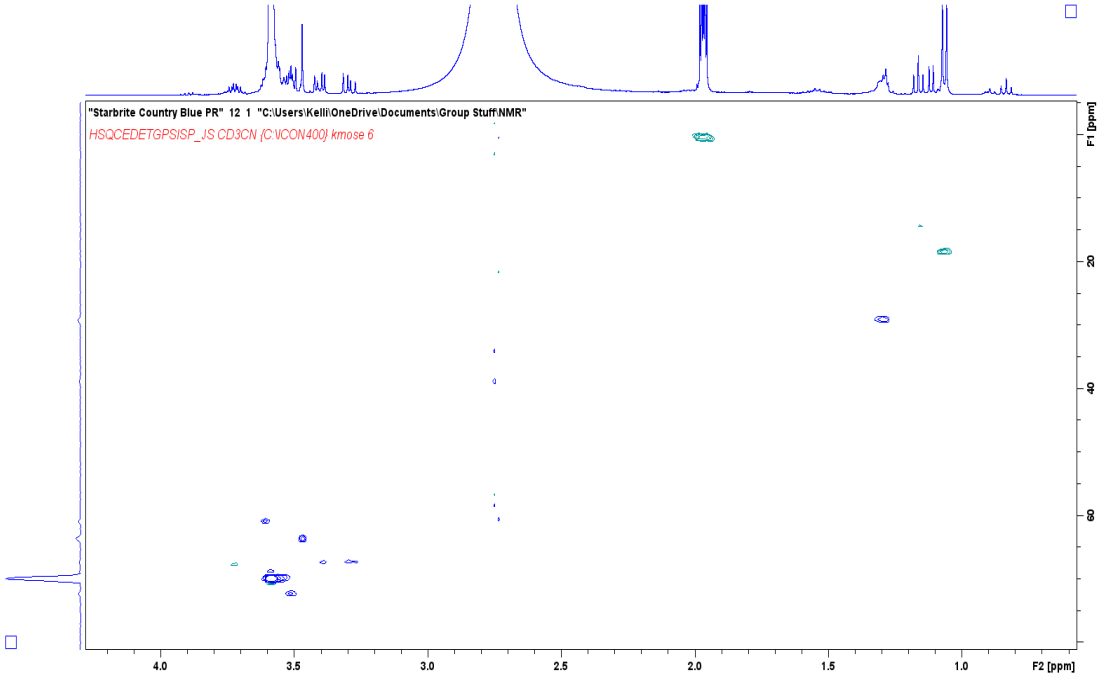

Figure S167. *^{1}H-^{13}C spectrum of Starbrite Country Blue pot residue in acetonitrle-d3*

Coupling occurs between the ^{1}H peaks at δ3.2937 ppm and δ3.4045 ppm and the ^{13}C peak around δ67.6 ppm, as well as the ^{1}H peak at δ3.7256 ppm and the ^{13}C peak at δ68.4215 ppm. This, in addition to the ^{1}H doublet at δ1.0659 ppm and ^{13}C peak δ19.0164 ppm, support propylene glycol being in tis sample. Additionally, coupling occurs between the ^{1}H peak at δ1.2870 ppm and a ^{13}C peak at δ29.2 ppm, suggesting the presence of a long-chain hydrocarbon.

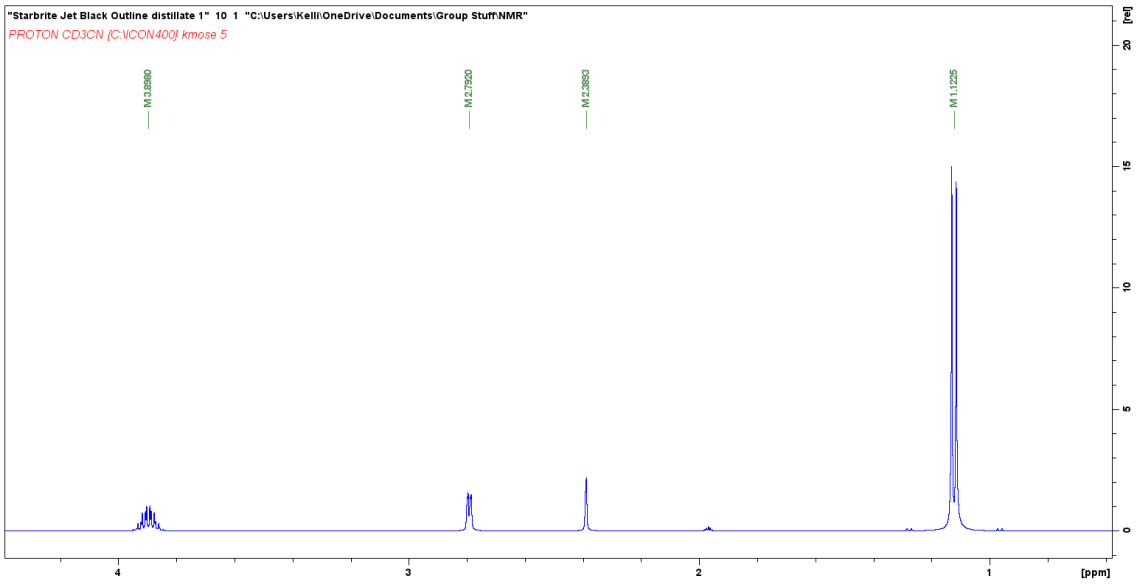

Figure S168. *^{1}H NMR spectrum of Starbrite Jet Black Outline distillate in acetonitrile-d3*

Isopropanol produces signals at δ1.1225 ppm (doublet), δ2.7920 ppm (doublet), and δ3.8980 ppm (octet of doublets). Water produces a small peak at δ2.3893 ppm (singlet).

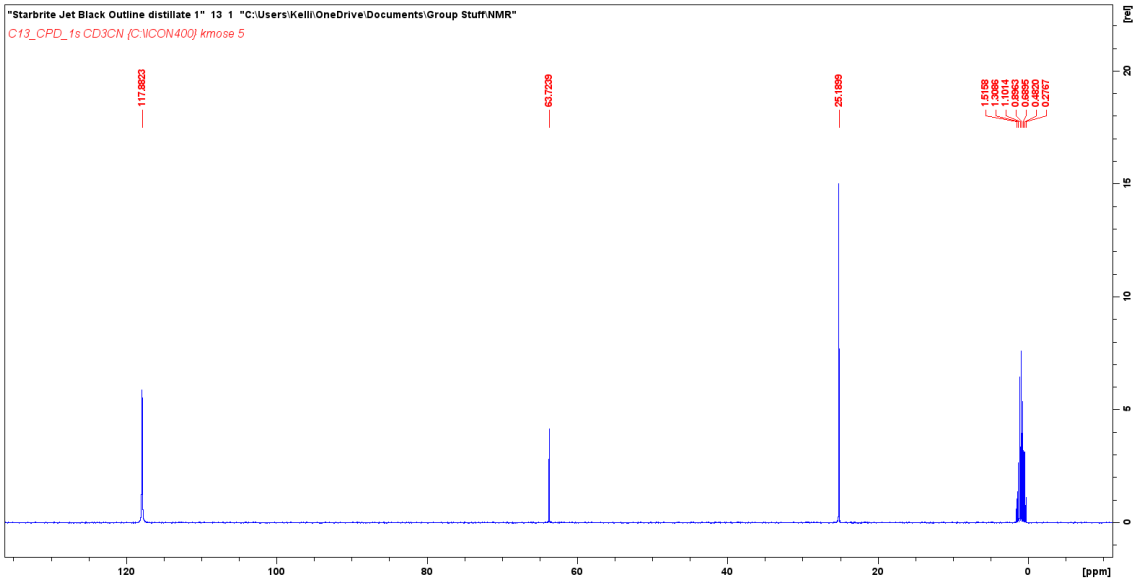

Figure S169. *^{13}C NMR spectrum of Starbrite Jet Black Outline distillate in acetonitrile-d3*

Peaks at δ25.1899 ppm and δ63.7239 ppm are produced by isopropanol. The lack of other peaks, besides the ones produced by the solvent, alludes to the singlet ^{1}H peak at δ2.3893 ppm being water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

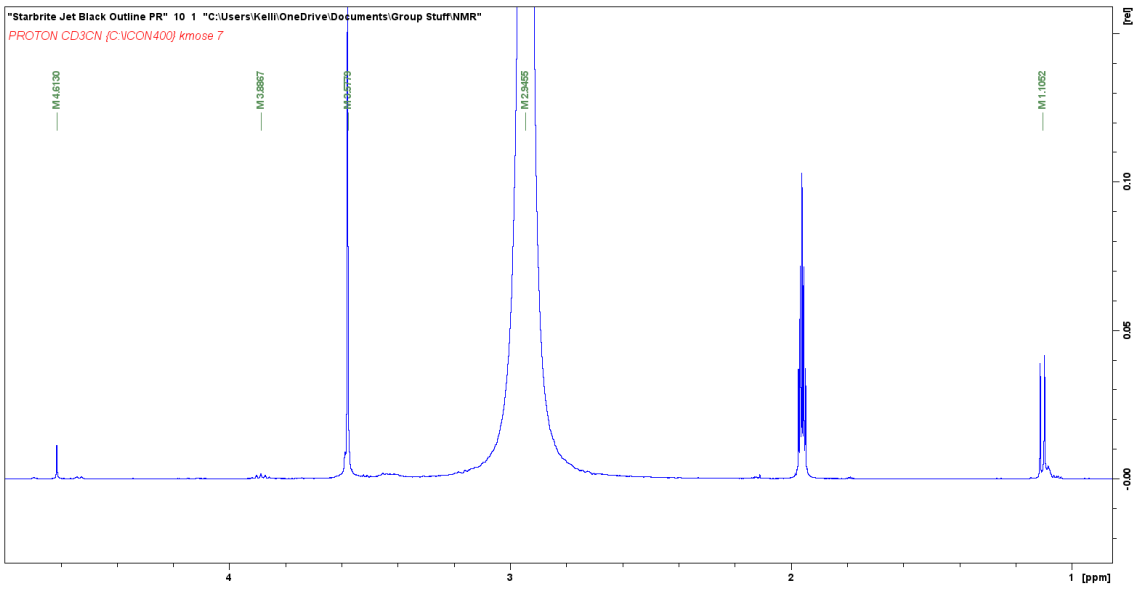

Figure S170. *^{1}H NMR spectrum of Starbrite Jet Black Outline pot residue in acetonitrile-d3*

A singlet present at δ3.5779 ppm remains unidentified. There is a doublet at δ1.1052 ppm and small multiplet at δ3.8867 ppm which is produced by a small amount of isopropanol. The singlet at δ4.6130 ppm is consistent with hexamethylenetetramine. The singlet at δ3.5779 ppm is assigned to poly(ethylene glycol).The acetonitrile solvent peak is located at δ1.94 ppm.

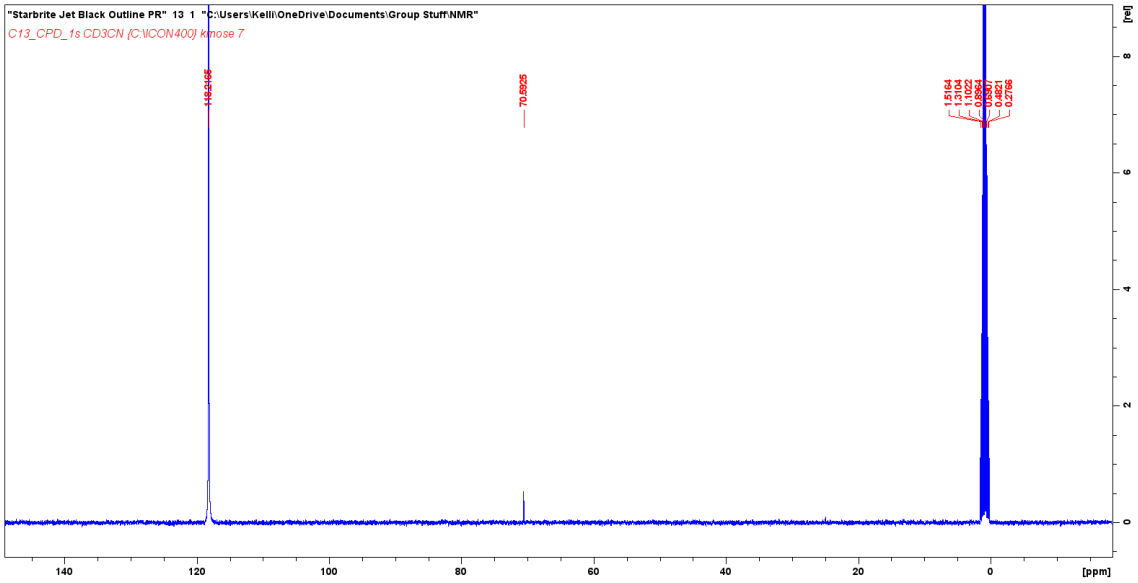

Figure S171. *^{13}C NMR spectrum of Starbrite Jet Black Outline pot residue in acetonitrile-d3*

The only peak present at δ70.5925 ppm is assigned to poly(ethylene glycol). There are no isopropanol peaks as the concentration is too low to be detected. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

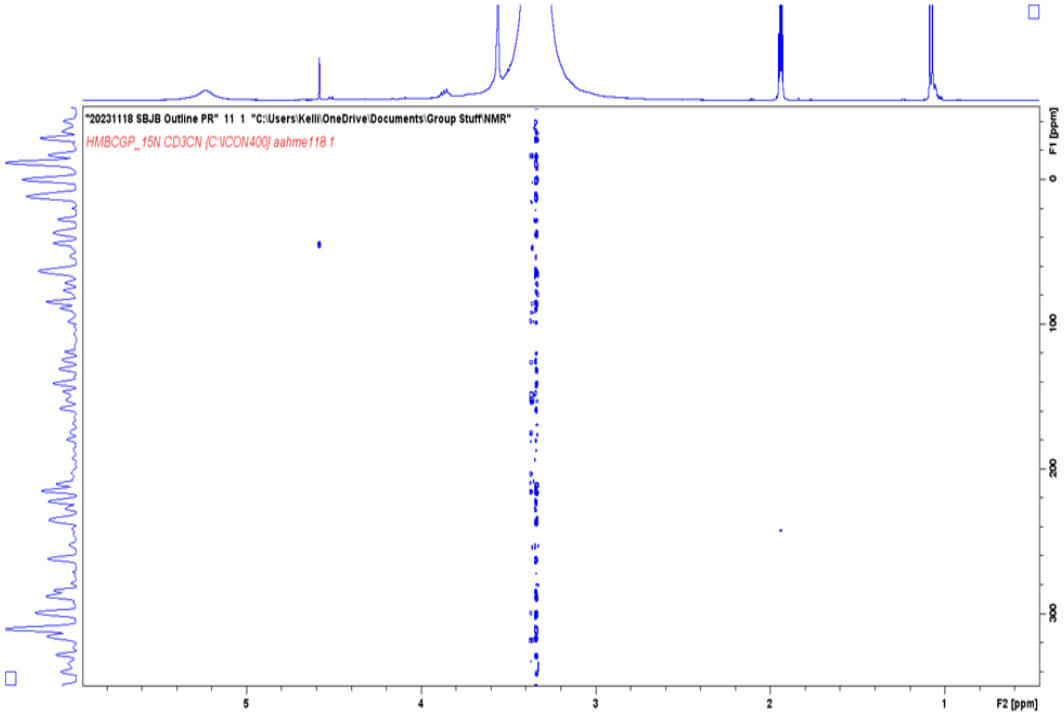

Figure S172. *^{1}H-^{15}N HBMC spectrum of Starbrite Jet Black Outline pot residue in CD_3CN*

A peak coupling between δ4.583 ppm in the ^{1}H NMR spectrum and δ44.18 ppm in the ^{15}N NMR spectrum indicates the presence of hexamethylenetetramine in this sample.

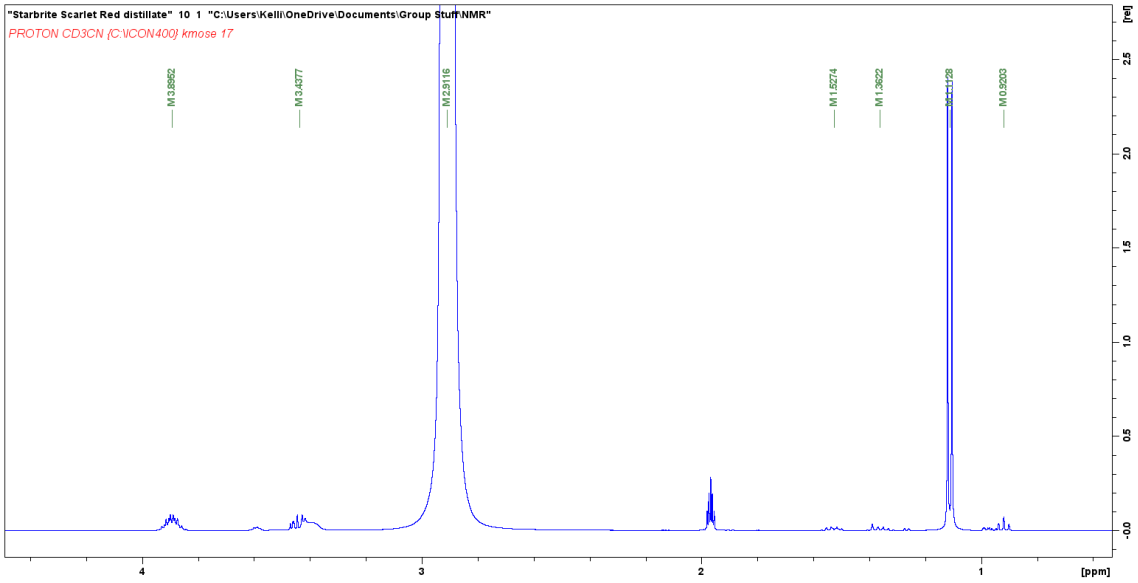

Figure S173. *^{1}H NMR spectrum of Starbrite Scarlet Red distillate in acetonitrile-d3*

The doublet at δ1.1128 ppm and multiplet at δ3.8952 ppm corresponds to isopropanol. Peaks at δ0.9203 ppm (triplet), δ1.3622 ppm (multiplet), δ1.5274 ppm (multiplet), and δ3.4377 ppm (multiplet) are produced by 1-butanol. The large peak at δ2.9116 ppm is attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

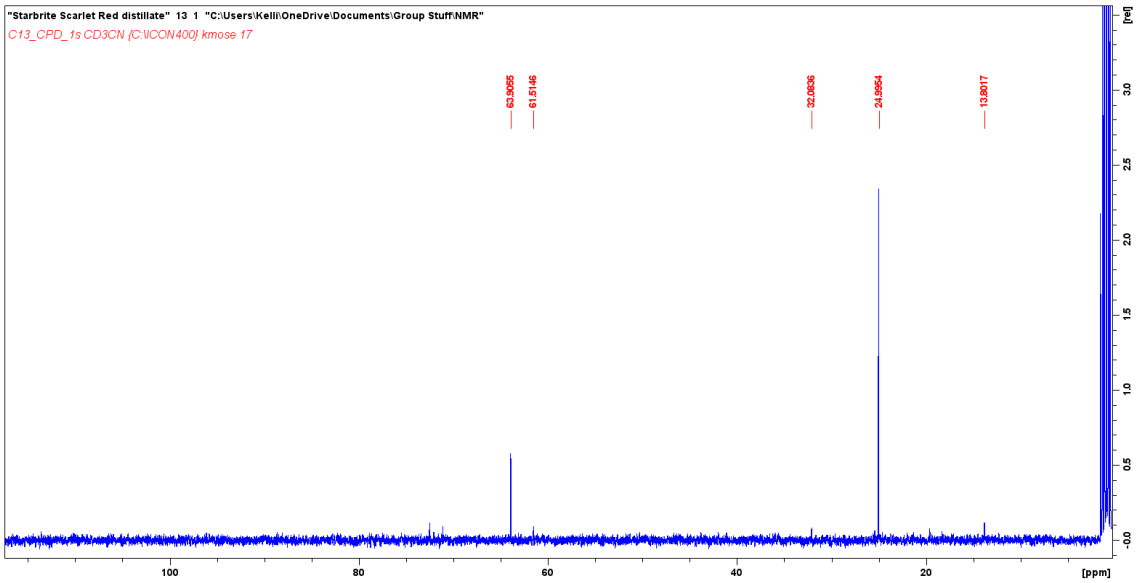

Figure S174. *^{13}C NMR spectrum of Starbrite Scarlet Red distillate in acetonitrile-d3*

Peaks for isopropanol appear at δ25.1908 ppm and δ63.9313 ppm. 1-butanol produces signals at δ13.8359 ppm, δ19.4657 ppm, δ32.1565 ppm, and δ61.4558 ppm The acetonitrile-d3 solvent peak is found around δ1 ppm.

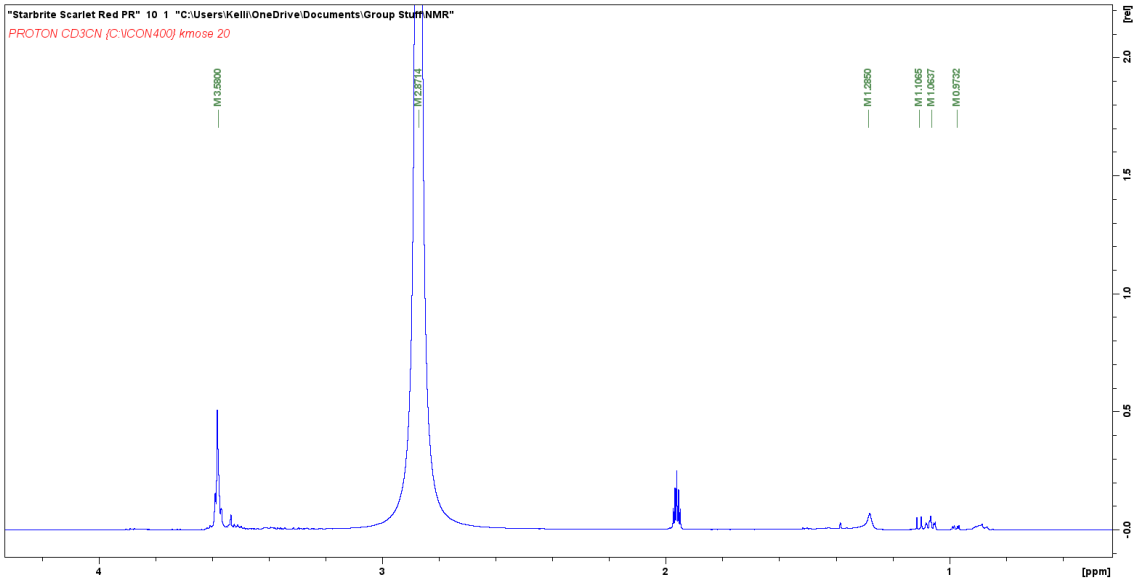

Figure S175. *^{1}H NMR spectrum of Starbrite Scarlet Red pot residue in acetonitrile-d3*

The large singlet at δ3.5900 ppm is assigned to poly(ethylene glycol). Several peaks upfield remain unassigned. There is no coupling between these peaks making them difficult to analyze. The doublet at δ1.1065 ppm may be a small signal from residual isopropanol. The peaks at δ0.9732 ppm and δ1.2850 ppm are unidentified. The acetonitrile solvent peak is located at δ1.94 ppm.

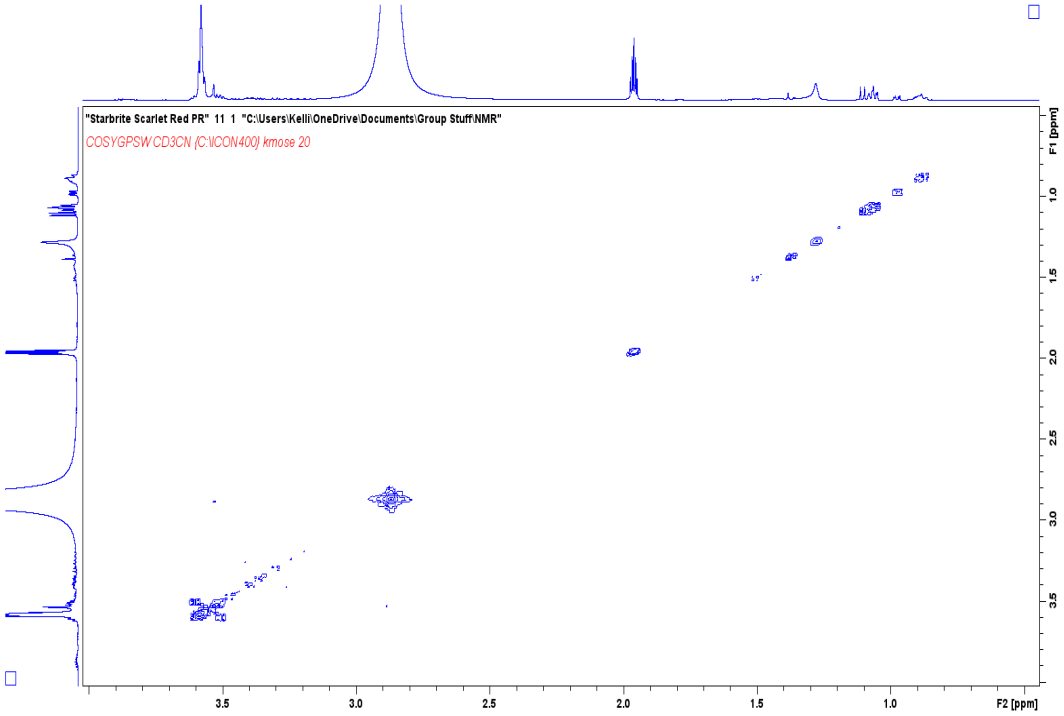

Figure S176. *^{1}H-^{1}H COSY spectrum of Starbrite Scarlet Red pot residue in acetonitrile-d3*

Peaks upfield at δ0.9732 ppm, δ1.0637 ppm, δ1.1065 ppm, and δ1.2950 ppm do not exhibit coupling with other hydrogens in the spectrum leaving them unidentified.

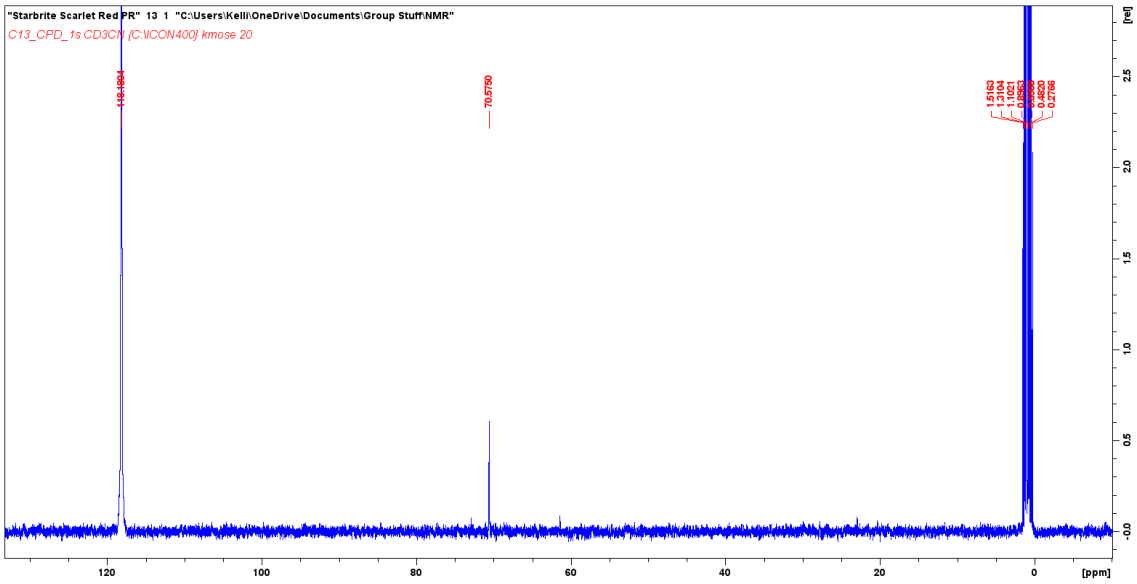

Figure S177. *^{13}C NMR spectrum of Starbrite Scarlet Red pot residue in acetonitrile-d3*

The peak at δ70.5750 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

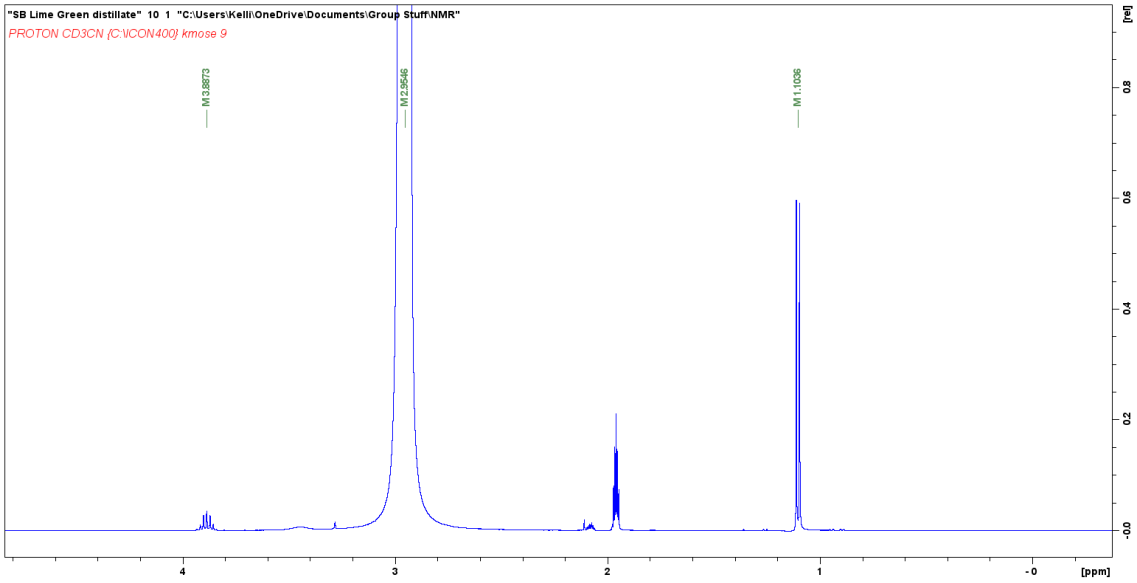

Figure S178. *^{1}H NMR spectrum of Starbrite Lime Green distillate in acetonitrile-d3*

Isopropanol produces peaks at δ1.1036 ppm (doublet) and δ3.8873 ppm (septet). There is a large water peak at δ2.9546 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

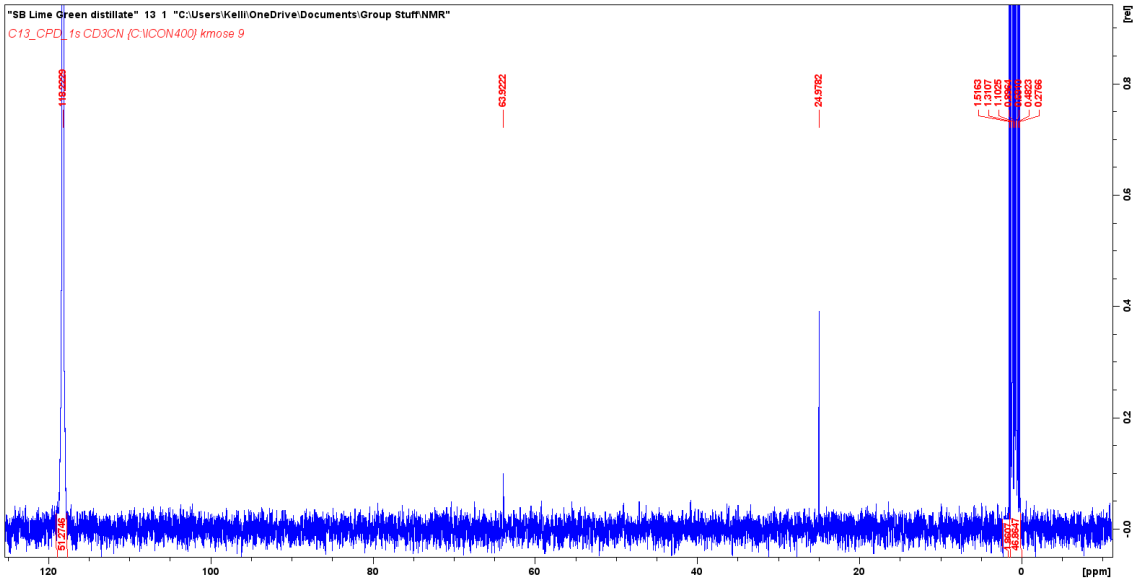

Figure S179. *^{13}C NMR spectrum of Starbrite Lime Green distillate in acetonitrile-d3*

Peaks at δ24.9782 ppm and δ63.9222 ppm are produced by isopropanol. The lack of other signals confirms that the peak at δ2.9546 in the ^{1}H NMR spectrum is water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

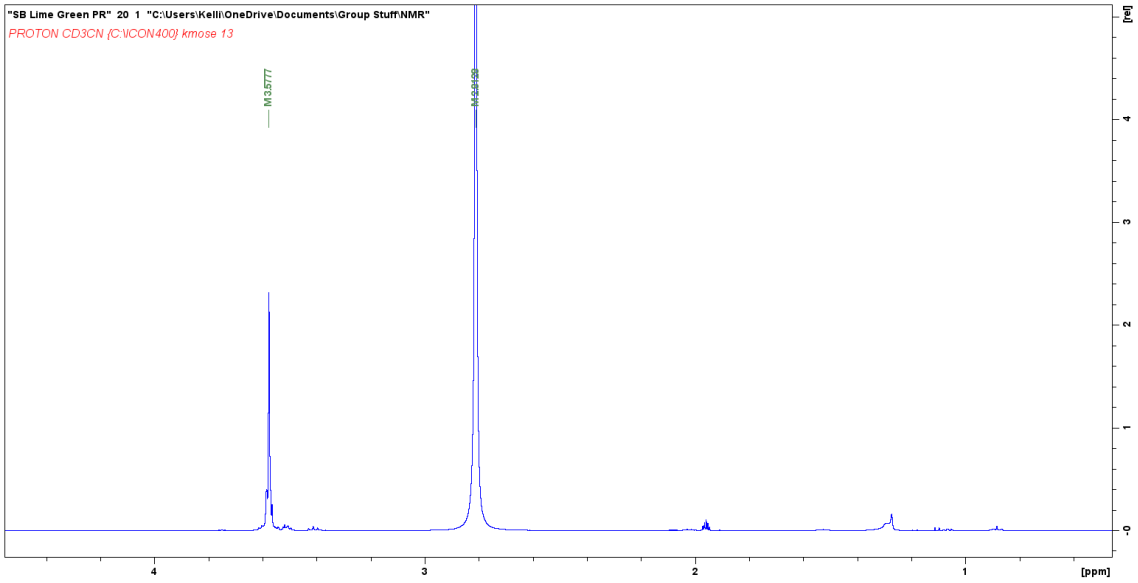

Figure S180. *^{1}H NMR spectrum of Starbrite Lime Green pot residue in acetonitrile-d3*

A peak at δ3.5777 ppm is assigned to poly(ethylene glycol). The other peak located at δ2.8128 ppm corresponds to water.

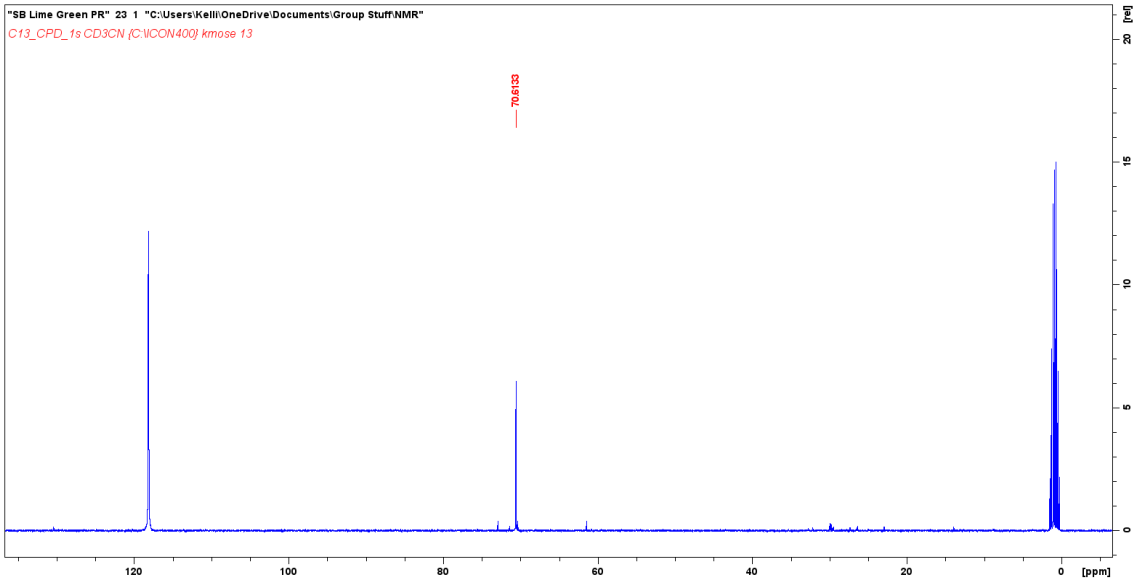

Figure S181. *^{13}C NMR spectrum of Starbrite Lime Green pot residue in acetonitrile-d3*

The peak at δ70.6133 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

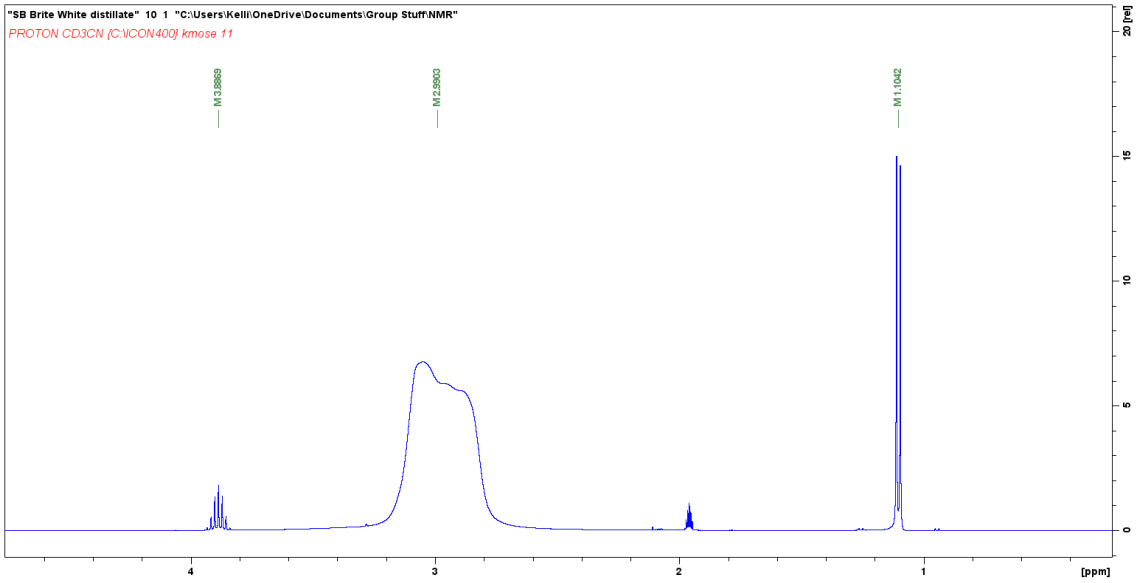

Figure S182. *^{1}H NMR spectrum of Starbrite Brite White distillate in acetonitrile-d3*

Isopropanol in the sample produced the doublet at δ1.1042 ppm and septet at δ3.8869 ppm. The peak at δ2.9903 ppm is attributed to a large amount of water. The acetonitrile solvent peak is located at δ1.94 ppm.

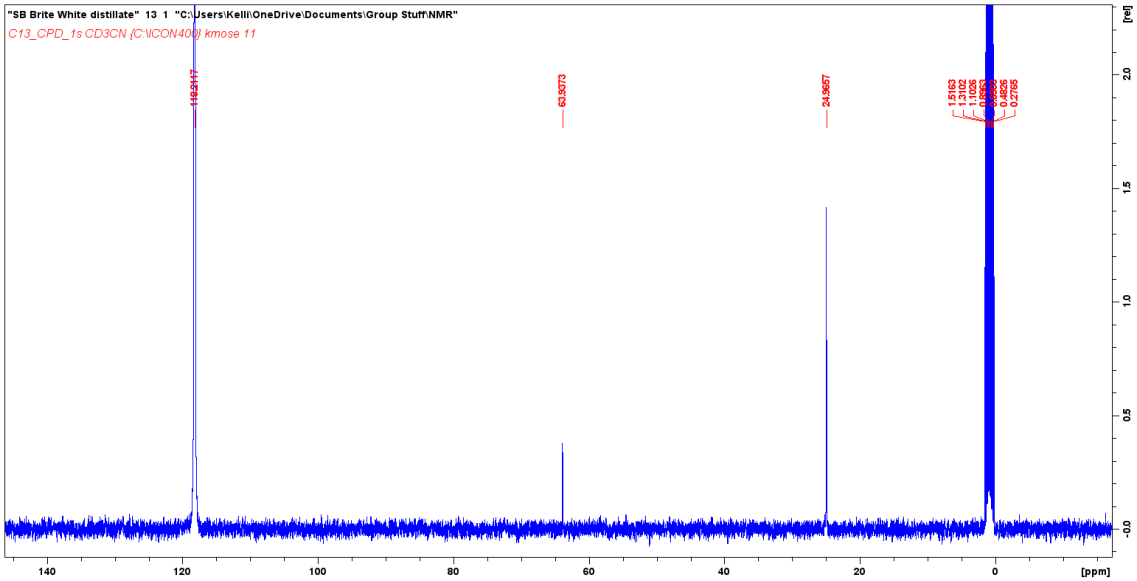

Figure S183. *^{13}C NMR spectrum of Starbrite Brite White distillate in acetonitrile-d3*

Peaks at δ24.9657 ppm and δ63.9373 ppm correspond to isopropanol. The lack of other carbon signals confirms the presence of water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

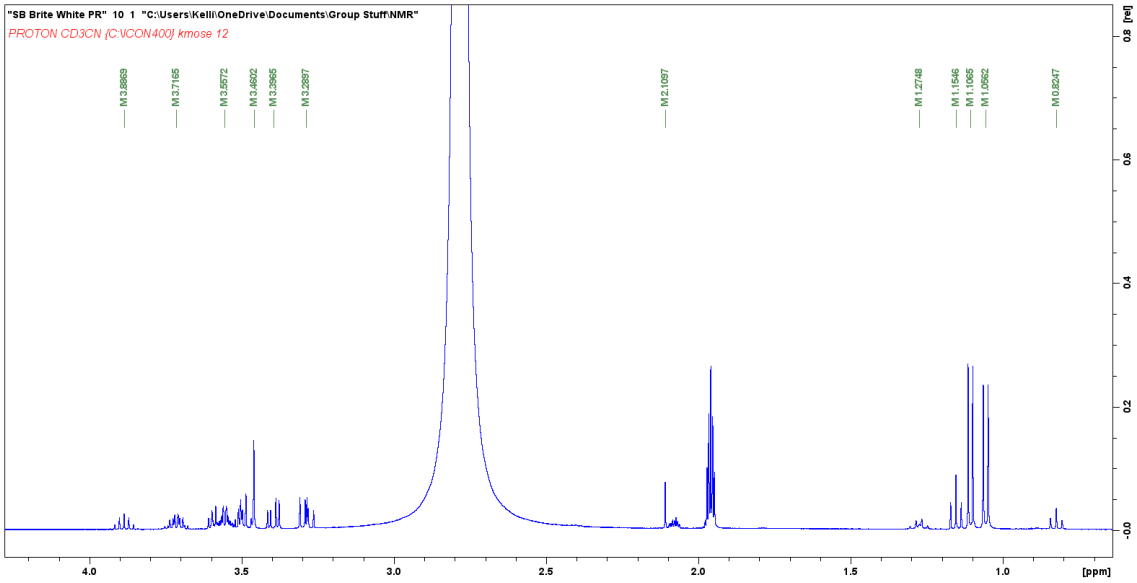

Figure S184. *^{1}H NMR spectrum of Starbrite Brite White pot residue in acetonitrile-d3*

Peaks at δ1.1064 ppm (doublet) and δ3.8866 ppm (septet) can be attributed to isopropanol. The doublet at δ1.0561 ppm, and multiplets at δ3.2888 ppm, δ3.3973 ppm and δ3.7145 ppm all likely correspond to propylene glycol. Peak at δ0.8247 ppm, δ1.2765 ppm, δ1.1545 ppm, δ2.1097 ppm, δ3.5572 ppm, and δ3.4606 ppm are unidentified. The acetonitrile solvent peak is located at δ1.94 ppm.

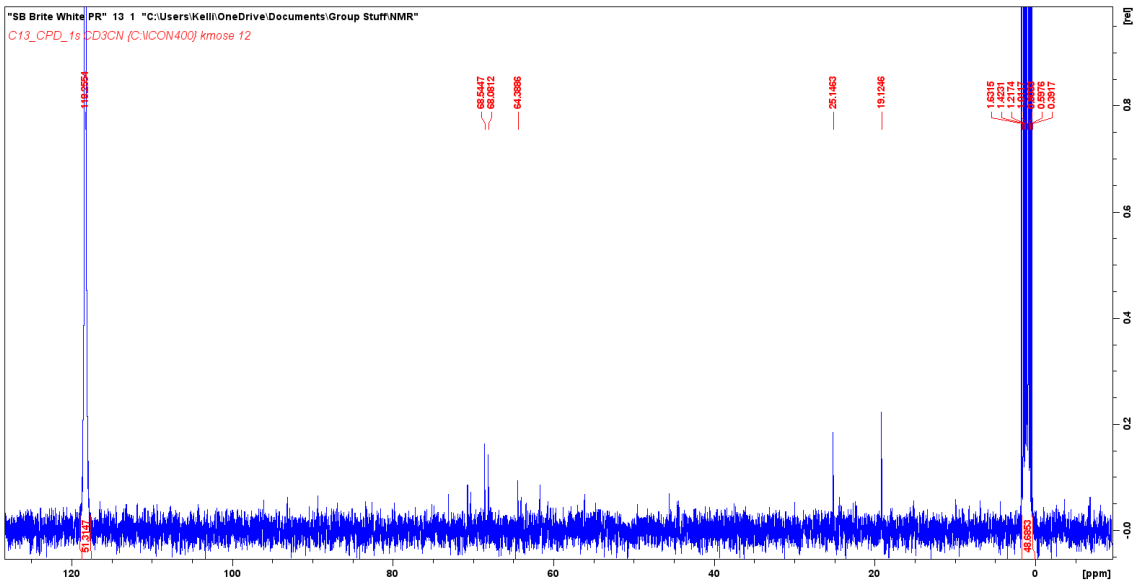

Figure S185. *^{13}C NMR spectrum of Starbrite Brite White pot residue in acetonitrile-d3*

Peaks at δ25.0310 ppm and δ64.2732 ppm are produced by isopropanol while peaks at δ19.0092 ppm, δ67.9659 ppm, and δ68.4294 ppm are consistent with propylene glycol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

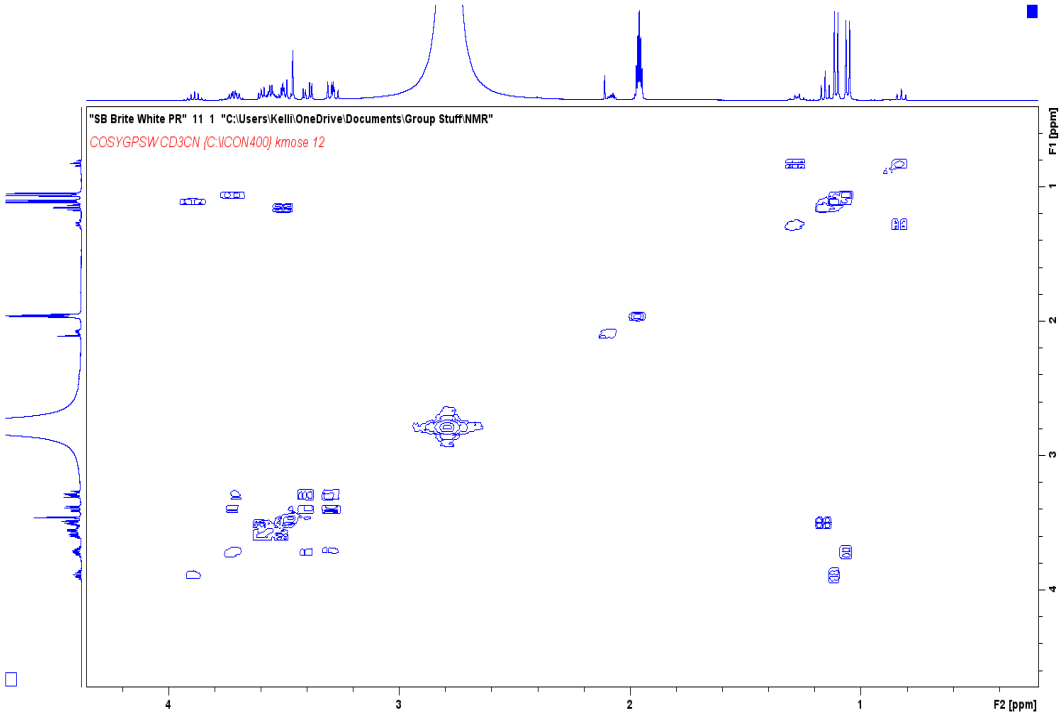

Figure S186. *^{1}H-^{1}H COSY NMR spectrum of Starbrite Brite White pot residue in acetonitrile-d3*

Coupling occurs between peaks at δ1.0561 ppm, δ3.2888 ppm, δ3.3973 ppm and δ3.7145 ppm which supports the presence of propylene glycol. Peaks at δ1.1064 ppm and δ3.8866 ppm also interact, confirming the presence of isopropanol. Coupling also occurs between peaks at δ0.8247 ppm and δ1.2765 ppm, as well at peaks at δ1.1545 ppm and a peak around δ3.497 ppm. These two components are unidentified.

6.2 Raman Data

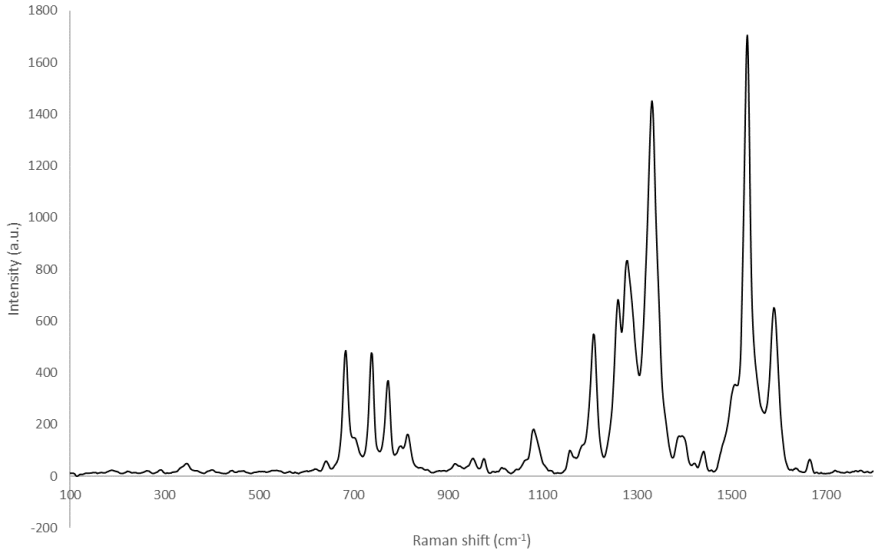

Figure S187. *Raman spectrum of Starbrite Lime Green*

Parameters used to obtain this spectrum are as follows: 785 nm, 200mW, 5 second integration, 2 average, 1 boxcar, auto-baseline on. Major peaks at 1590 cm^{-1}, 1534 cm^{-1}, 1332 cm^{-1}, 1280 cm^{-1}, 1260 cm^{-1}, 1210 cm^{-1}, 774 cm^{-1}, 740 cm^{-1}, and 684 cm^{-1} match the spectrum of Pigment Green from the SOPRANO Raman spectra database.[1]

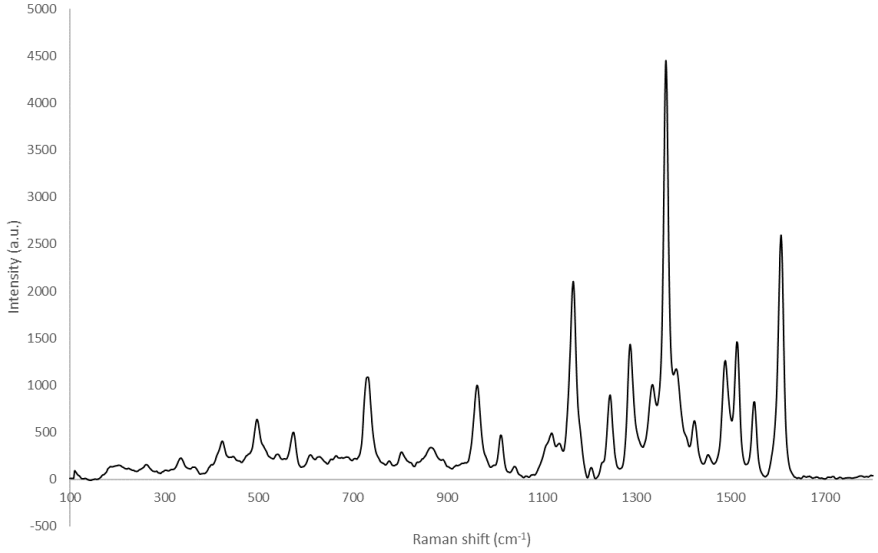

Figure S188. *Raman spectrum of Starbrite Scarlet Red*

Parameters used to obtain this spectrum are as follows: 785 nm, 200mW, 5 second integration, 2 average, 1 boxcar, auto-baseline on. Major peaks at 1606 cm^{-1}, 1512 cm^{-1}, 1488 cm^{-1}, 1362 cm^{-1}, 1288 cm^{-1}, 1246 cm^{-1}, 1166 cm^{-1}, 964 cm^{-1}, and 730 cm^{-1} correspond to Pigment Red 170 from the SOPRANO Raman spectra database.[1]

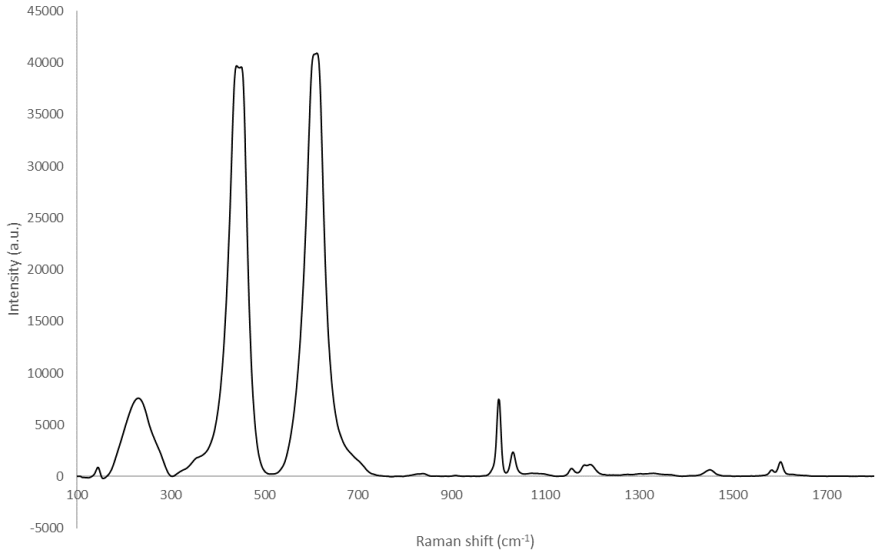

Figure S189. *Raman spectrum of Starbrite Brite White*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 5 second integration, 2 average, 1 boxcar, auto-baseline on. Major peaks at 612 cm^{-1}, 448 cm^{-1}, and 236 cm^{-1} are made by Pigment White 6 (TiO_2). A small peak at 1000 cm^{-1} could potentially be from a small amount of $BaSO_4$ (see section 10).

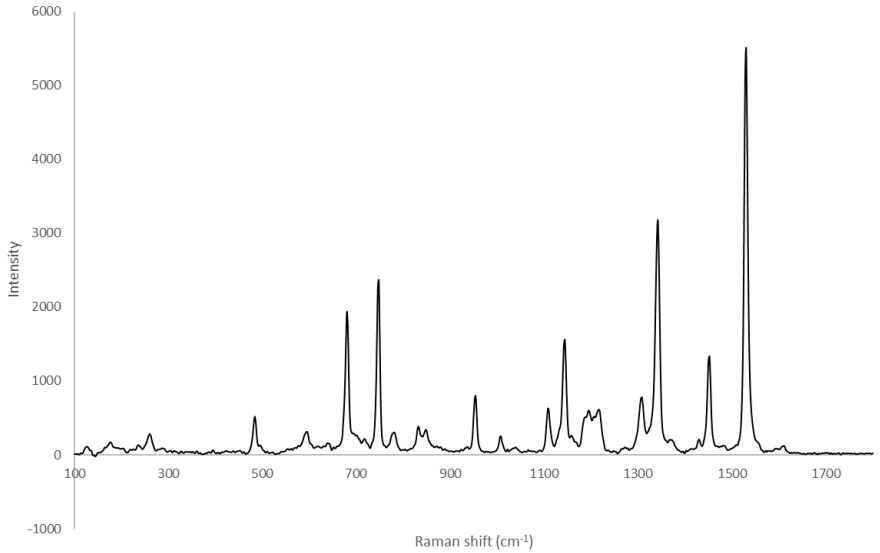

Figure S190. *Raman spectrum of Starbrite Country Blue*

Parameters used to obtain this spectrum are as follows: 785 nm, 175 mW, 5 second integration, 1 average, 0 boxcar, auto-baseline on. Peaks at 1530 cm^{-1}, 1452 cm^{-1}, 1342 cm^{-1}, 1308 cm^{-1}, 1144 cm^{-1}, 954 cm^{-1}, 748 cm^{-1}, and 680 cm^{-1} match the spectrum of Pigment Blue 15 from the SOPRANO Raman spectra database.[1]

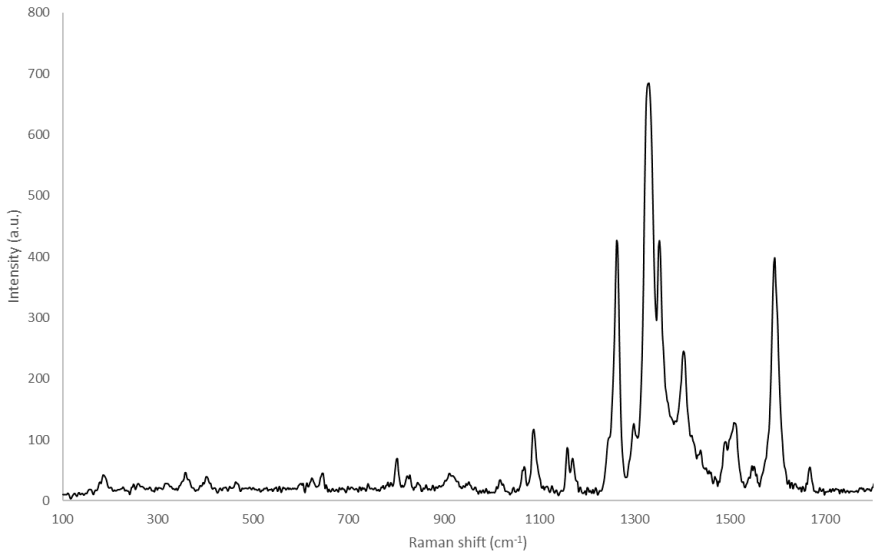

Figure S191. *Raman spectrum of Starbrite Canary Yellow*

Parameters used to obtain this spectrum are as follows: 785 nm, 150 mW, 10 second integration, 1 average, 0 boxcar, auto-baseline on. Peaks at 1592 cm^{-1}, 1512 cm^{-1}, 1404 cm^{-1}, 1352 cm^{-1}, 1328 cm^{-1}, 1264 cm^{-1}, and 1088 cm^{-1} match the Raman spectrum of Pigment Yellow 74 from the SOPRANO Raman spectra database. [1]

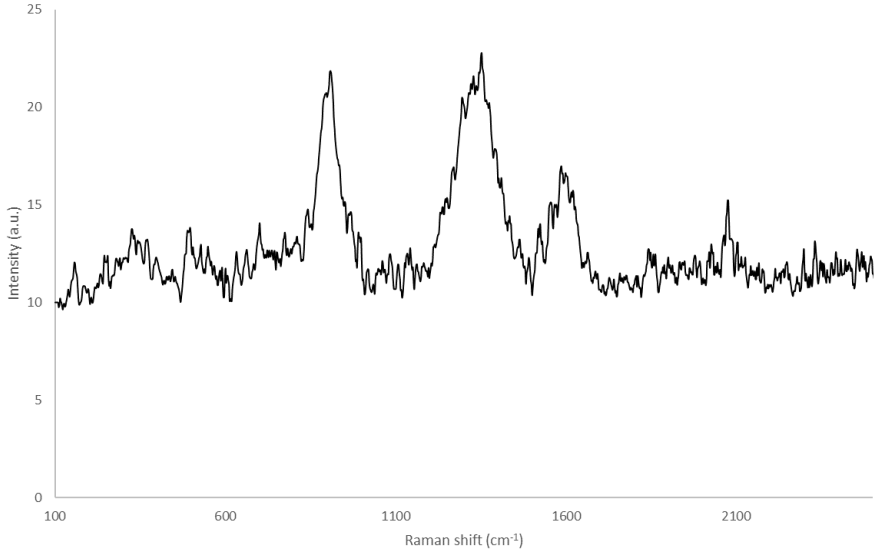

Figure S192. *Raman spectrum of Starbrite Jet Black Outline*

Parameters used to obtain this spectrum are as follows: 785 nm, 150 mW, 10 second integration, 3 average, 2 boxcar, auto-baseline on. Major peaks at 1598 cm^{-1}, 1350 cm^{-1}, and 914 cm^{-1} correspond to the Raman spectrum of carbon black (see section 10).

6.3 XRF Data

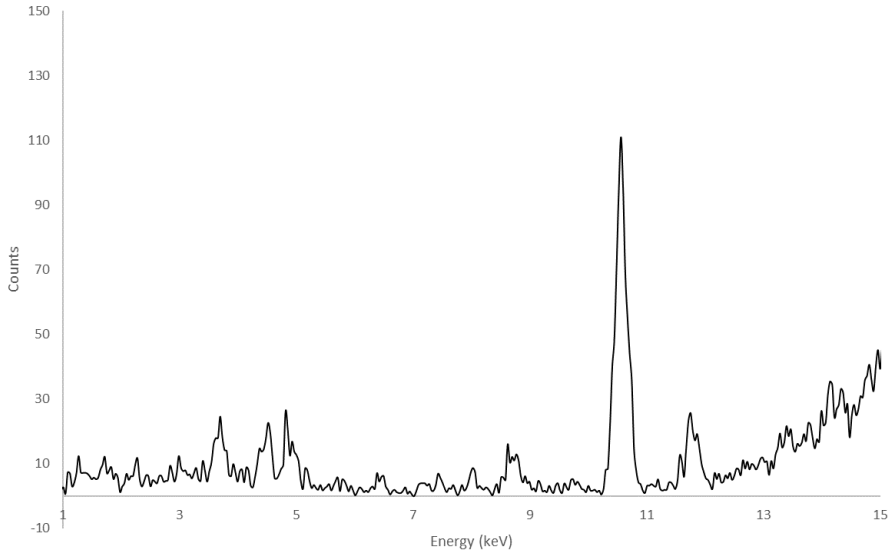

Figure S193. *X-ray fluorescence spectrum of Starbrite Canary Yellow*

A small peak pair appears at 4.51 keV and 4.93 keV which could be attributed to titanium, though it cannot be confirmed due to the low intensity. A peak pair at 10.56 keV and 11.75 keV is attributed to arsenic present in the glass microscope slide that the sample is on.

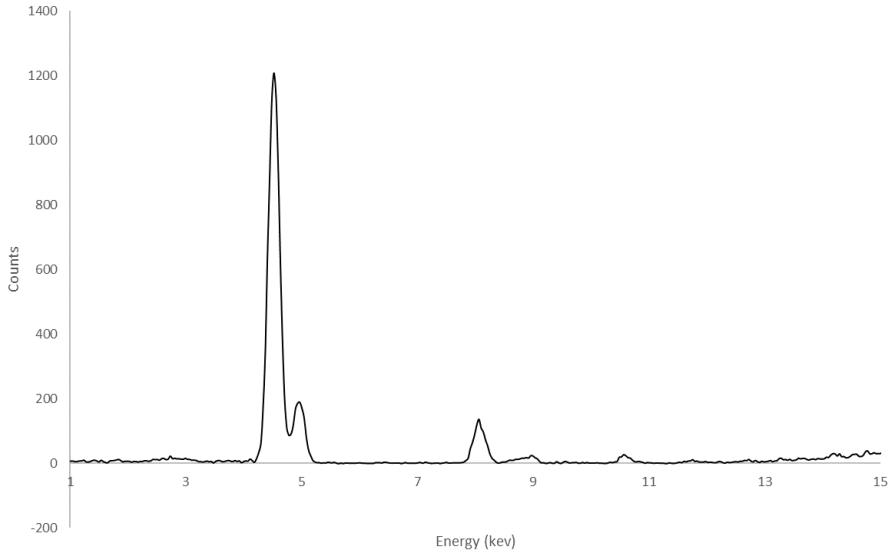

Figure S194. *X-ray fluorescence spectrum of Starbrite Country Blue*

Major peak pairs at 4.52 keV and 4.96 keV, and 8.06 keV and 8.95 keV can be attributed to titanium and copper, respectively.

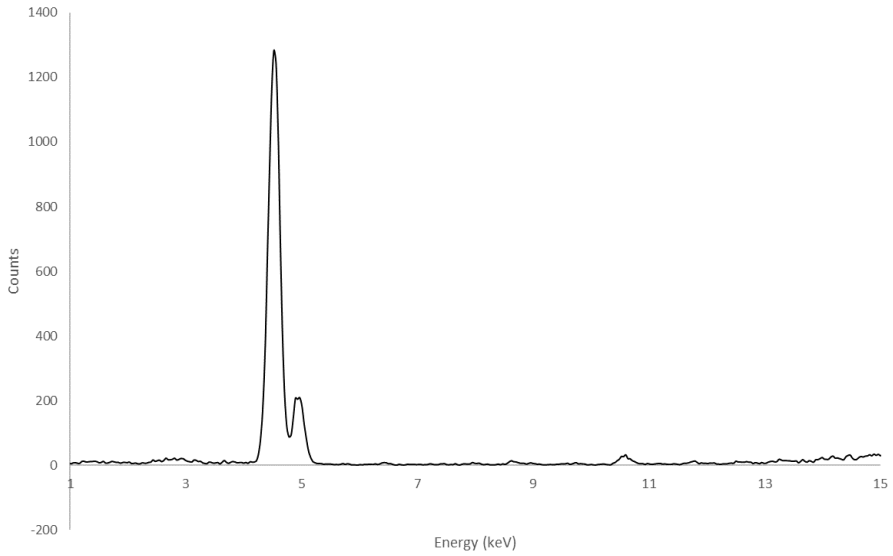

Figure S195. *X-ray fluorescence spectrum of Starbrite Brite White*

A peak pair appearing at 4.52 keV and 4.96 keV corresponds to the $K\alpha_1$ and $K\beta_1$ lines of titanium. This confirms the presence of Pigment White 6 (TiO_2) in the sample.

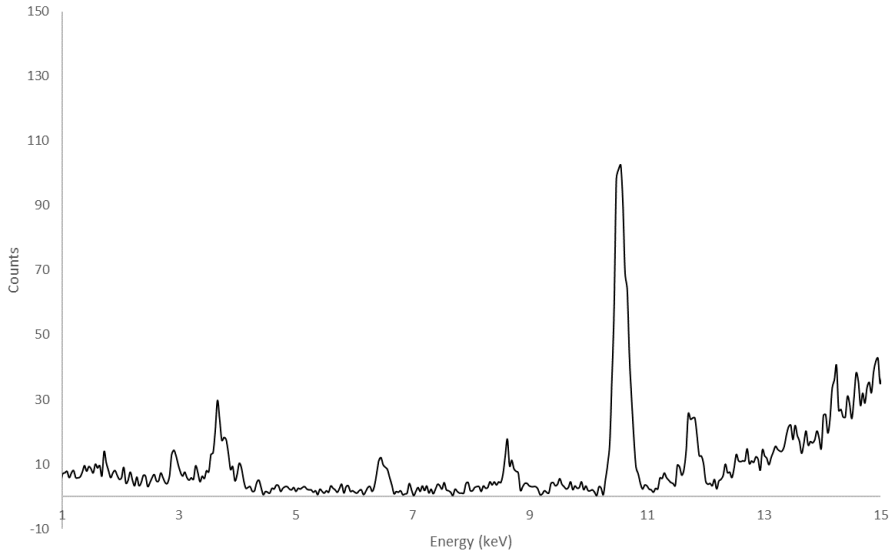

Figure S196. *X-ray fluorescence spectrum of Starbrite Scarlet Red*

A peak pair at 10.56 keV and 11.83 keV corresponds to the $K\alpha_1$ and $K\beta_1$ lines of the arsenic that is present in the glass microscope slide used to dry the sample on.

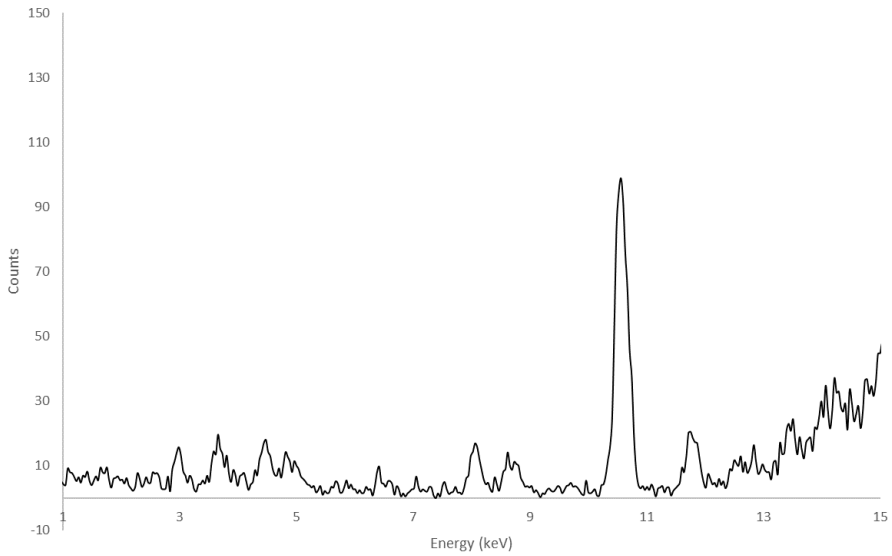

Figure S197. *X-ray fluorescence spectrum of Starbrite Lime Green*

Signals at 4.48 keV and 4.85 keV, though small, can be attributed to the $K\alpha_1$ and $K\beta_1$ lines of titanium. Peaks at 8.10 keV and 8.62 keV correspond to the $K\alpha_1$ and $K\beta_1$ lines of copper. Small signals at 2.99 keV and 3.69 keV do not correlate to any known $K\alpha_1$ and $K\beta_1$ lines. Lastly, peaks at 10.56 keV and 11.75 keV are produced by the $K\alpha_1$ and $K\beta_1$ lines of arsenic in the glass microscope slide used to dry the sample on.

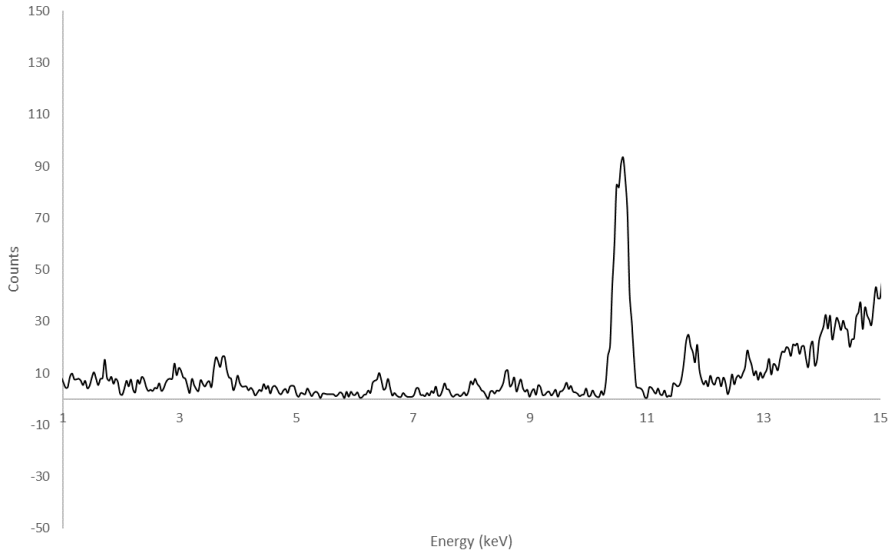

Figure S198. *X-ray fluorescence spectrum of Starbrite Jet Black Outline*

Major peaks at 10.60 keV and 11.72 keV are attributed to the $K\alpha_1$ and $K\beta_1$ lines of arsenic that is present in the glass microscope slides used to dry the sample on.

7. Millennium

7.1 NMR

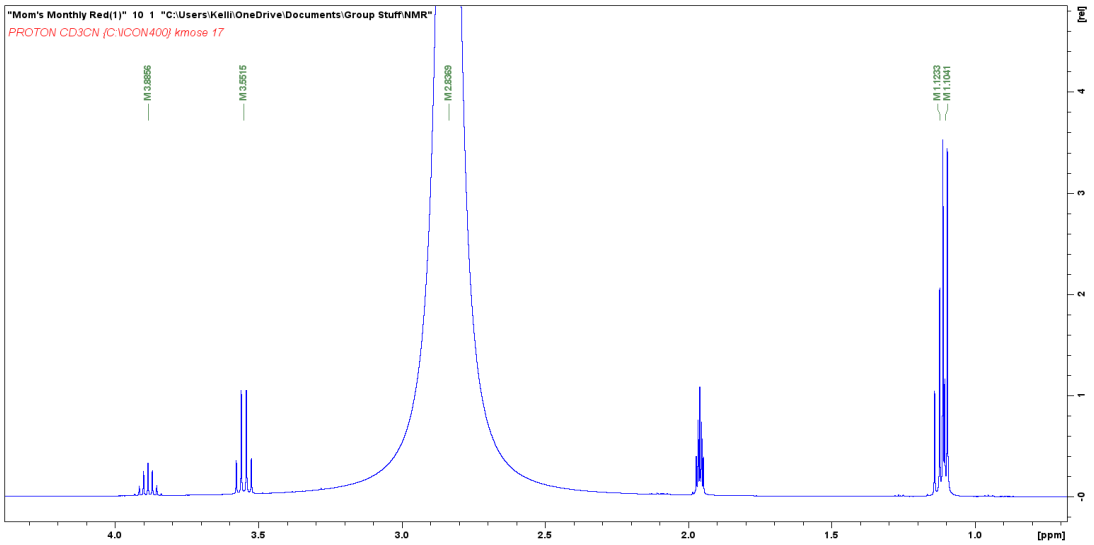

Figure S199. *^{1}H NMR of Millennium Mom's Monthly Red distillate in acetonitrile-d3*

A doublet at δ1.1041 ppm and septet at δ3.8856 ppm is attributed to isopropanol. Ethanol produces a triplet at δ1.1233 ppm and a quartet at δ3.5515 ppm. Due to overlapping signals upfield, J-couple constants (6.10 Hz for isopropanol and 7.00 Hz for ethanol) were used to confirm the presence of two different molecules. Water produces a large, broad singlet at δ2.8369 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

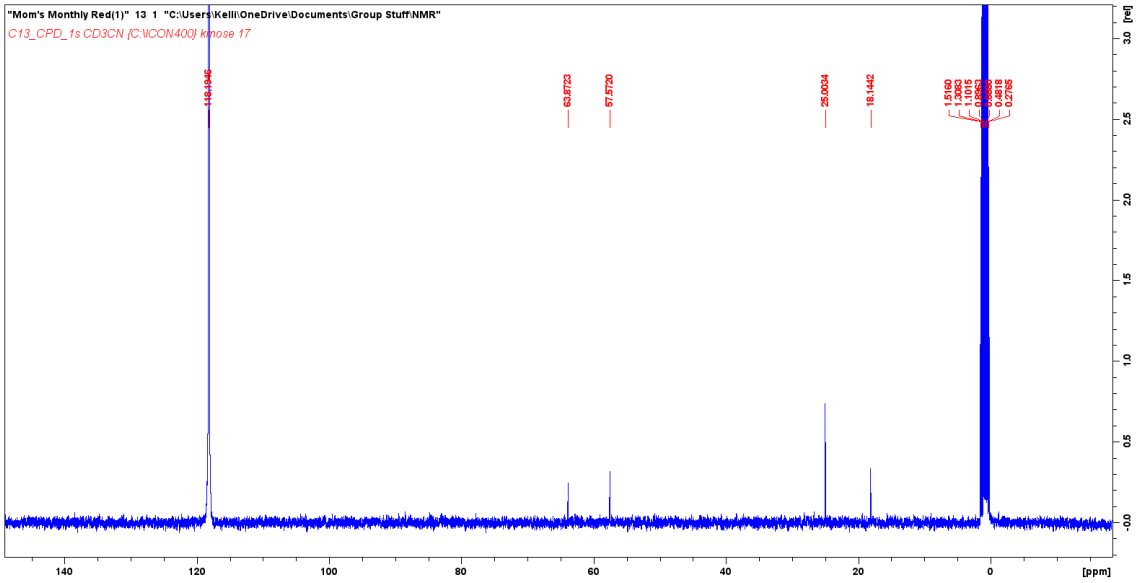

Figure S200. *^{13}C NMR of Millennium Mom's Monthly Red distillate in acetonitrile-d3*

Ethanol produces signals at δ18.1442 ppm and δ57.5720 ppm while isopropanol produces signals at δ25.0034 ppm and δ63.8723 ppm. The lack of other carbon peaks indicates that the large, broad peak in the H^1 NMR spectrum is water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

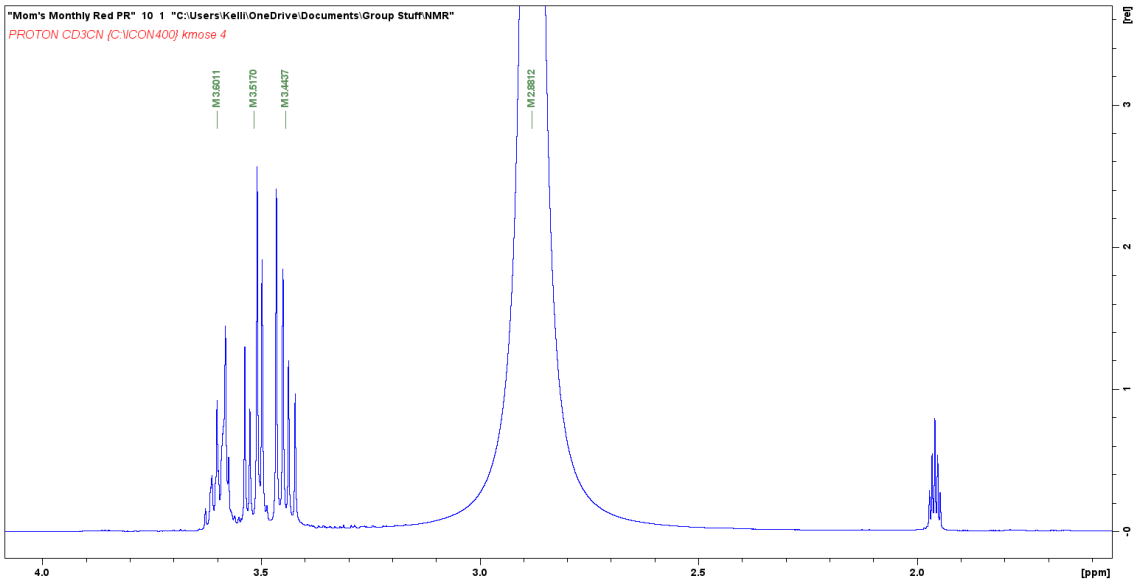

Figure S201. *^{1}H NMR of Millennium Mom's Monthly Red pot residue in acetonitrile-d3*

Glycerol produces multiplets at δ3.4437 ppm, δ3.5170 ppm, and δ3.6011 ppm. There is an overlapping singlet at δ3.5824 ppm is assigned to poly(ethylene glycol). The acetonitrile solvent peak is located at δ1.94 ppm.

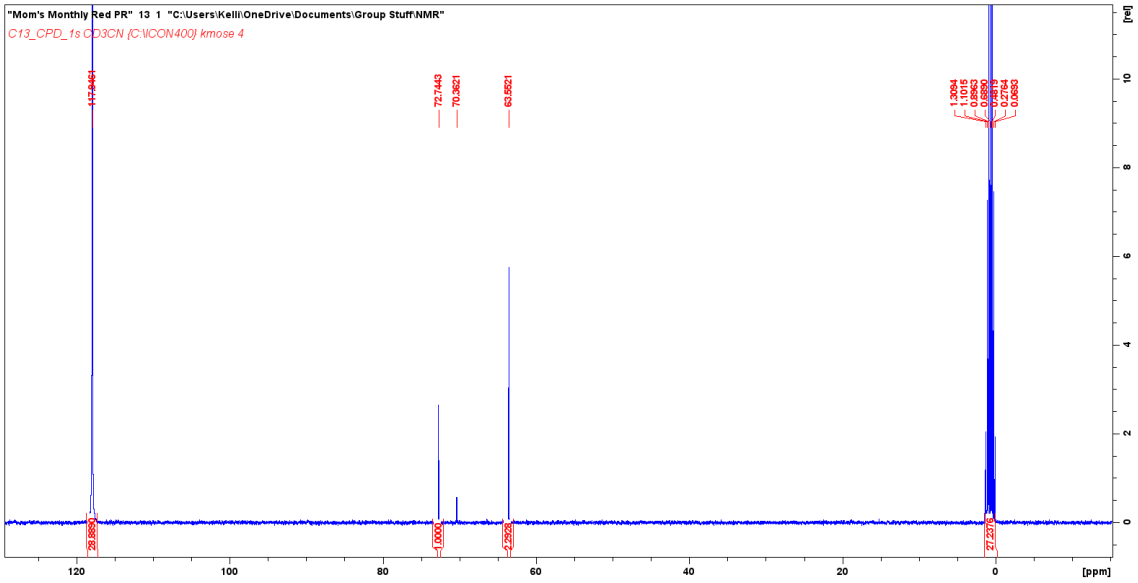

Figure S202. *^{13}C NMR of Millennium Mom's Monthly Red pot residue in acetonitrile-d3*

Glycerol produces signals at δ63.5521 ppm and δ72.7443 ppm. The signal at δ70.3621 ppm is assigned to poly(ethylene glycol).. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

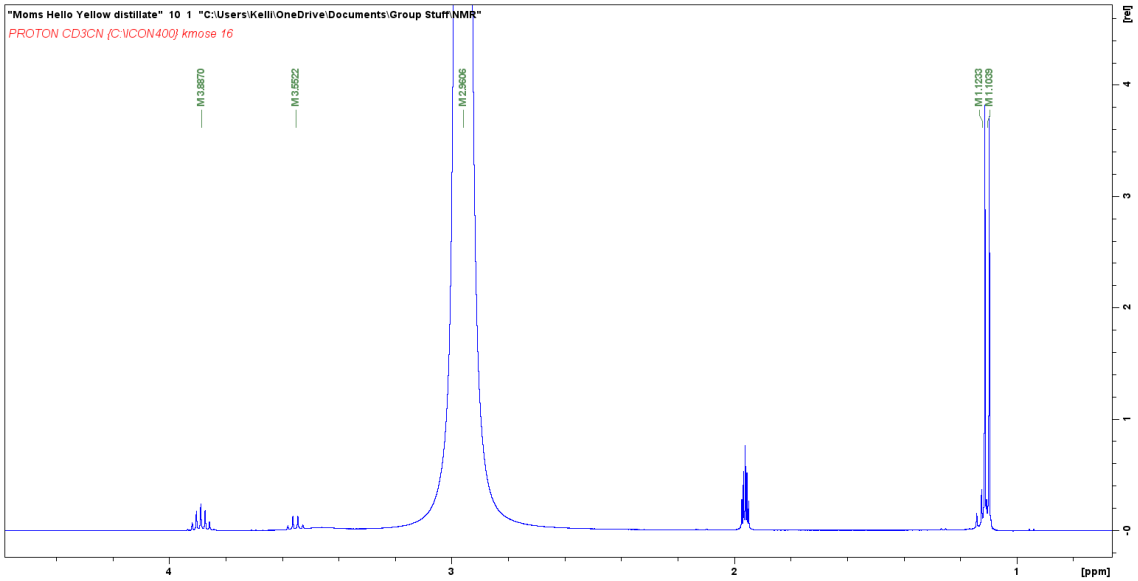

Figure S203. *^{1}H NMR of Mom's Millennium Hello Yellow distillate in acetonitrile-d3*

A doublet at δ1.1039 ppm and septet at δ3.8870 ppm is attributed to isopropanol. Ethanol produces a triplet at δ1.1233 ppm and a quartet at δ3.5522 ppm. Due to overlapping signals up field, J-couple constants (6.10 Hz for isopropanol and 7.00 Hz for ethanol) were used to confirm the presence of two different molecules. Water produces a large, broad singlet at δ2.9606 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

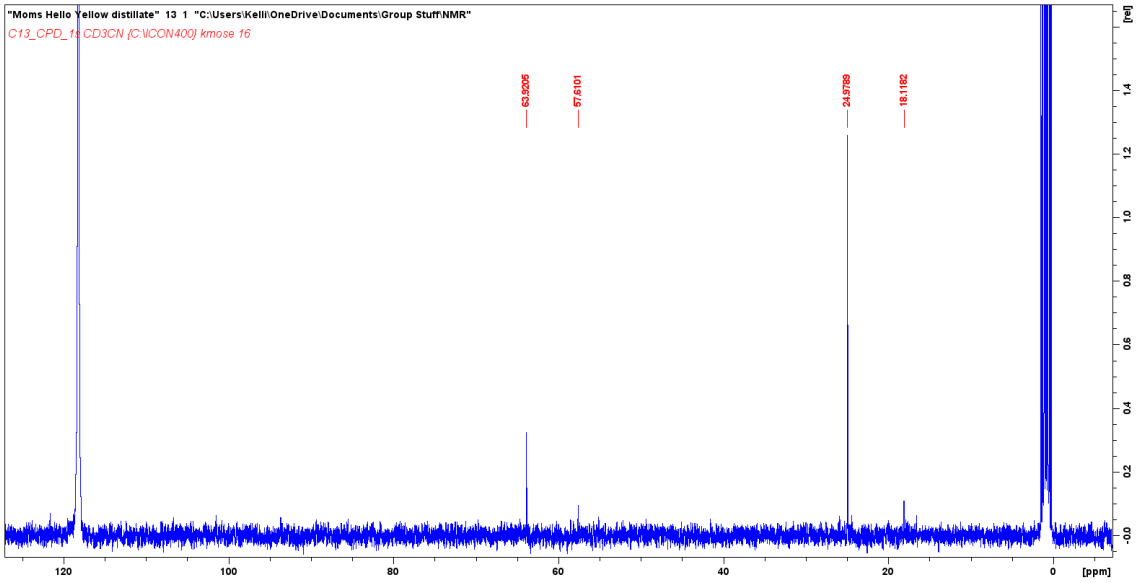

Figure S204. *^{13}C NMR of Mom's Millennium Hello Yellow distillate in acetonitrile-d3*

Isopropanol produces the signals at δ24.9789 ppm and δ63.9205 ppm. Ethanol produces signals at δ18.1182 ppm and δ57.6101 ppm. The absence of other signals confirms that the ^{1}H NMR signal at δ2.9606 ppm is produced by water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

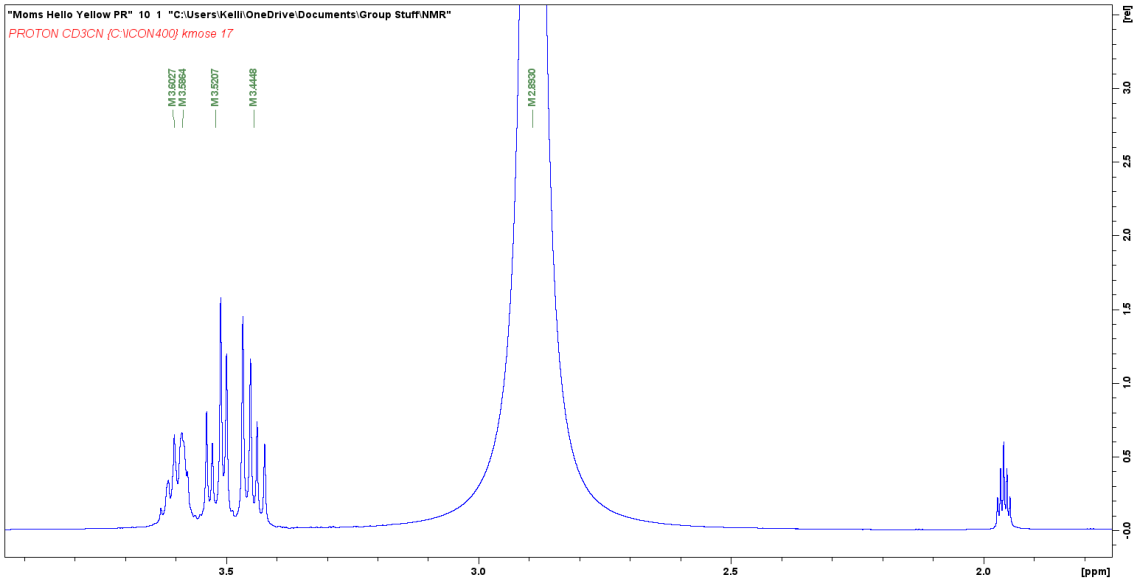

Figure S205. *^{1}H NMR of Mom's Millennium Hello Yellow pot residue in acetonitrile-d3*

Glycerol produces multiplets at δ3.4448 ppm, δ3.5207 ppm, and δ3.6027 ppm. The singlet at δ3.5864 ppm is assigned to poly(ethylene glycol). Water produces a large, broad singlet at δ2.8930 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

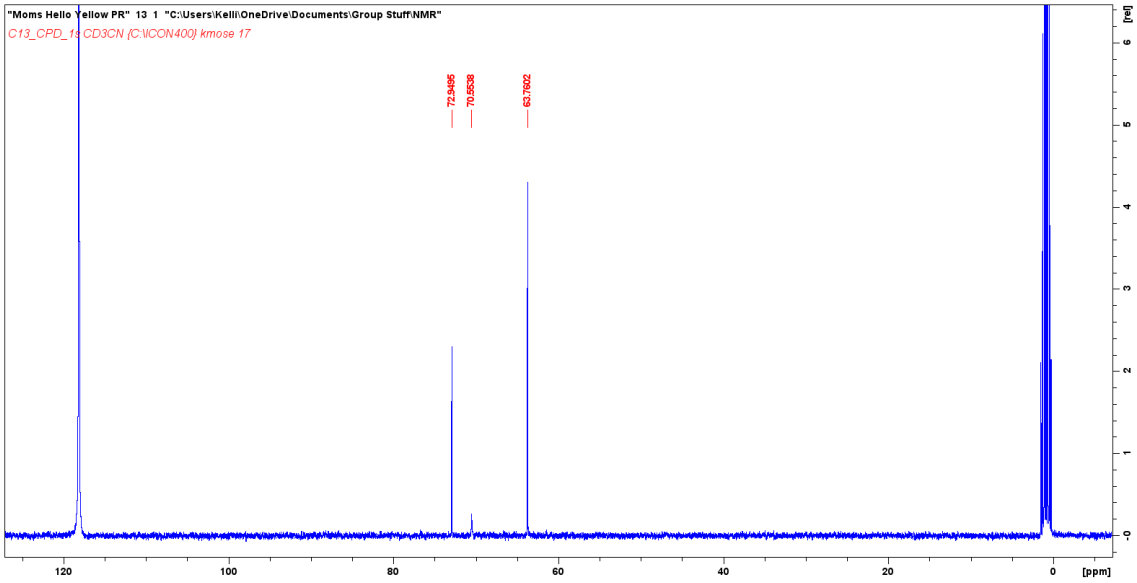

Figure S206. *^{13}C NMR of Mom's Millennium Hello Yellow pot residue in acetonitrile-d3*

Peaks at δ63.7602 ppm and δ72.9495 ppm are produced by glycerol. The peak at δ70.5538 is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

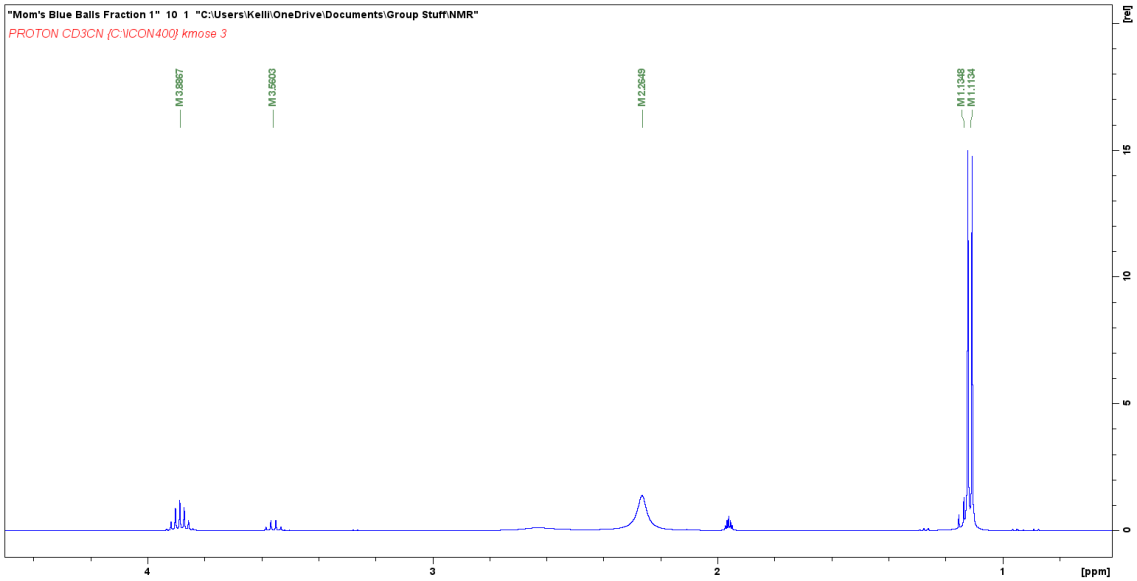

Figure S207. *^{1}H NMR of Mom's Millennium Blue Balls distillate in acetonitrile-d3*

Isopropanol produces a doublet at δ1.1134 ppm and a septet at δ3.8867 ppm. Ethanol produces a triplet at δ1.1348 ppm and a quartet at δ3.5603 ppm. Due to overlapping signals upfield, J-couple constants (6.10 Hz for isopropanol and 7.00 Hz for ethanol) were used to confirm the presence of two different components. A broad singlet at δ2.2649 ppm is attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

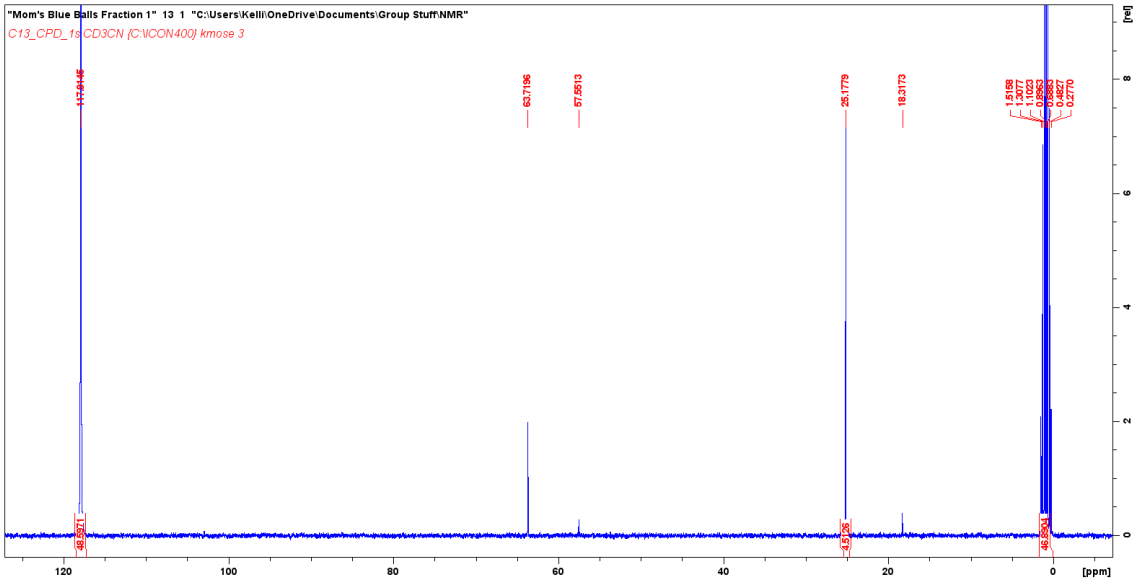

Figure S208. *^{13}C NMR of Mom's Millennium Blue Balls distillate in acetonitrile-d3*

Ethanol produces signals at δ18.3173 ppm and δ57.5513 ppm. Isopropanol produces signals at δ25.1779 ppm and δ63.7196 ppm. The absence of other carbon signals indicates that the ^{1}H NMR peak at δ2.2649 ppm is water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

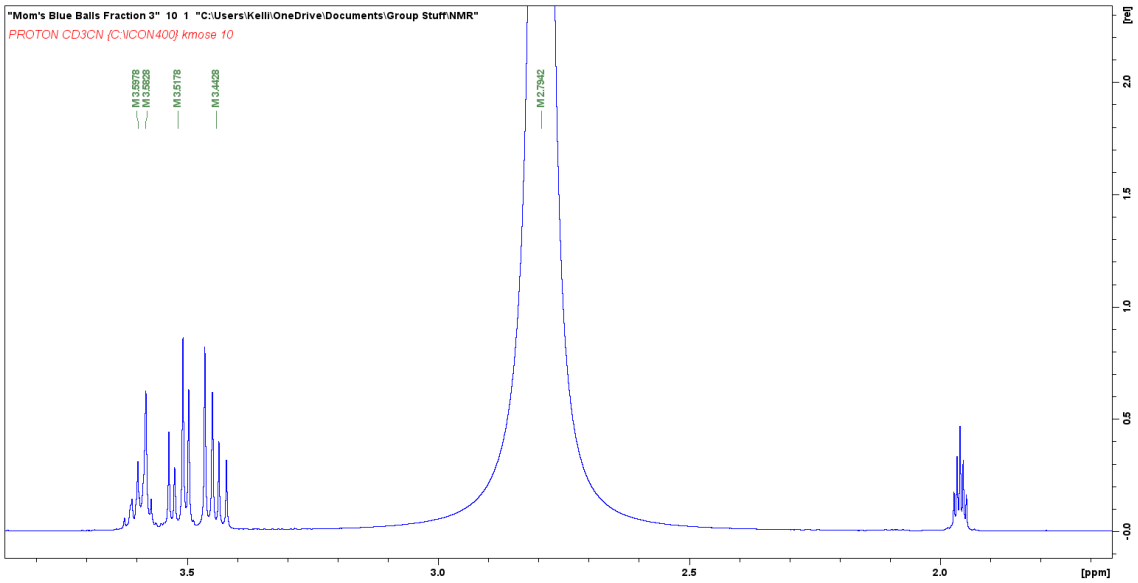

Figure S209. *^{1}H NMR of Mom's Millennium Blue Balls pot residue in acetonitrile-d3*

Glycerol produces multiplets at δ3.4428 ppm, δ3.5178 ppm, and δ3.5978 ppm. The singlet appears at δ3.5828 ppm is assigned to poly(ethylene glycol). A large, broad singlet at δ2.7942 ppm is produced by water. The acetonitrile solvent peak is located at δ1.94 ppm.

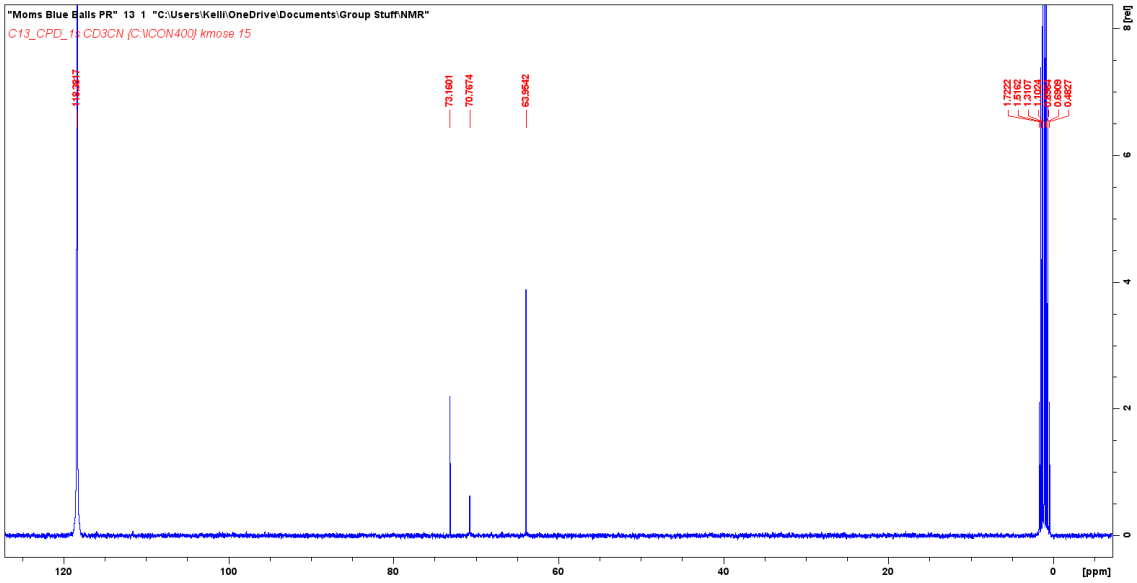

Figure S210. *^{13}C NMR of Mom's Millennium Blue Balls pot residue in acetonitrile-d3*

Peaks at δ63.7755 ppm and δ72.9429 ppm are produced by glycerol. The small peak at δ70.5855 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

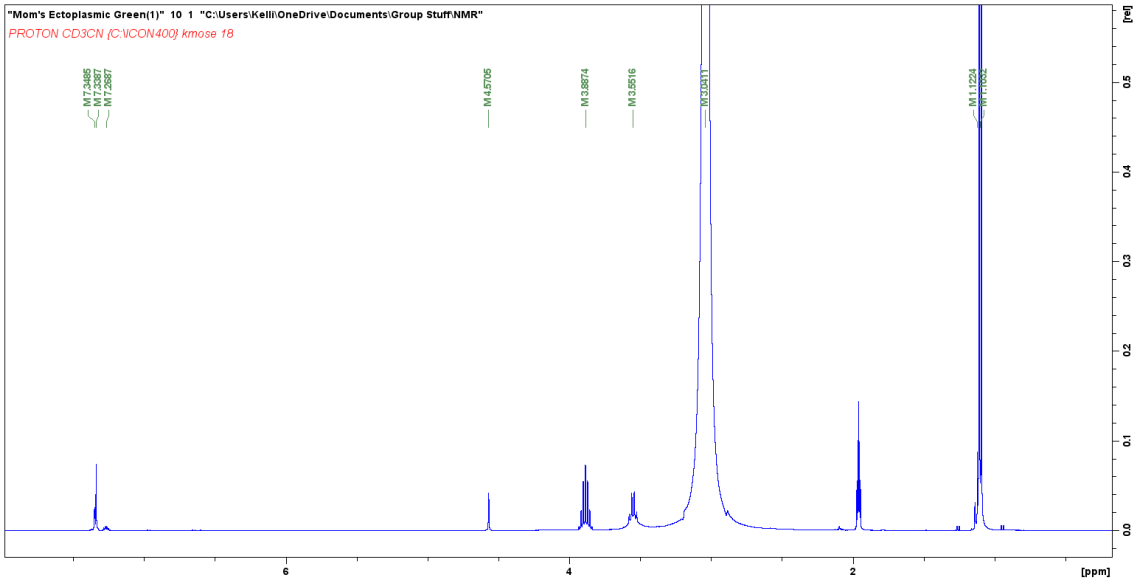

Figure S211. *^{1}H NMR of Mom's Millennium Ectoplasmic Green distillate in acetonitrile-d3*

Isopropanol produces a doublet at δ1.1032 ppm, and a septet at δ3.8874 ppm. Ethanol produces a triplet at δ1.1224 ppm and a quartet at δ3.5516 ppm. Benzyl alcohol is also present in the sample, giving rise to peaks at δ4.5705 ppm, δ7.3387 ppm, and δ7.3485 ppm and a multiplet at δ7.2687 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

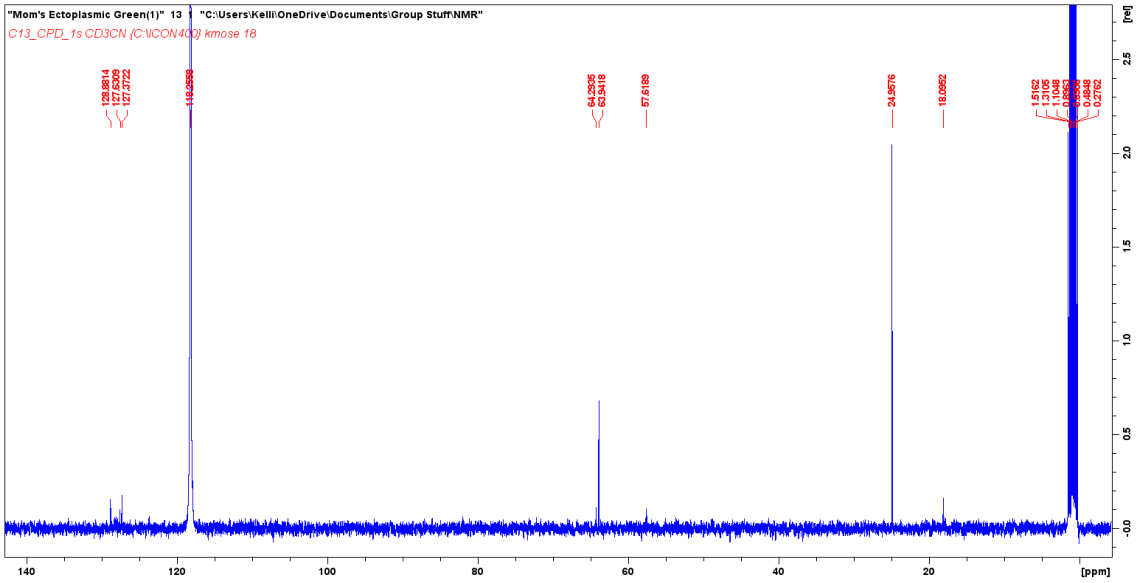

Figure S212. *^{13}C NMR of Mom's Millennium Ectoplasmic Green distillate in acetonitrile-d3*

Peaks at δ18.0952 ppm and δ57.6189 ppm are produced by ethanol while peaks at δ24.9576 ppm and δ63.9418 ppm are produced by isopropanol. Benzyl alcohol produces signals at δ64.2935 ppm, δ127.3722 ppm, δ127.6309 ppm, and δ128.8814 ppm. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

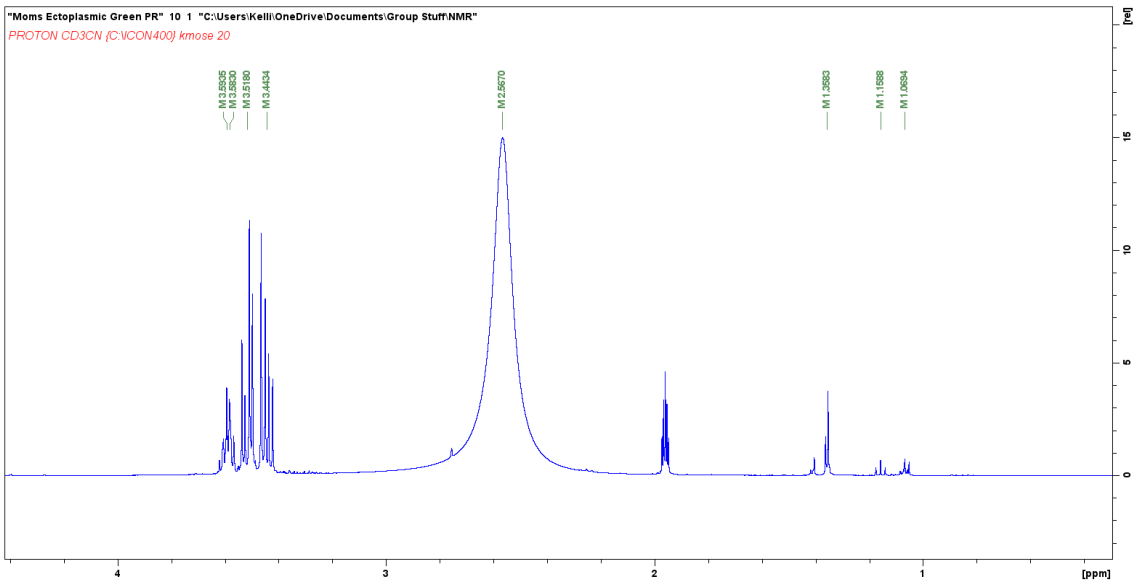

Figure S213. *^{1}H NMR of Mom's Millennium Ectoplasmic Green pot residue in acetonitrile-d3*

Glycerol produces multiplets at δ3.4434 ppm, δ3.5180 ppm, and δ3.5935 ppm. A triplet at δ1.1588ppm is likely from ethanol. A peak overlapping the glycerol signals at δ3.5830 ppm is assigned to poly(ethylene glycol). The peaks at δ1.3583 ppm and δ1.0694 ppm remain unidentified. The acetonitrile solvent peak is located at δ1.94 ppm.

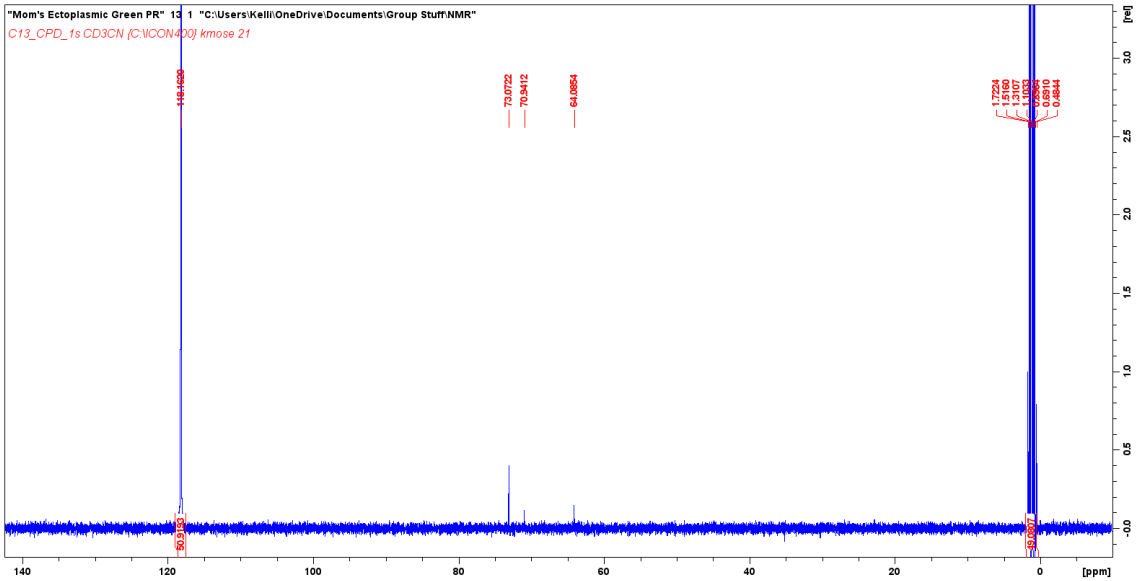

Figure S214. *^{13}C NMR of Mom's Millennium Ectoplasmic Green pot residue in acetonitrile-d3*

Peaks at δ64.0854 ppm and δ73.0722 ppm are attributed to glycerol. Peaks for benzyl alcohol are not seen as the concentration is too low to detect through ^{13}C NMR. No signals are observed for ethanol due to its low concentration. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

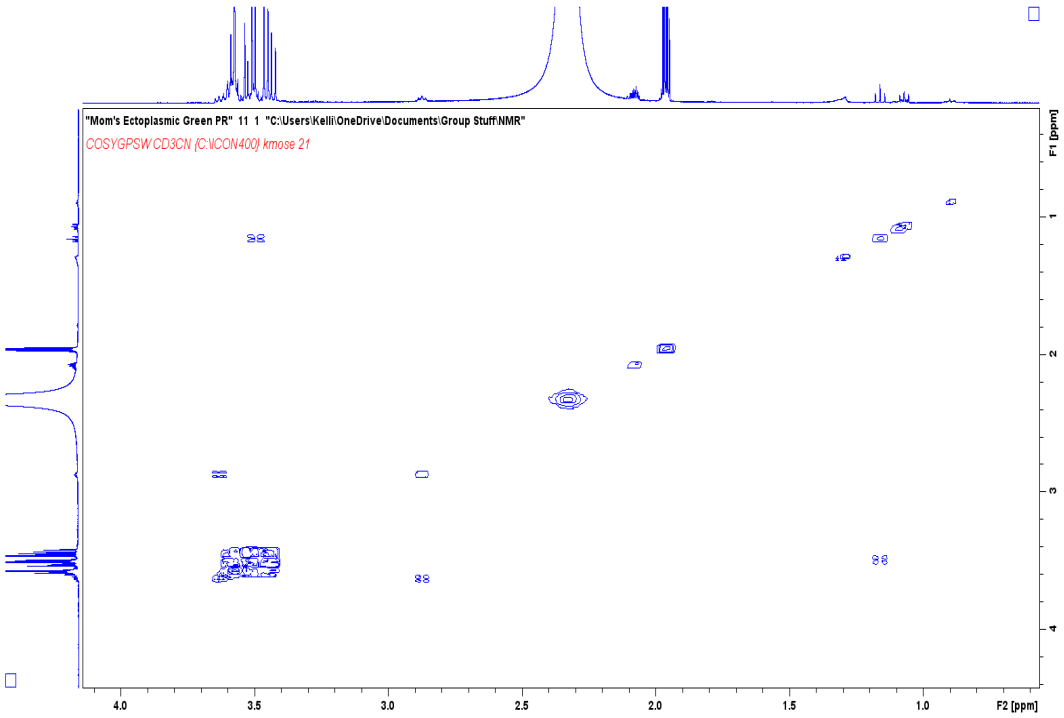

Figure S215. *^{1}H-^{1}H COSY spectrum of Mom's Millennium Ectoplasmic Green pot residue in acetonitrile-d3*

Coupling occurring between peaks at δ3.4434 ppm, δ3.5180 ppm, and δ3.5935 ppm support glycerol being present. The ethanol peak at δ1.1588 ppm also couples with δ 3.501 ppm, although this peak is not observed due to overlapping signals. Additionally, peaks at δ2.877 ppm and δ3.631 ppm couple but this component was not identified.

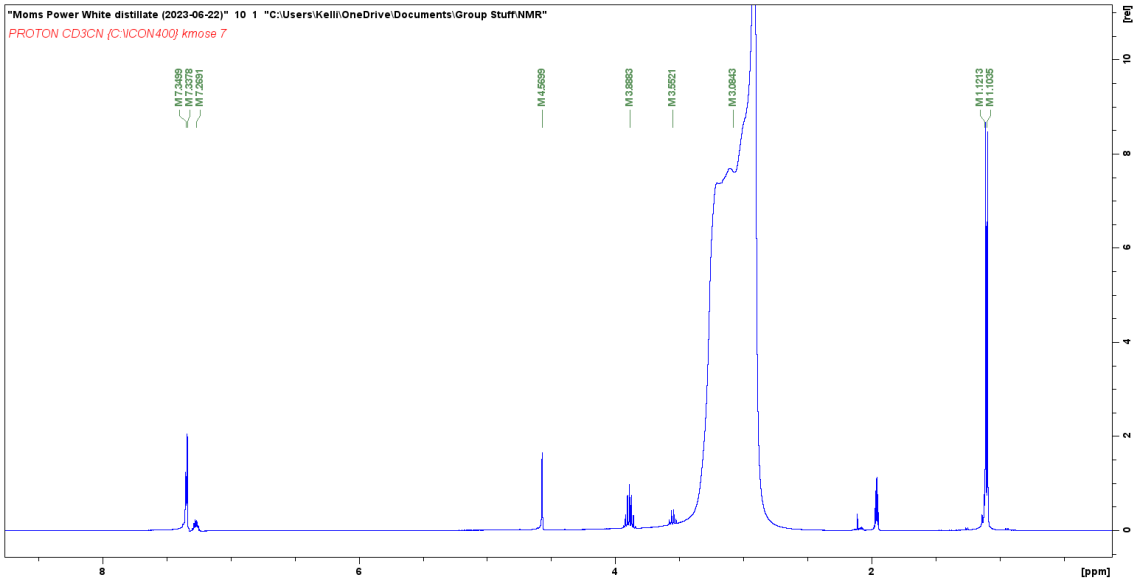

Figure S216. *[1]H NMR of Mom's Millennium Power White distillate in acetonitrile-d3*

A doublet at δ1.1035 ppm and septet at δ3.8883 ppm is produced by isopropanol. Ethanol produces a triplet at δ1.1213 ppm and a quartet at δ3.5521 ppm. Benzyl alcohol produces singlets at δ4.5699 ppm, δ7.3378 ppm, and δ7.3499 ppm and a multiplet at δ7.2691 ppm. A large peak at δ3.0843 ppm is attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

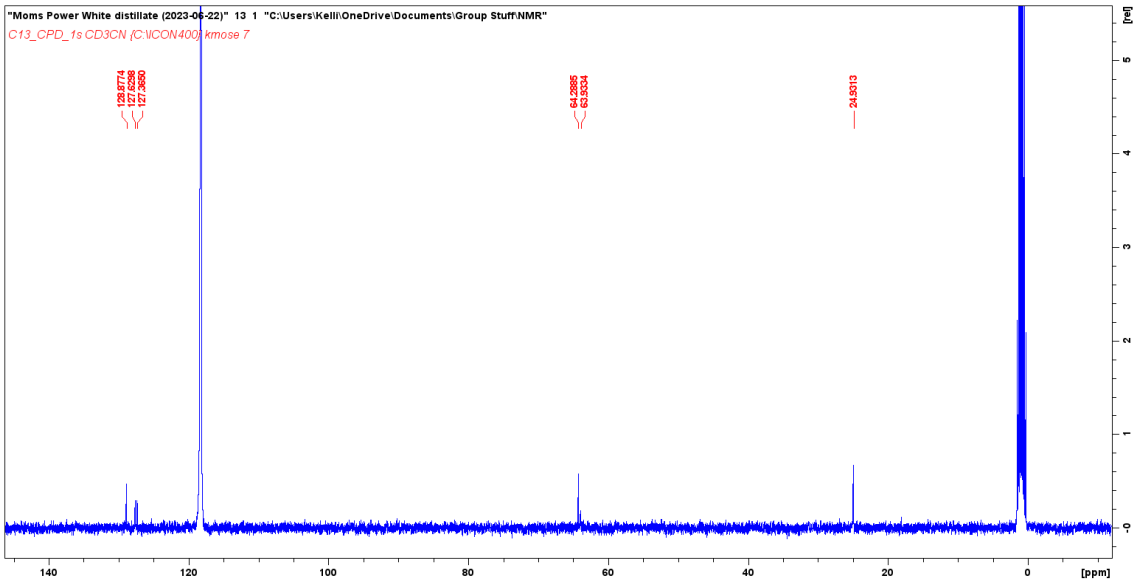

Figure S217. *[13]C NMR of Mom's Millennium Power White distillate in acetonitrile-d3*

Peaks at δ24.9313 ppm and δ63.9334 ppm correspond to isopropanol. Benzyl alcohol produces signals at δ64.2885 ppm, δ127.3650 ppm, δ127.6298 ppm, and δ128.8774 ppm. A peak around δ140 ppm should be present but due to the low concentration of benzyl alcohol, it is undetected. Peaks for ethanol at δ18 ppm and δ57 ppm should be present as well, but due to low concentrations they are undetected. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

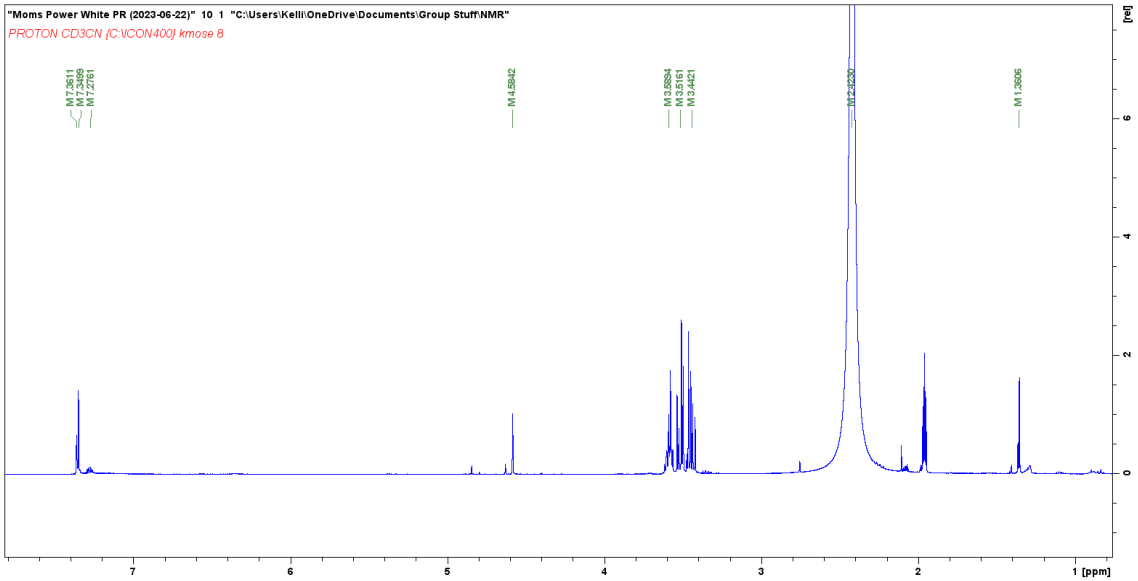

Figure S218. *^{1}H NMR of Mom's Millennium Power White pot residue in acetonitrile-d3*

Benzyl alcohol produces singlets at δ4.5842 ppm, δ7.3499 ppm, and δ7.3611 ppm and a multiplet at δ7.2761 ppm. Glycerol produces the multiplets at δ3.4421 ppm, δ3.5161 ppm, and δ3.5894 ppm. The peak at δ3.5801 ppm is assigned to poly(ethylene glycol). A peak at δ1.3606 ppm remains unidentified. The acetonitrile solvent peak is located at δ1.94 ppm.

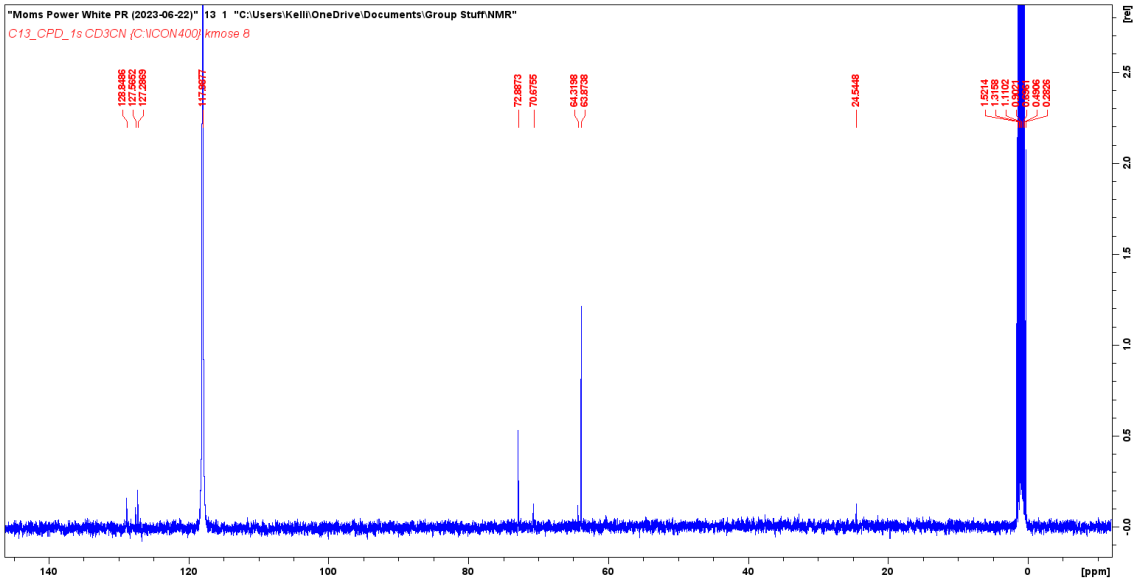

Figure S219. *^{13}C NMR spectrum of Mom's Millennium Power White pot residue in acetonitrile-d3*

Benzyl alcohol produces the peaks at δ64.3198 ppm, δ127.2869 ppm, δ127.5652 ppm, and δ128.8486 ppm. A peak is expected at δ140 ppm, but it is not present due to the low concentration of benzyl alcohol. Peaks for glycerol appear at δ63.8738 ppm and δ72.8873 ppm. A peak at δ 70.6755 ppm is assigned to poly(ethylene glycol). A small peak at δ24.5448 ppm is likely residual isopropanol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

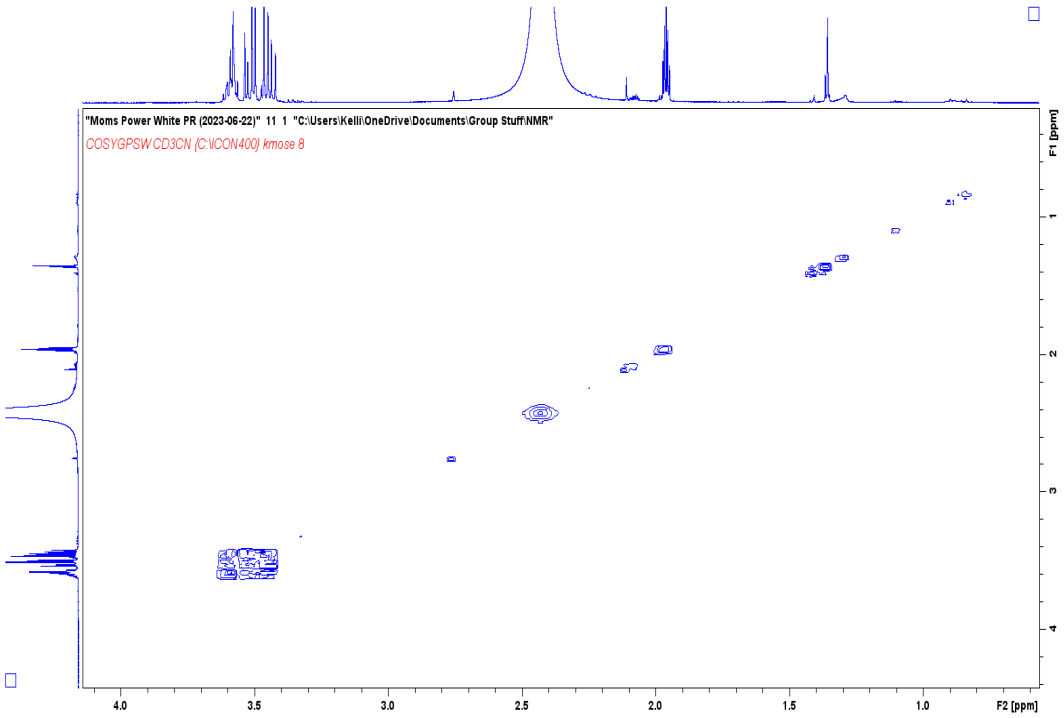

Figure S220. *^{1}H-^{1}H COSY spectrum of Mom's Millennium Power White pot residue in acetonitrile-d3*

Coupling occurs between peaks at δ3.4421 ppm, δ3.5161 ppm, and δ3.5894 ppm, supporting glycerol being present in this sample. Peaks at δ3.5801 ppm and at δ1.3606 ppm do not couple with other peaks, indicating they are two separate unidentified components, one of which (δ3.5801 ppm) we assign to be poly(ethylene glycol).

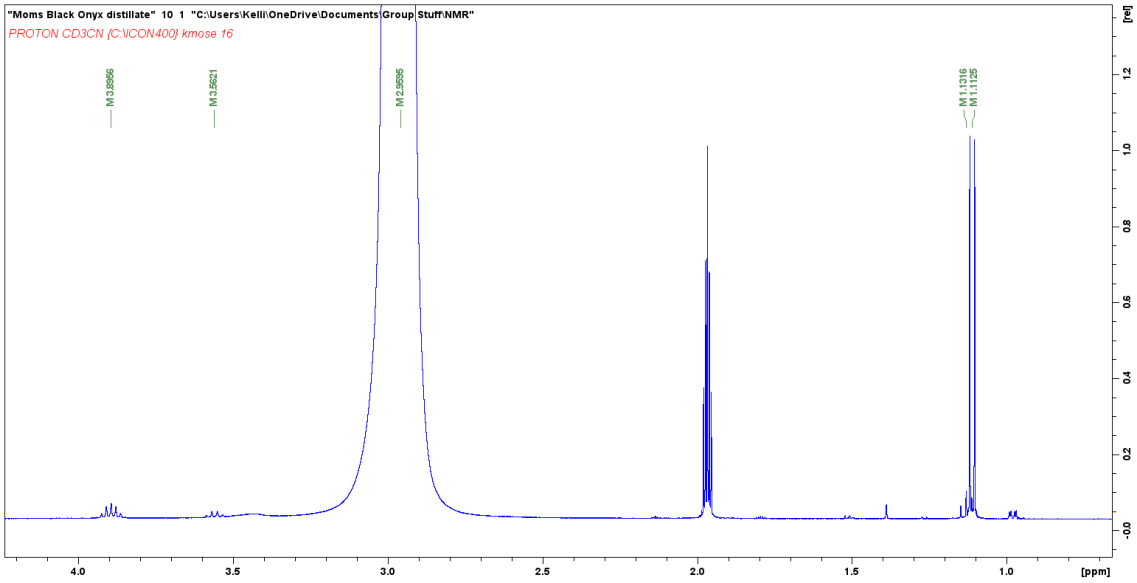

Figure S221. *^{1}H NMR of Mom's Millennium Black Onyx distillate in acetonitrile-d3*

A doublet at δ1.1125 ppm and a septet at δ3.8956 ppm are attributed to isopropanol. Ethanol produces a small triplet at δ1.1316 ppm and a small quartet at δ3.5621 ppm. The large peak at δ2.9595 ppm is attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

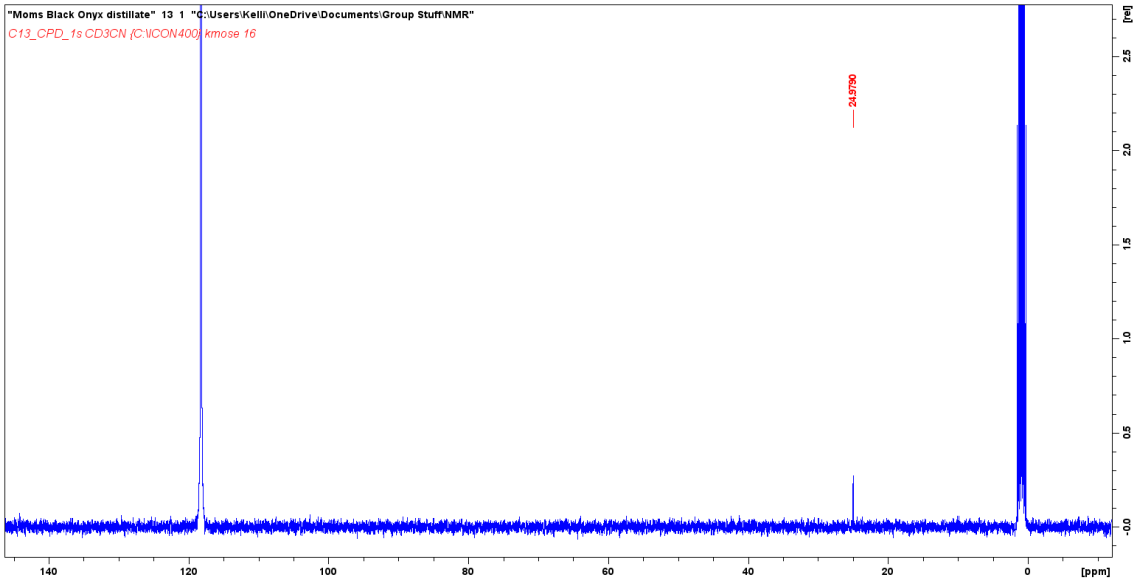

Figure S222. *^{13}C NMR of Mom's Millennium Black Onyx distillate in acetonitrile-d3*

The peak at δ24.9790 ppm can be attributed to isopropanol. The lack of other peaks for isopropanol and ethanol is due to the low concentration of each one. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

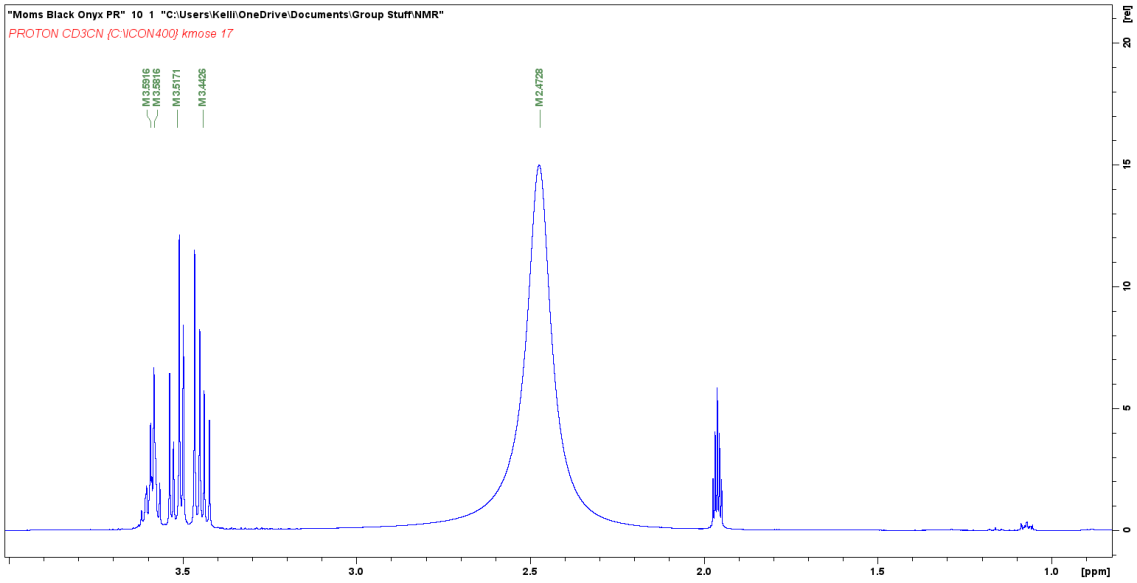

Figure S223. *^{1}H NMR of Mom's Millennium Black Onyx pot residue in acetonitrile-d3*

Glycerol produces multiplets at δ3.4426 ppm, δ3.5171 ppm, and δ3.5916 ppm. An overlapping singlet at δ3.5816 ppm is assigned to poly(ethylene glycol). The broad singlet at δ2.4728 ppm is attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

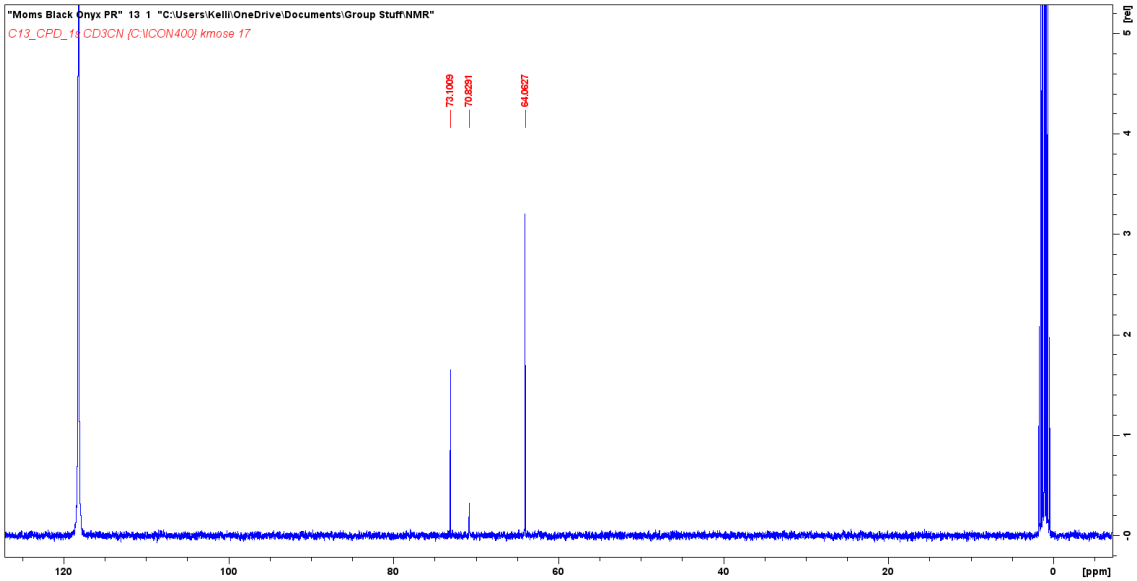

Figure S224. *^{13}C NMR of Mom's Millennium Black Onyx pot residue in acetonitrile-d3*

Glycerol produces the signals at δ634.0627 ppm and δ 723.1009 ppm. The signal at δ70.8291 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

7.2 Raman

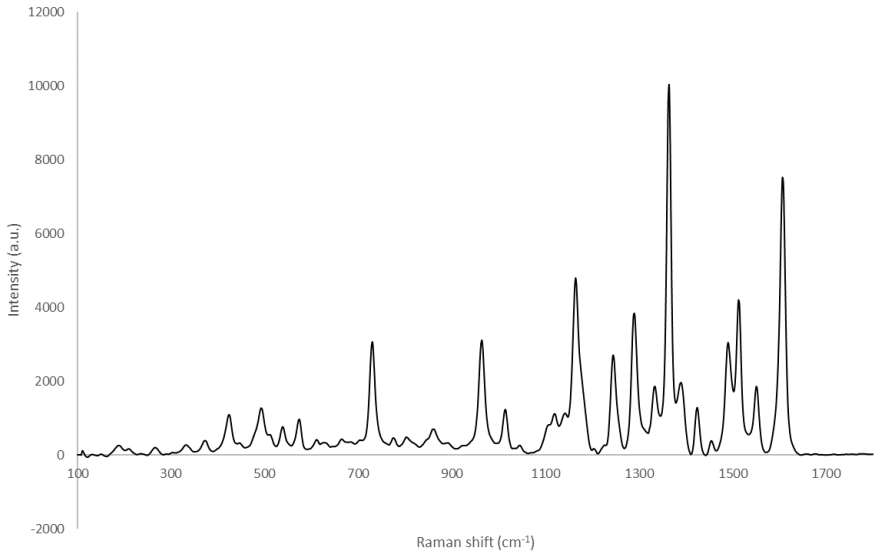

Figure S225. *Raman spectrum of Mom's Millennium Monthly Red*

Parameters used to obtain this spectrum are as follows: 785 nm, 150 mW, 5 second integration, 2 average, 1 boxcar, auto-baseline on. Peaks at 1606 cm^{-1}, 1552 cm^{-1}, 1514 cm^{-1}, 1490 cm^{-1}, 1364 cm^{-1}, 1292 cm^{-1}, 1244 cm^{-1}, 1164 cm^{-1}, 964 cm^{-1}, and 730 cm^{-1} match the peaks in both Pigment Red 170 and Pigment Red 210. Peaks around 800 cm^{-1} and at 538 cm^{-1}, and 572 cm^{-1} indicate that it is actually Pigment Red 170.[1]

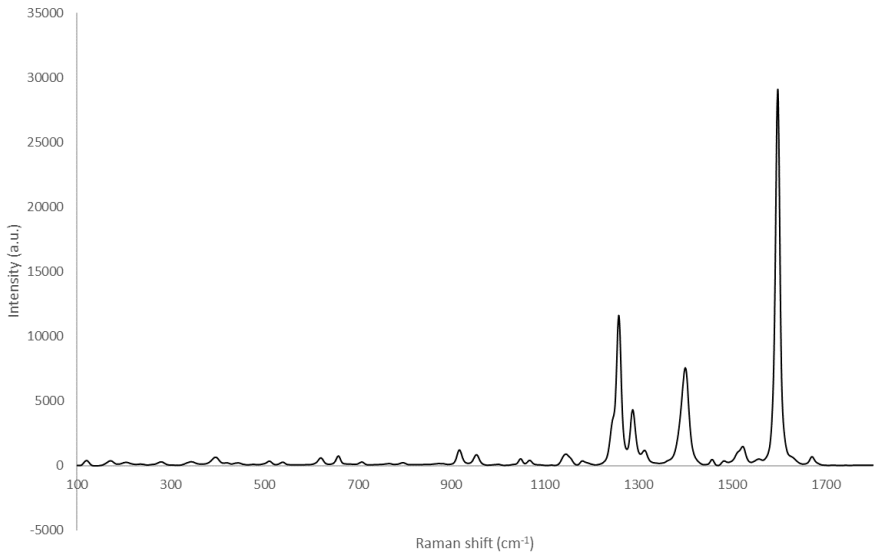

Figure S226. *Raman spectrum of Mom's Millennium Hello Yellow*

Parameters used to obtain this spectrum are as follows: 785 nm, 150 mW, 5 second integration, 2 average, 1 boxcar, auto-baseline on. Peaks located at 1598 cm^{-}, 1400 cm^{-1}, 1290 cm^{-1}, and 1258 cm^{-1} match those found in the SOPRANO Raman spectra database for Pigment Yellow 14.[1]

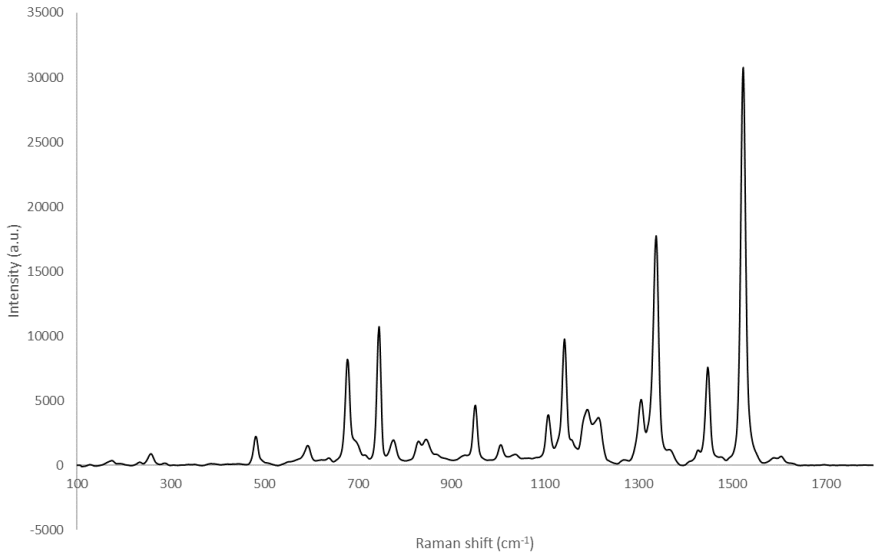

Figure S227. *Raman spectrum of Mom's Millennium Blue Balls*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 5 second integration, 2 average, 1 boxcar, auto-baseline on. Peaks at 1524 cm^{-1}, 1450 cm^{-1}, 1338 cm^{-1}, 1306 cm^{-1}, 1192 cm^{-1}, 1142 cm^{-1}, 1108 cm^{-1}, 952 cm^{-1}, 746 cm^{-1}, and 680 cm^{-1} match those of Pigment Blue 15 found in the SOPRANO Raman spectra database.[1]

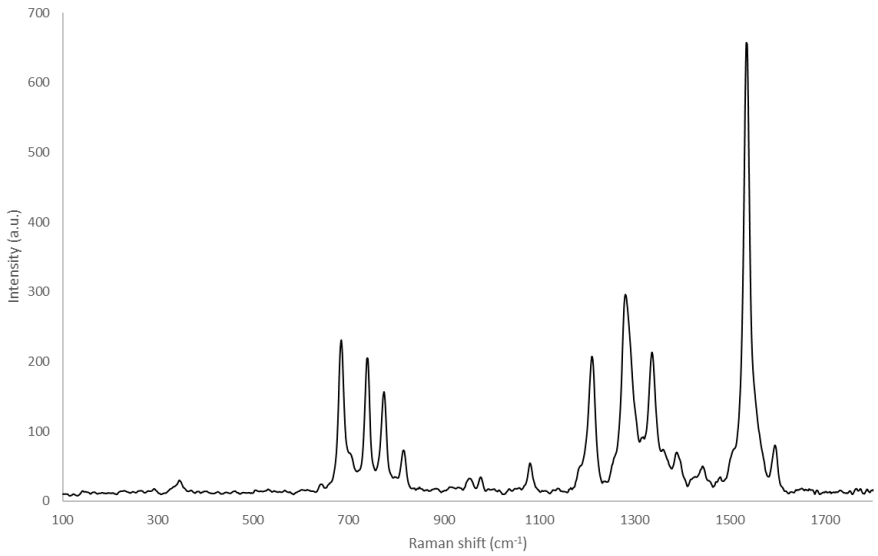

Figure S228. *Raman spectrum of Mom's Millennium Ectoplasmic Green*

Parameters used to obtain this spectrum are as follows: 785 nm, 150 mW, 5 second integration, 2 average, 1 boxcar, auto-baseline on. Peaks at 1534 cm^{-1}, 1338 cm^{-1}, 1280 cm^{-1}, 1210 cm^{-1}, 774 cm^{-1}, 738 cm^{-1}, and 684 cm^{-1} match the spectrum for Pigment Green 7 from the SOPRANO Raman spectra database.[1]

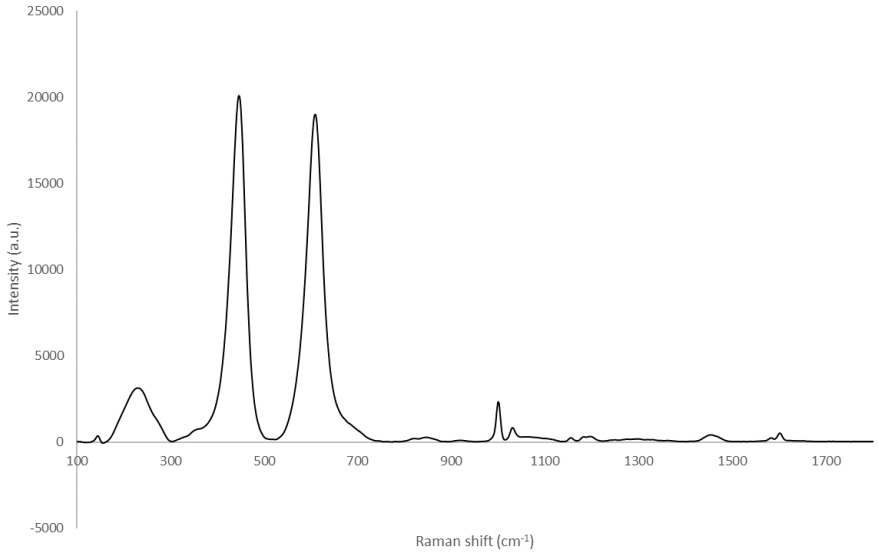

Figure S229. *Raman spectrum of Mom's Millennium Power White*

Parameters used to obtain this spectrum are as follows: 785 nm, 150 mW, 5 second integration, 2 average, 1 boxcar, auto-baseline on. Peaks at 612 cm^{-1}, 446 cm^{-1}, and 232 cm^{-1} indicate the presence of Pigment White 6 (TiO_2), A small peak 1000 cm^{-1} may suggest the presence of $BaSO_4$ (see section 10).

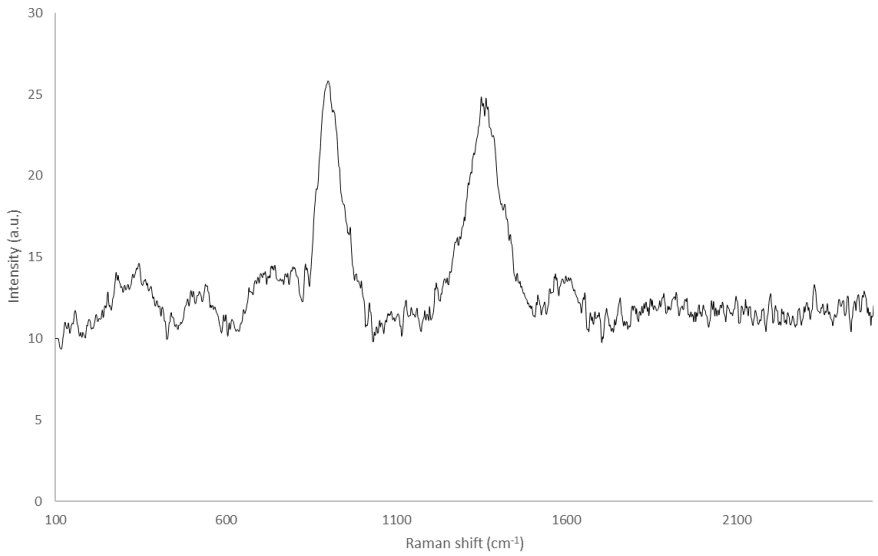

Figure S230. *Raman spectrum of Mom's Millennium Black Onyx*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 4 second integration, 3 average, 2 boxcar, auto-baseline on. Peaks at 1598 cm^{-1}, 1364 cm^{-1}, and 902 cm^{-1} indicate that carbon black is in the sample (see section 10).

7.3 XRF Data

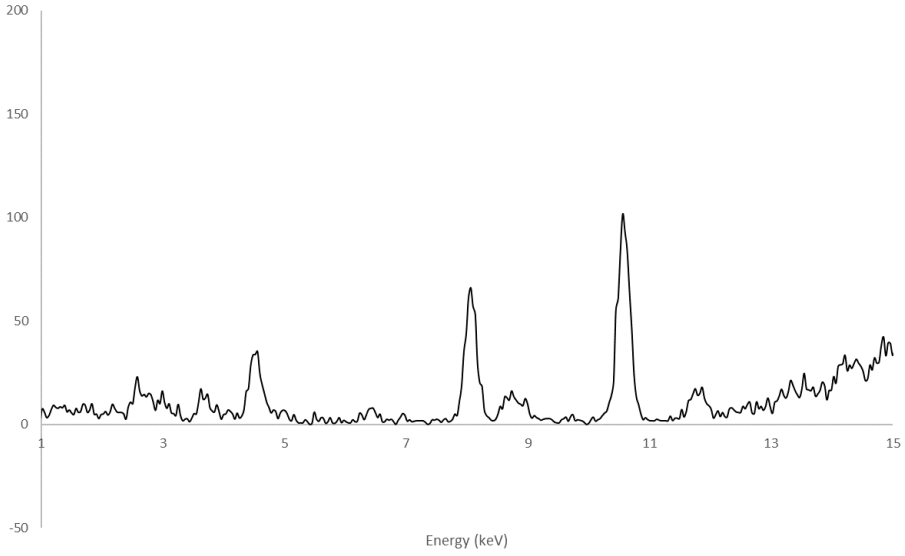

Figure S231. *X-ray fluorescence spectrum of Mom's Millennium Ectoplasmic Green*

Peaks at 8.06 keV and 8.73 keV match the $K\alpha_1$ and $K\beta_1$ lines of copper suggesting the presence of Pigment Green 7. Peaks at 4.51 keV could be attributed to small amounts of titanium, likely from Pigment White 6. Peaks at 10.56 keV and 11.86 keV match the $K\alpha_1$ and $K\beta_1$ lines for arsenic which is present in the glass microscope slide used to dry the sample on.

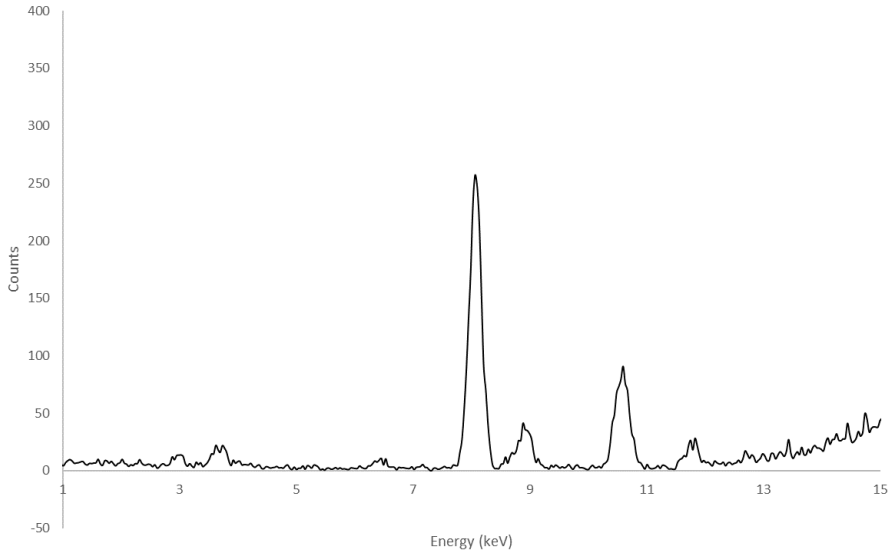

Figure S232. *X-ray fluorescence spectrum of Mom's Millennium Blue Balls*

Peaks at 8.06 keV and 8.88 keV match the $K\alpha_1$ and $K\beta_1$ lines of copper in the ink, indicating the presence of Pigment Blue 15 in the ink. Peaks at 10.60 keV and 11.83 keV match the $K\alpha_1$ and $K\beta_1$ lines of arsenic which is present in the glass microscope slide used to dry the sample on.

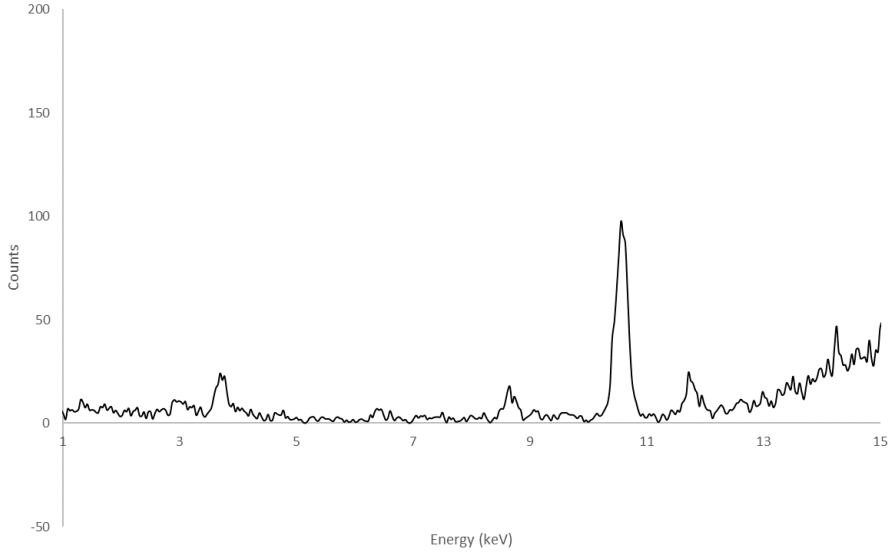

Figure S233. *X-ray fluorescence spectrum of Mom's Millennium Monthly Red*

The only major peaks at 10.56 keV and 11.72 keV correspond to the $K\alpha_1$ and $K\beta_1$ lines of arsenic which is present in the glass microscope slide used to dry the ink sample on.

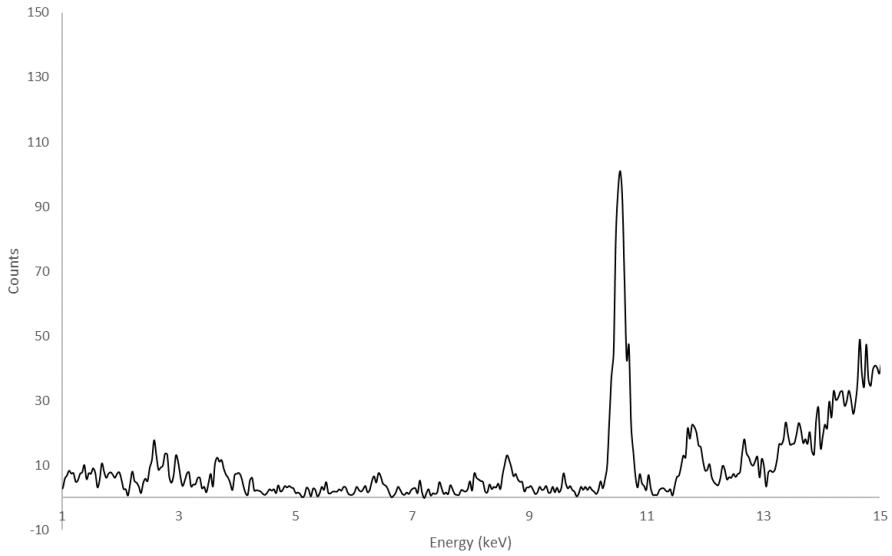

Figure S234. *X-ray fluorescence spectrum of Mom's Millennium Hello Yellow*

The only major peaks at 10.56 keV and 11.83 keV correspond to the $K\alpha_1$ and $K\beta_1$ lines of arsenic which is present in the glass microscope slide used to dry the ink sample on.

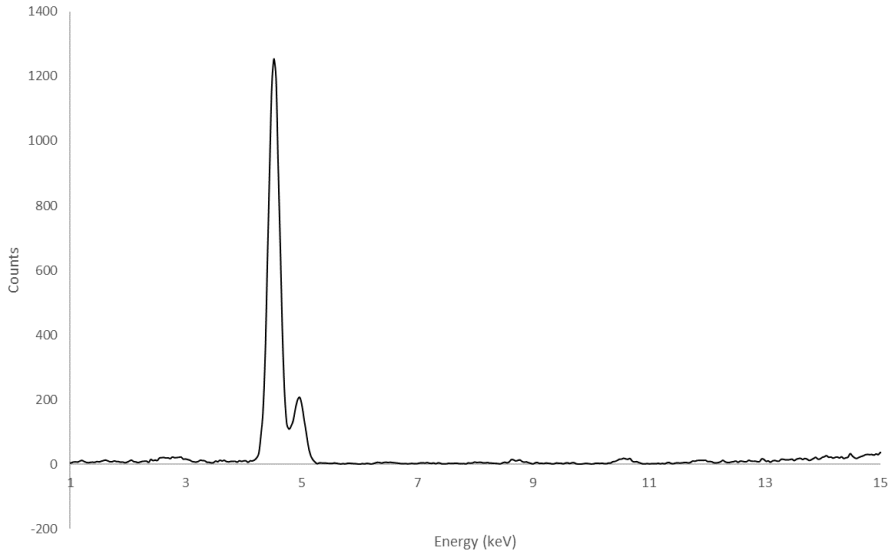

Figure S235. *X-ray fluorescence spectrum of Mom's Millennium Power White*

Peaks at 4.52 keV and 4.69 keV match the $K\alpha_1$ and $K\beta_1$ for titanium indicating the presence of Pigment White 6.

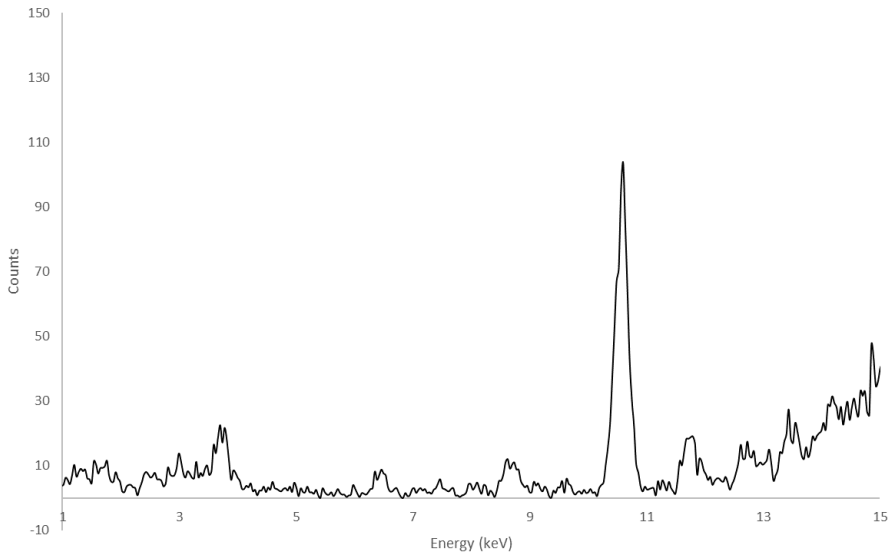

Figure S236. *X-ray fluorescence spectrum of Mom's Millennium Black Onyx*

The only major peaks at 10.60 keV and 11.79 keV correspond to the $K\alpha_1$ and $K\beta_1$ lines of arsenic which is present in the glass microscope slide used to dry the ink sample on.

8. Solong

8.1 NMR

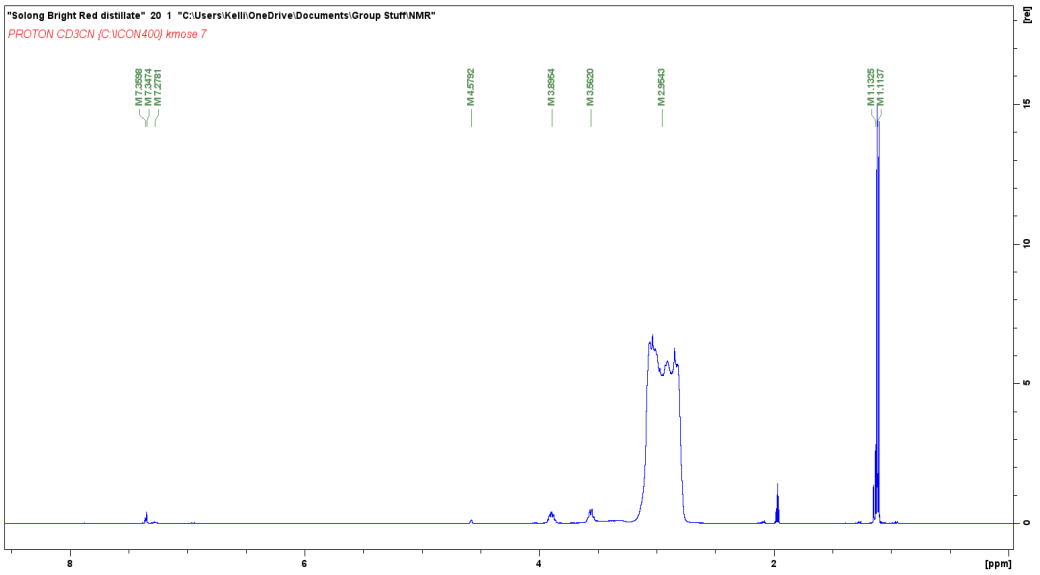

Figure S237. *^{1}H NMR spectrum of Solong Bright Red distillate in acetonitrile-d3*

Three different products are found in the distillate of Solong Bright Red. Benzyl alcohol produces small singlets at δ4.5712 ppm, δ7.3394 ppm, and δ7.3517 and a multiplet at δ7.2701 ppm. Isopropanol peaks appear as a doublet at δ1.1056 ppm and a septet at δ3.8873 ppm. Ethanol produces a quartet at δ3.5539 ppm and a triplet at δ1.1244 ppm. A water peak appears at δ2.9462 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

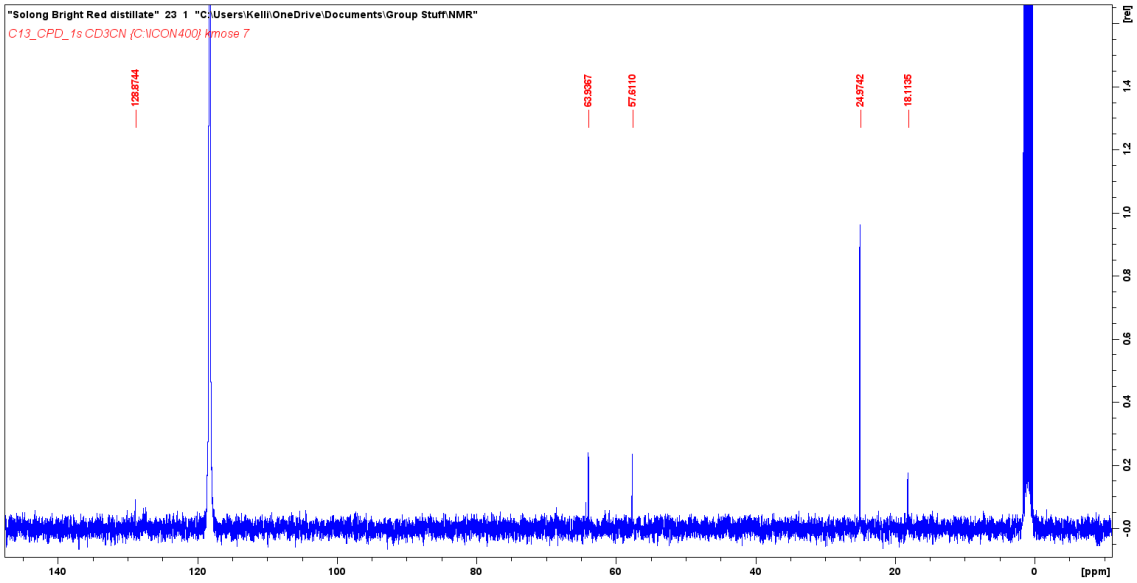

Figure S238. *^{13}C NMR spectrum of Solong Bright Red distillate in acetonitrile-d3*

Peaks at δ18.1135 ppm and δ57.6110 ppm are produced by ethanol. Peaks at δ24.9742 ppm and δ63.9367 ppm are produced by isopropanol. A peak at δ128.8744 ppm suggests the presence of benzyl alcohol, though the other peaks at δ64, δ126, δ127, and δ140 are not present, probably due to low concentration. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

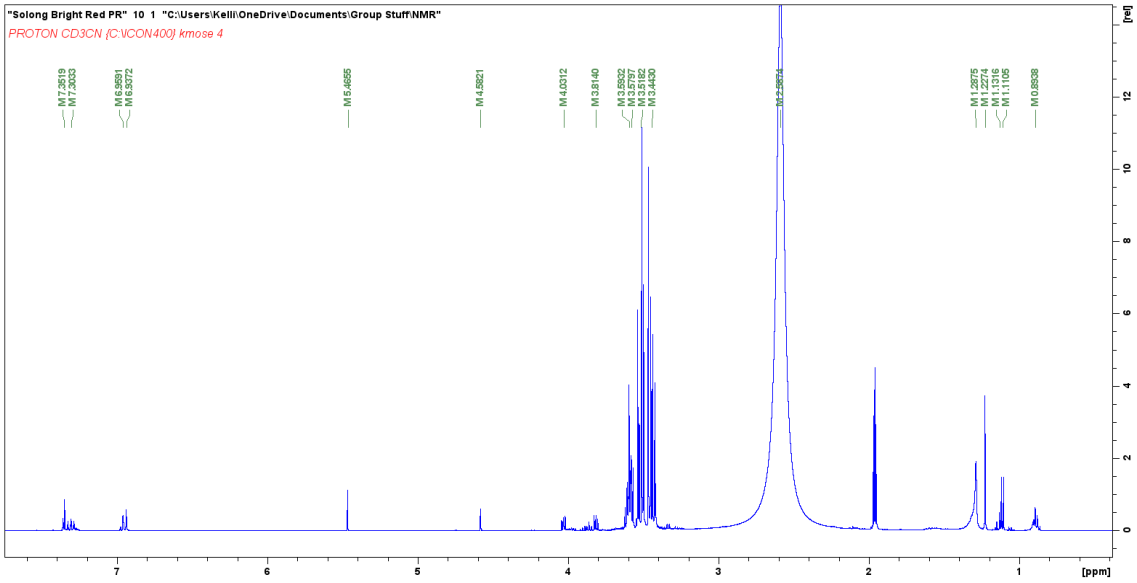

Figure S239. *^{1}H NMR spectrum of Solong Bright Red pot residue in acetonitrile-d3*

2-phenoxyethanol produces the signals at δ3.8140 ppm, δ4.0312 ppm, δ6.9372 ppm, δ6.9591 ppm, and δ7.3519 ppm. Peaks at δ7.3033 ppm and δ4.5821 ppm are produced by benzyl alcohol. Glycerol peaks appear at δ3.4430 ppm, δ3.5182 ppm, and 3.5797 ppm. A peak at δ3.5932 ppm is assigned to poly(ethylene glycol). Additional peaks at δ1.1105 ppm (doublet) and δ1.1316 ppm (triplet) are likely from small amounts of isopropanol and ethanol, respectively. The remaining peaks at δ0.8938 ppm, δ1.2274 ppm, and δ1.2875 ppm are unidentified. The acetonitrile solvent peak is located at δ1.94 ppm.

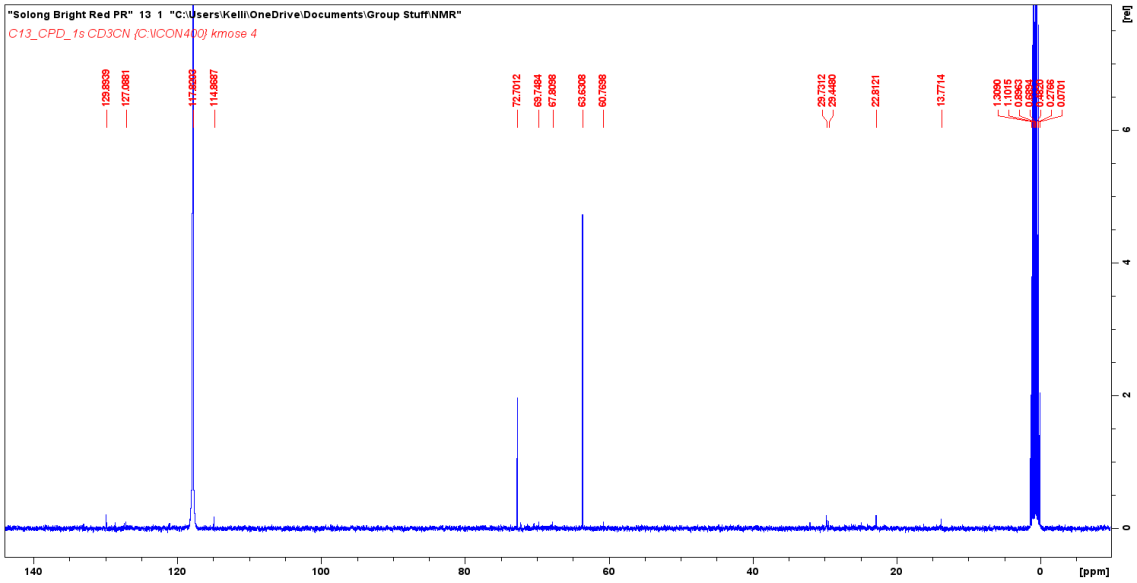

Figure S240. *^{13}C NMR spectrum of Solong Bright Red pot residue in acetonitrile-d3*

2-phenoxyethanol produces small signals at δ129.8939 ppm, δ114.8687 ppm, δ69.7484 ppm, and δ60.7698 ppm. The peak at δ127.0881 ppm is likely from benzyl alcohol, though the other peaks are not observed likely due to low concentration. The large peaks at δ72.7012 ppm and δ63.6308 ppm are characteristic of glycerol. Weak signals at δ13.7714 ppm, δ22.8121 ppm, δ29.4480 ppm, and δ29.7312 ppm remain unidentified. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

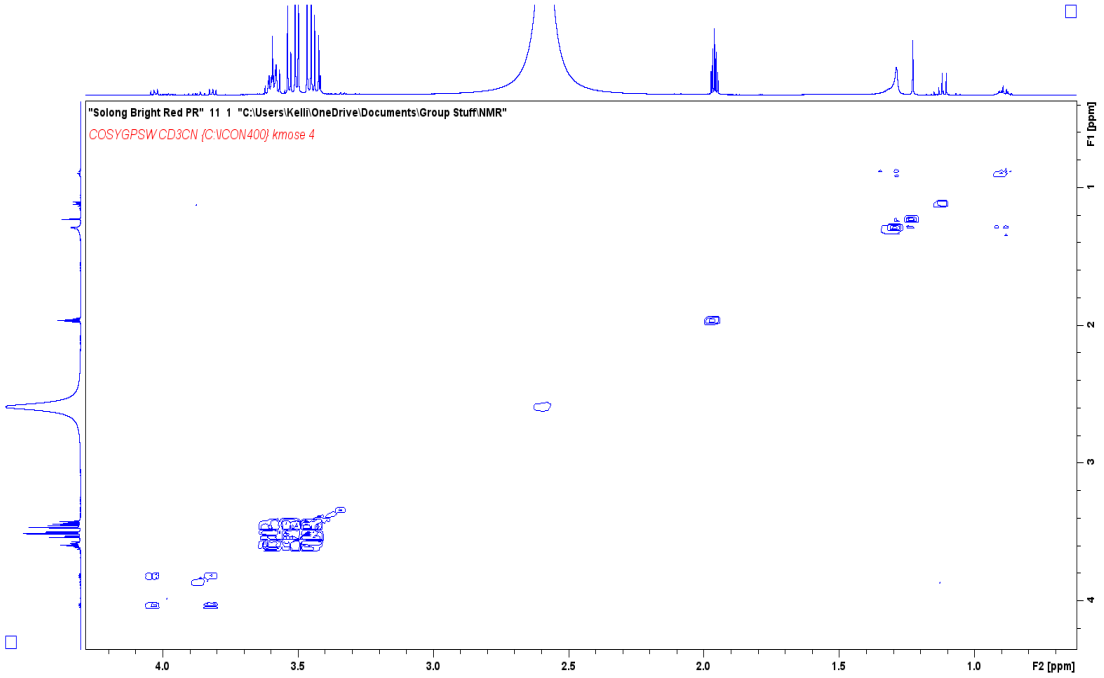

Figure S241. *^{1}H-^{1}H COSY spectrum of Solong Bright Red pot residue in acetonitrile-d3*

Coupling occurs between peaks at δ0.8938 ppm and δ1.2875 ppm, indicating they are produced by the same unidentified component. Also, coupling occurs between peaks at δ3.4430 ppm, δ3.5182 ppm, and δ3.5797 ppm, supporting glycerol being present in this sample.

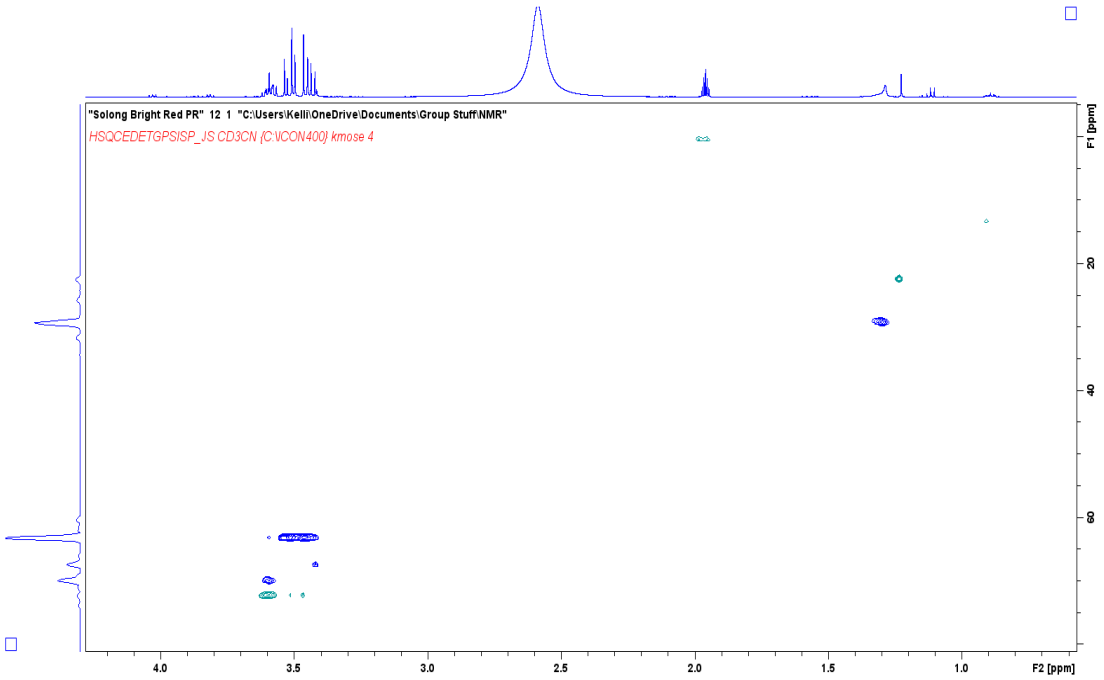

Figure S242. *^{1}H-^{13}C HSQC spectrum of Solong Bright Red pot residue in acetonitrile-d3*

Coupling between peaks at ^{1}H peaks at δ3.4430 ppm and δ3.5182 ppm with the ^{13}C peak at δ63.6308 ppm, as well as the ^{1}H peak at δ3.5797 ppm with the ^{13}C peak at δ72.7012 ppm supports glycerol being present. Additionally, coupling occurs between the ^{1}H peak at δ1.2875 ppm and the ^{13}C peak at δ29.4480 ppm, as well as the ^{1}H peak at δ1.2274 ppm and the ^{13}C peak at δ22.8121 ppm support a long-chain hydrocarbon being in the sample.

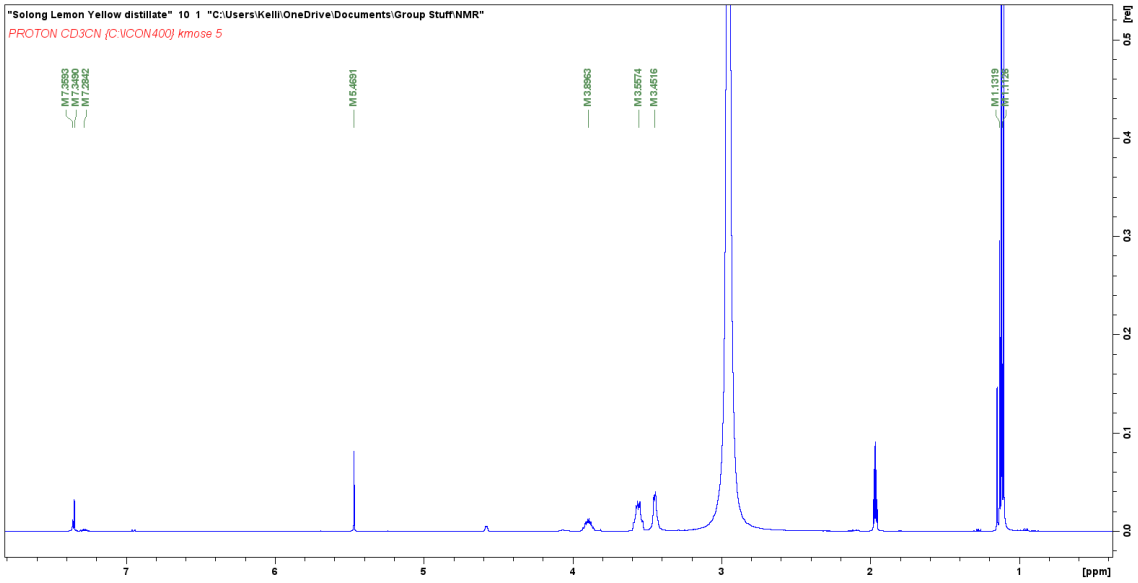

Figure S243. *[1]H NMR spectrum of Solong Lemon Yellow distillate in acetonitrile-d3*

Benzyl alcohol produced signals at δ7.3593 ppm, δ7.3490 ppm, δ7.2842 ppm, and δ4.5 ppm. The triplet at δ1.1319 ppm and quartet at δ3.5574 ppm are produced by ethanol. A septet at δ3.8963 ppm and doublet at δ1.1128 ppm are attributed to isopropanol. A small peak at δ5.4696 ppm remains unidentified. The acetonitrile solvent peak is located at δ1.94 ppm.

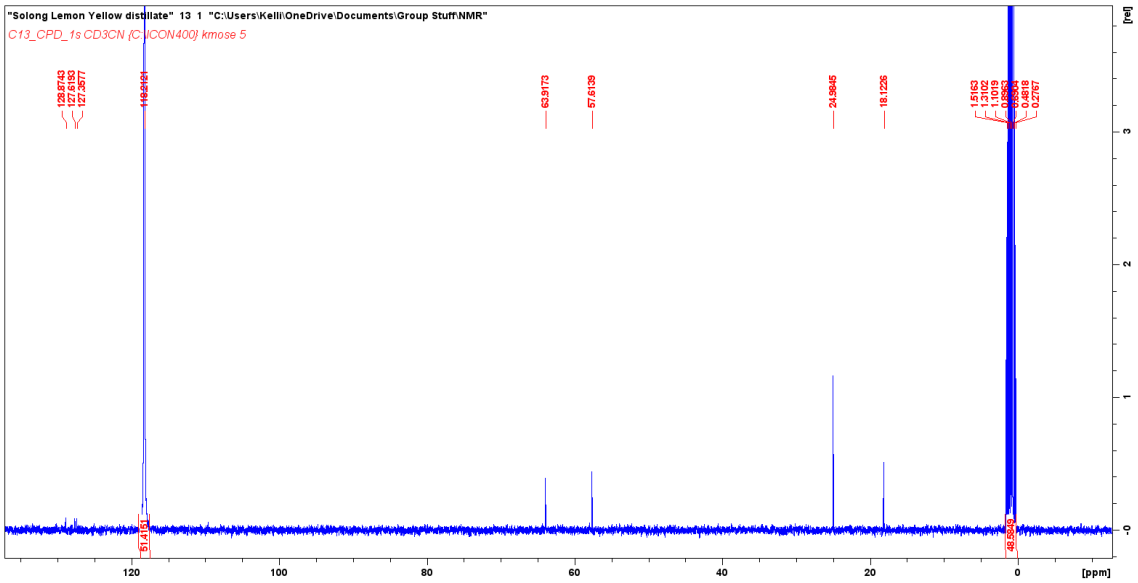

Figure S244. *[13]C NMR spectrum of Solong Lemon Yellow distillate in acetonitrile-d3*

Peaks at δ128.8743 ppm, δ127.61.933, and δ127.3577 ppm are attributed to benzyl alcohol. An additional peak would be expected at δ64 ppm but is not due to low concentration. Additionally, isopropanol produces peaks at δ63.9173 ppm and δ24.9845 ppm while ethanol produces those at δ57.81396 ppm and δ18.1226 ppm. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

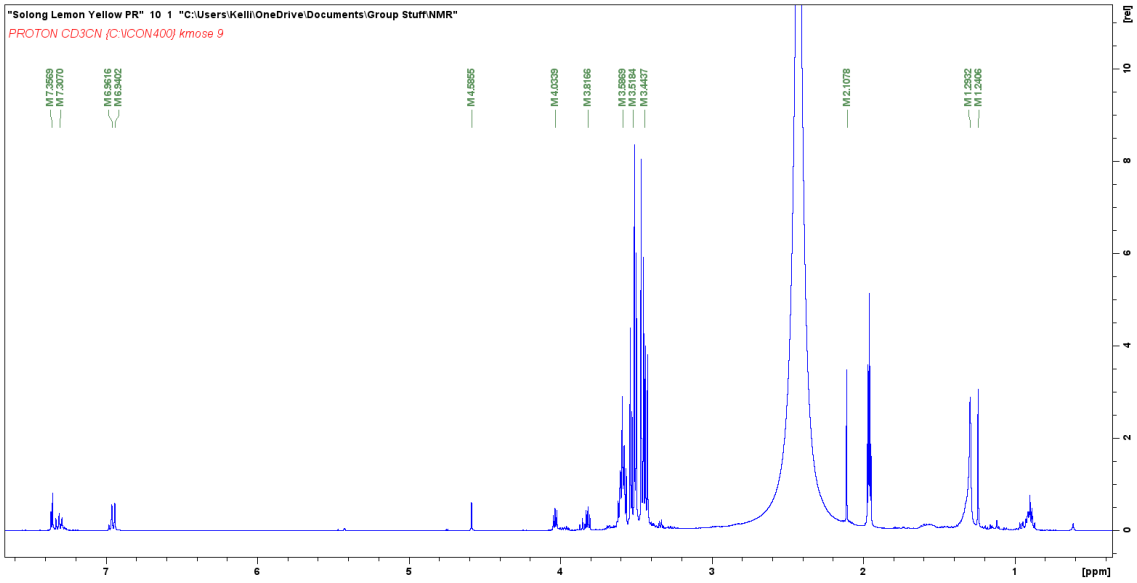

Figure S245. *^{1}H NMR of Solong Lemon Yellow pot residue in acetonitrile-d3*

Peaks at δ7.3569 ppm, δ6.9316 ppm, δ6.9402 ppm, δ4.0339 ppm, and δ3.8166 ppm are attributed to 2-phenoxyethanol. There are peaks for benzyl alcohol appearing at δ7.3070 ppm and δ4.5855 ppm. There are also signals produced by glycerol at δ3.4437 ppm, δ3.5184 ppm, and δ3.5869 ppm. Peaks downfield at δ0.8973 ppm, δ1.2406 ppm, and δ1.2932 ppm are characteristic of a long-chain hydrocarbon. The peak at δ2.1078 ppm remains unidentified. The acetonitrile solvent peak is located at δ1.94 ppm.

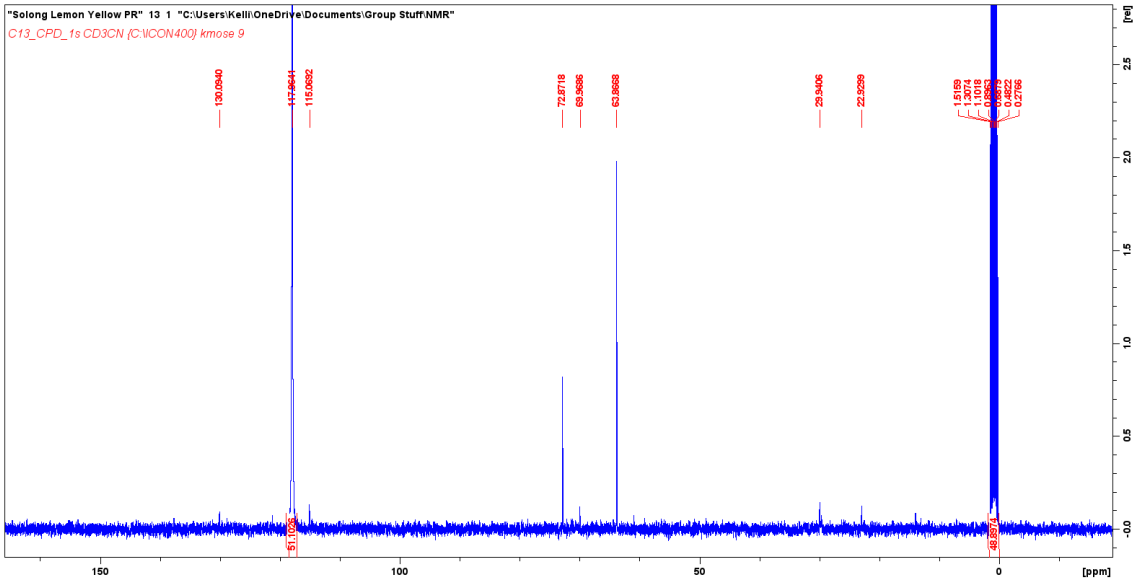

Figure S246. *^{13}C NMR of Solong Lemon Yellow pot residue in acetonitrile-d3*

Peaks at δ130.0940 ppm, δ115.0692 ppm, and δ69.9686 ppm are produced by 2-phenoxyethanol. Peaks at δ72.8718 ppm and δ63.8668 ppm are produced by glycerol. The remaining peaks at δ22.9299 ppm and δ29.9406 ppm are characteristic of a long-chain hydrocarbon. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

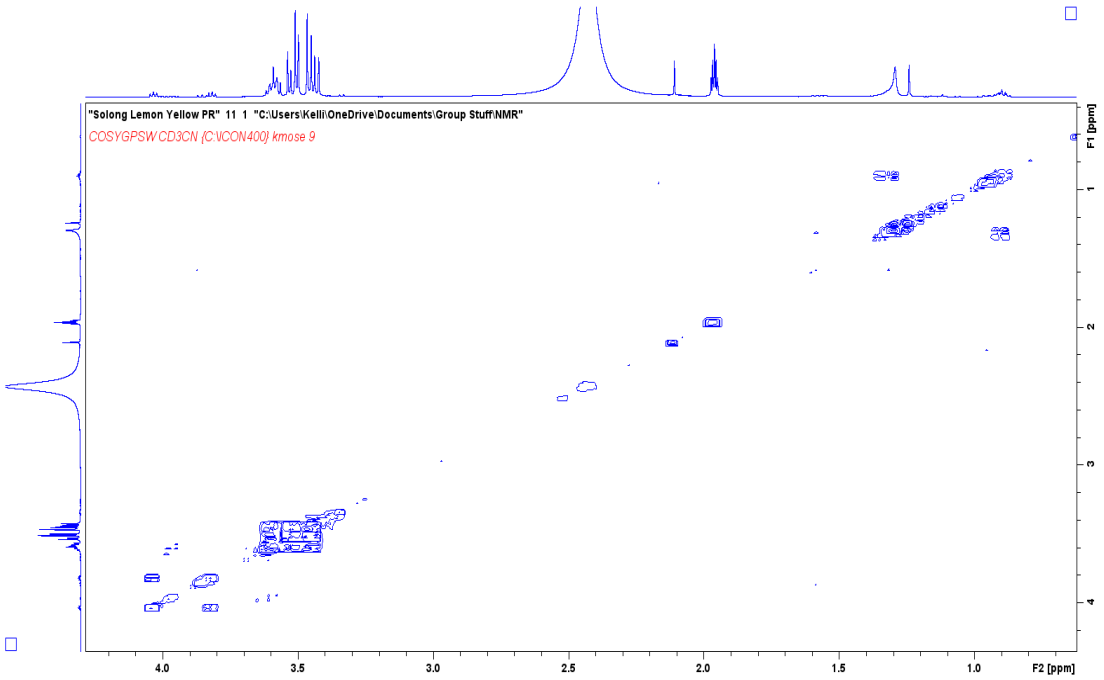

Figure S247. *^{1}H-^{1}H NMR of Solong Lemon Yellow pot residue in acetonitrile-d3*

Coupling occurring between peaks at δ0.8973 ppm and δ1.2932 ppm indicates that they are produced from the same long-chain hydrocarbon. Additionally, glycerol peaks at δ3.4437 ppm, δ3.5184 ppm, and δ3.5869 ppm display coupling.

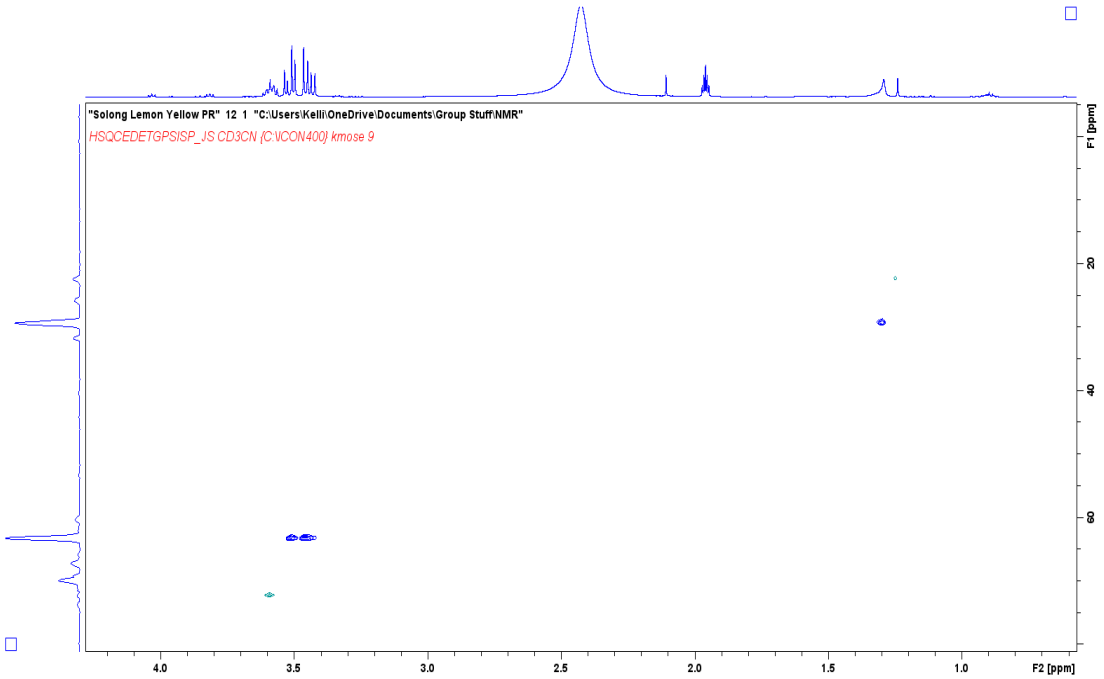

Figure S248. ^{1}H-^{13}C HSQC spectrum of Solong Lemon Yellow distillate in acetonitrile-d3 Coupling occurring between ^{1}H peaks at δ3.4437 ppm and δ3.5184 ppm and the ^{13}C peak at δ63.8668 ppm, as well as the coupling between ^{1}H peak at δ3.5869 ppm with the ^{13}C peak at δ72.8718 ppm supports glycerol being present in this sample. Coupling also occurs between the ^{1}H peak at δ1.2406 ppm and the ^{13}C peak at δ29.9406 ppm are characteristic of a long-chain hydrocarbon.

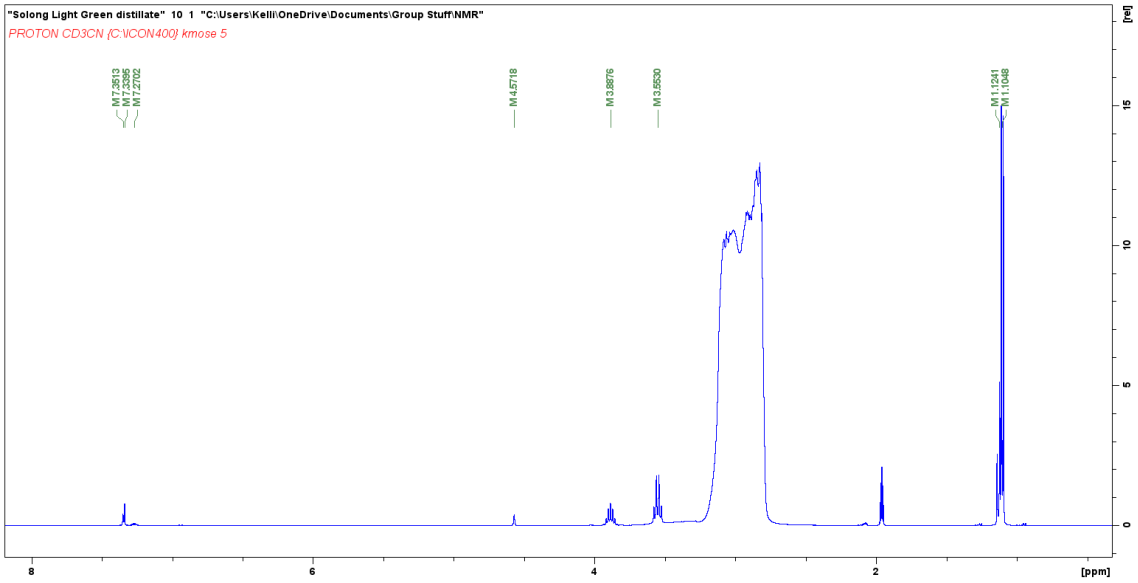

Figure S249. *^{1}H NMR of Solong Light Green distillate in acetonitrile-d3*

Benzyl alcohol, ethanol, water, and isopropanol are found in Solong Light Green distillate. Signals at δ7.3513 ppm, δ7.3395 ppm, δ7.2702 ppm correspond to benzyl alcohol. Signals at δ3.8876 ppm and δ1.1048 ppm correspond to isopropyl alcohol while signals at δ3.5530 ppm and δ1.1241 ppm correspond to ethanol. Due to overlapping signals upfield, J-couple constants (6.10 Hz for isopropanol and 7.00 Hz for ethanol) were used to confirm the presence of two different molecules. Water produces the peak at δ2.95 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

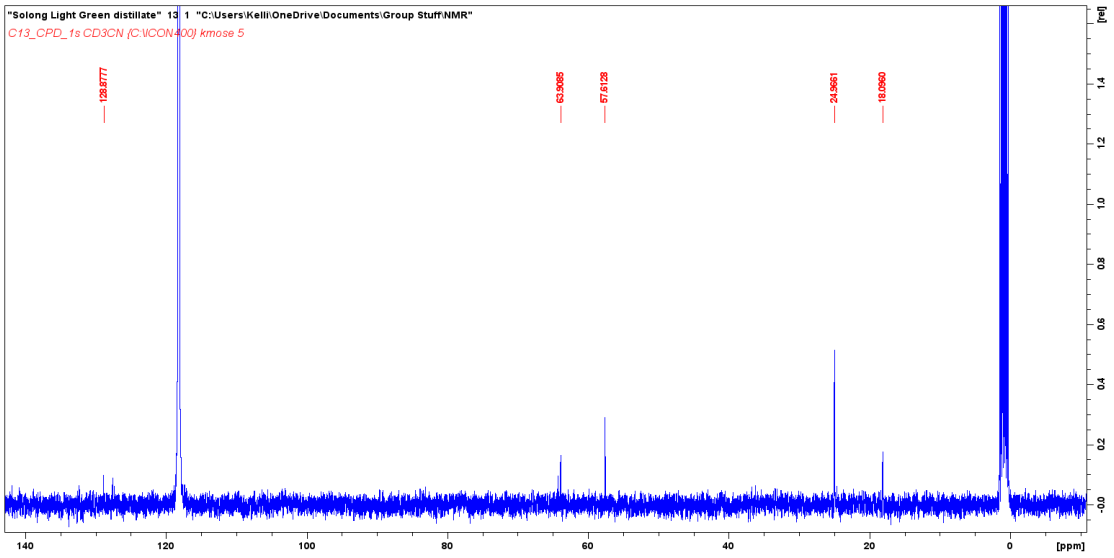

Figure S250. *^{12}C NMR of Solong Light Green distillate in acetonitrile-d3*

Peaks at δ18.0960 ppm and δ57.6128 ppm are produced by ethanol. Isopropanol peaks appear at δ24.9661 ppm and δ63.9085 ppm. A peak at δ128.8777 ppm corresponds to benzyl alcohol. The remaining peaks at δ64 ppm, δ126 ppm, δ127 ppm, and δ140 ppm are not detected due to low concentration. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

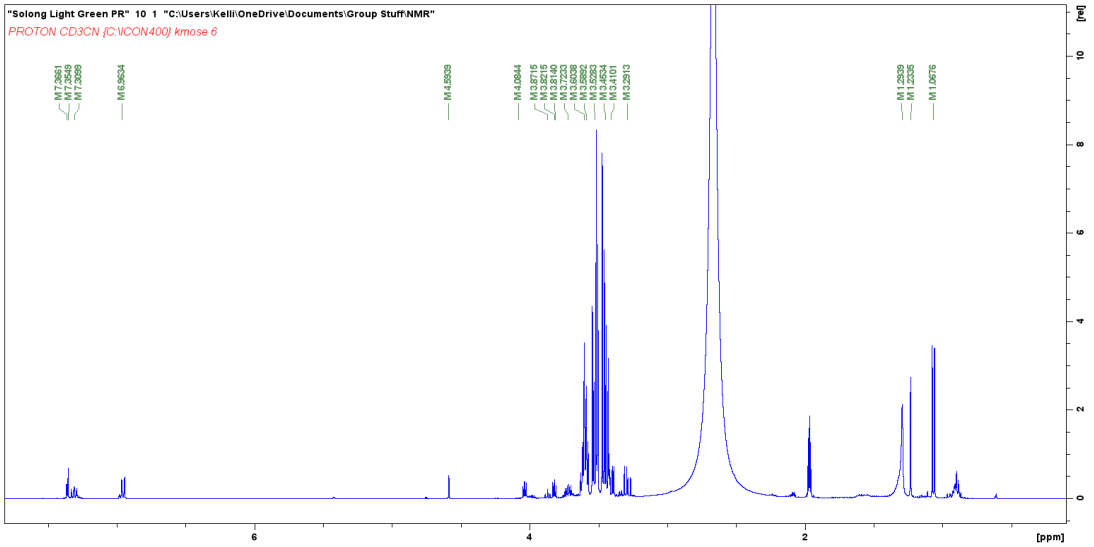

Figure S251. *^{1}H NMR of Solong Light Green pot residue in acetonitrile-d3*

Signals at δ4.5939 ppm, δ7.3549 ppm, and δ7.3661 ppm are produced by benzyl alcohol. Glycerol produces multiplets at δ3.4534 ppm, δ3.5283 ppm, and δ3.6038 ppm. Small amounts of propylene glycol can be attributed to a doublet at δ1.0676 ppm, and multiplets at δ3.2913 ppm, δ3.4101 ppm, and δ3.7233 ppm. 2-phenoxyethanol produces triplets at δ3.8218 ppm and δ4.0381 ppm, as well as the peaks at δ6.9450 ppm, δ6.9635 ppm, and δ7.3099 ppm. An overlapping singlet at δ3.5892 is assigned to poly(ethylene glycol). The acetonitrile solvent peak is located at δ1.94 ppm.

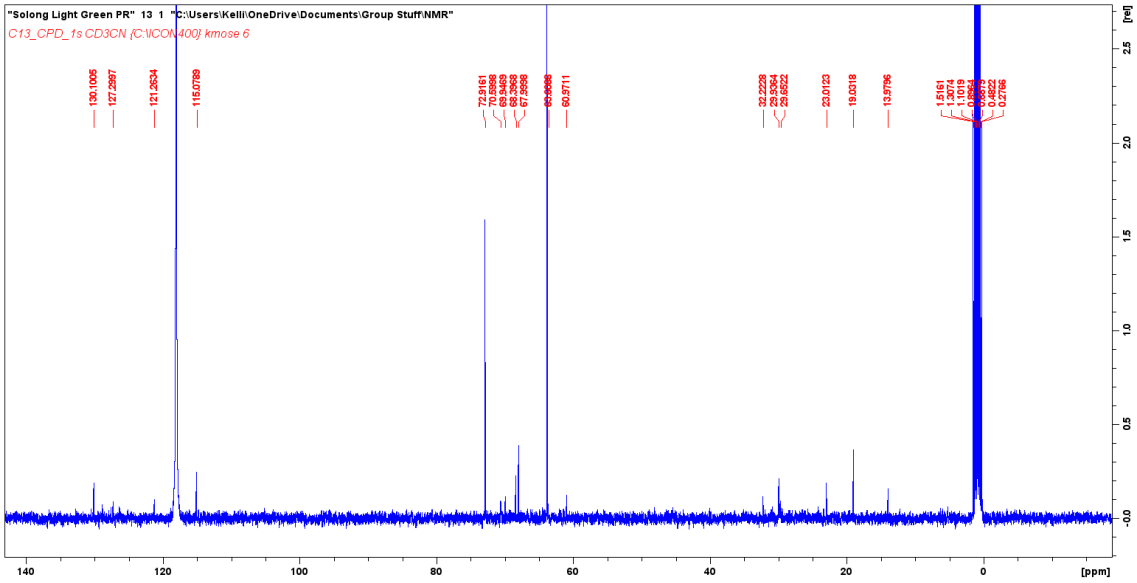

Figure S252. *^{13}C NMR of Solong Light Green pot residue in acetonitrile-d3*

Peaks at δ72.9161 ppm and δ63.6088 ppm are attributed to glycerol. Propylene glycol produces the peaks at δ19.0318 ppm, δ67.9998 ppm, and δ68.3968 ppm. 2-phenoxyethanol produces signals at δ130.1005 ppm, δ121.2634 ppm, δ115. 0789 ppm, δ69.9469 ppm, and δ60.9711 ppm. A peak is also expected at δ158 ppm but is not present due to the low concentration of the species. Benzyl alcohol produces a peak at δ127.2997 ppm. Peaks at δ140 ppm, δ128 ppm, δ126 ppm, and δ64 ppm would also be expected but are not detected due to the low concentration. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

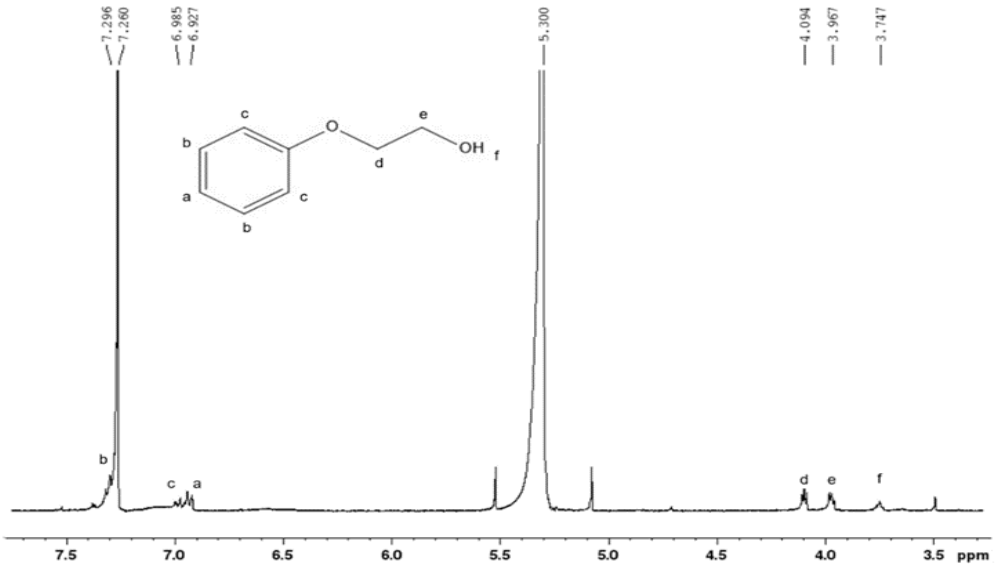

Figure S253. *^{1}H NMR spectrum of isolated 2-phenoxyethanol from Solong Light Green pot residue in chloroform-d*

The solvent peak of chloroform-d appears at δ7.26 ppm, overlapping the peak for peaks for hydrogen "b."

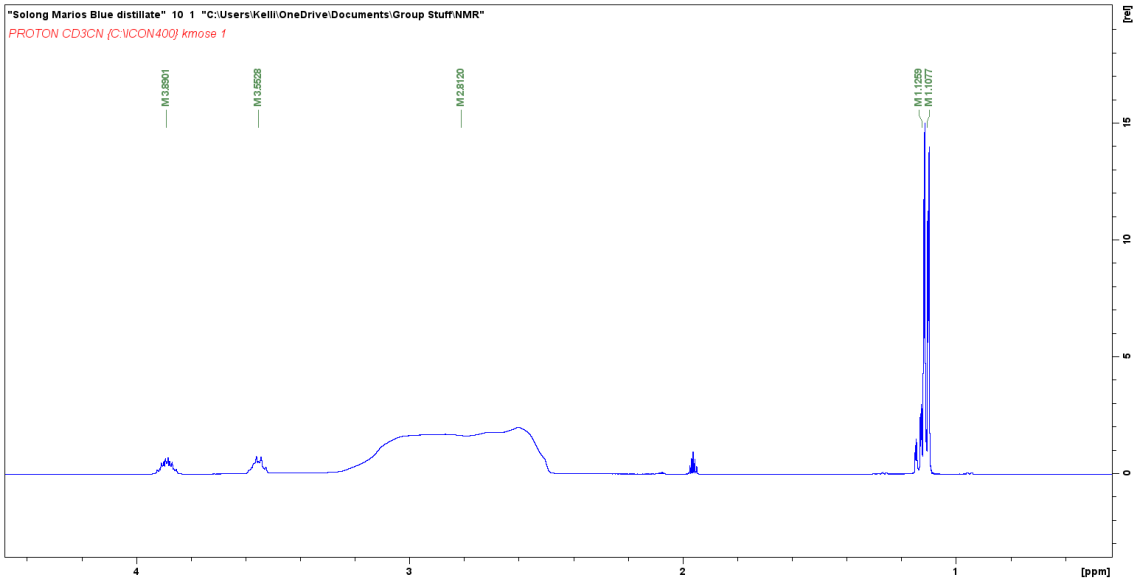

Figure S254. *^{1}H NMR of Solong Mario's Blue distillate in acetonitrile-d3*

Peaks at δ3.8901 ppm and δ1.1077 ppm are attributed to isopropanol. Ethanol produces peaks at δ3.5528 ppm and δ1.1259 ppm. Water produces a very large, broad signal around δ2.8120 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

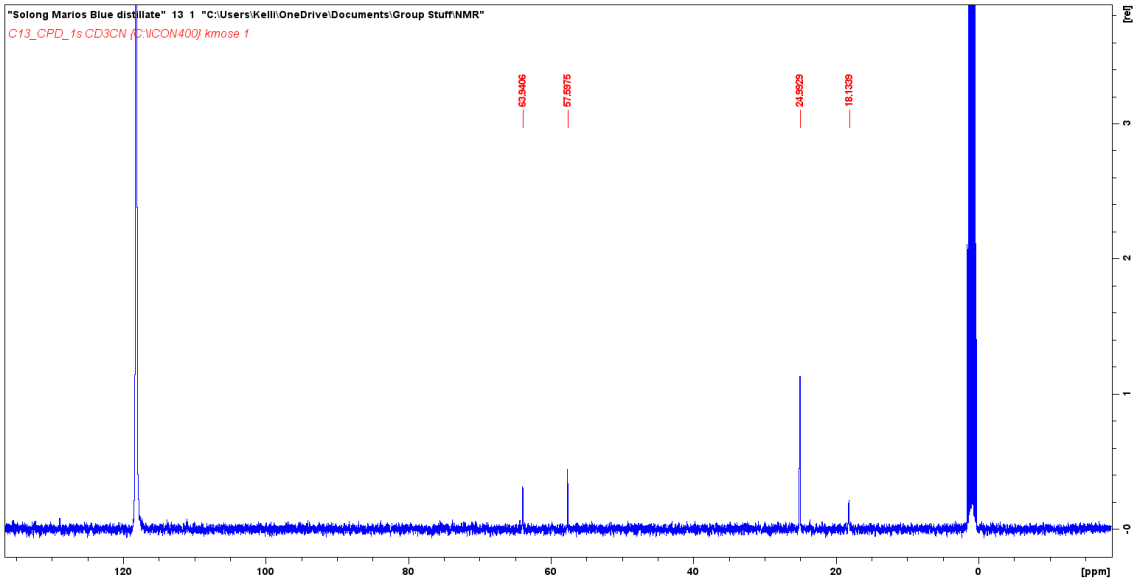

Figure S255. *^{13}C NMR of Solong Mario's Blue distillate in acetonitrile-d3*

Isopropanol produces signals at δ24.9929 ppm and δ63.9406 ppm while ethanol produces signals at δ18.1339 ppm and δ57.5975 ppm. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

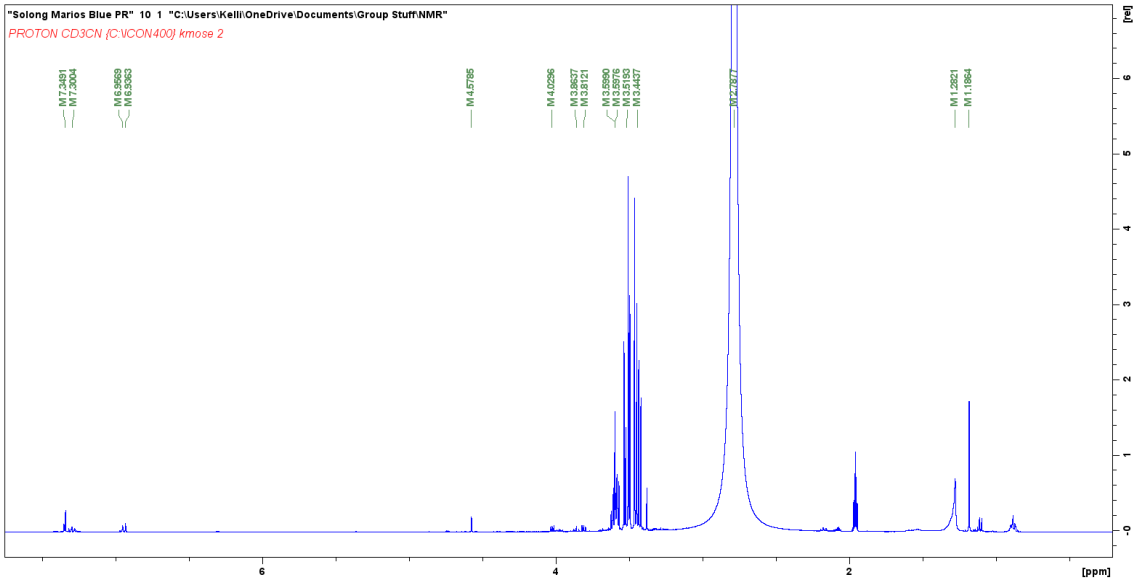

Figure S256. *^{1}H NMR of Solong Mario's Blue pot residue in acetonitrile-d3*

Benzyl alcohol produces peaks at δ7.3004 ppm, and δ4.5785 ppm. Signals consistent with 2-phenoxyethanol are also present, corresponding to the peaks at δ7.3491 ppm, δ6.9569 ppm, δ6.9363 ppm, δ4.0296 ppm, and δ3.8121 ppm. Additionally, glycerol produces multiplets at δ3.5990 ppm, δ3.5193 ppm, and δ3.4437 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

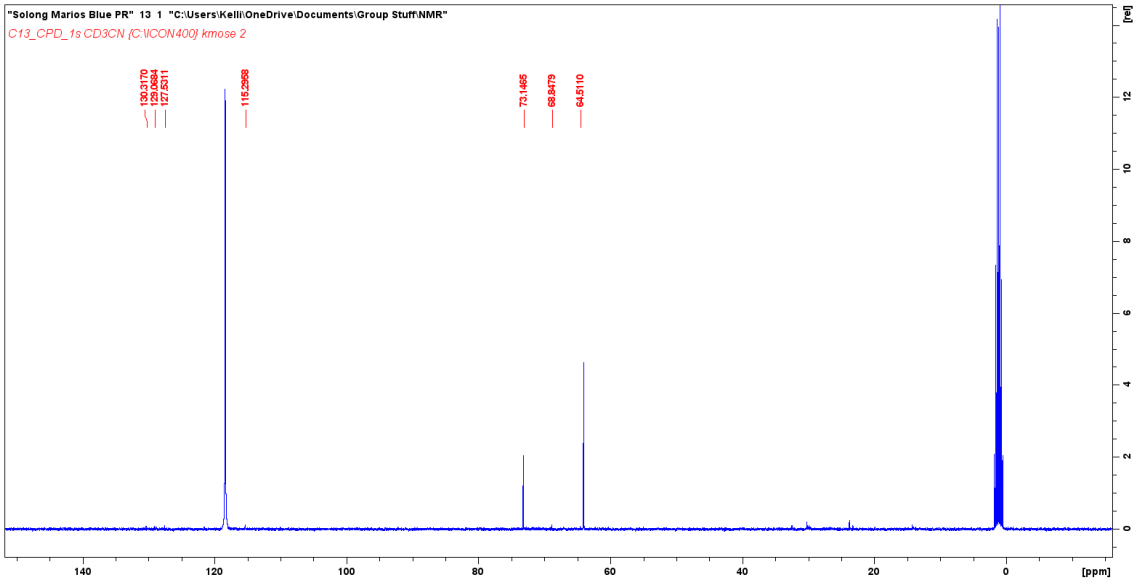

Figure S257. *^{13}C NMR of Solong Mario's Blue pot residue in acetonitrile-d3*

Glycerol signals appear at δ73.1465 ppm and δ63.9833 ppm. The remaining peaks can be attributed to either benzyl alcohol or 2-phenoxyethanol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

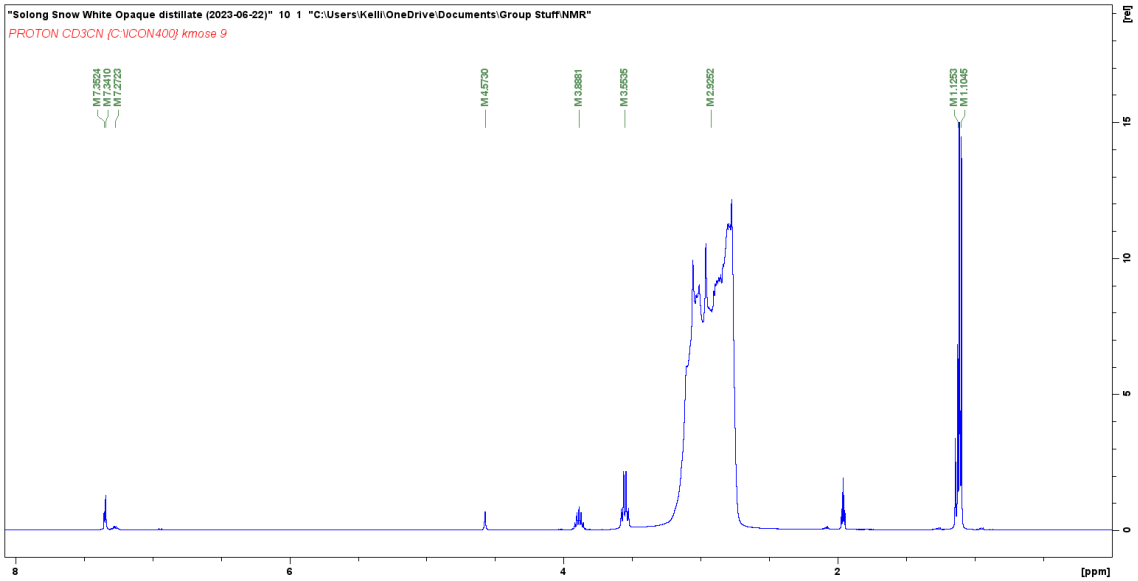

Figure S258. *^{1}H NMR of Solong Snow White Opaque distillate in acetonitrile-d3*

Benzyl alcohol produces singlet at δ4.5730 ppm, δ7.3410 ppm, and δ7.3524 ppm as well as a multiplet at δ7.2723 ppm. Isopropanol produces the doublet at δ1.1045 ppm and septet at δ3.8881 ppm. Ethanol produces a quartet at δ3.5535 ppm and a triplet at δ1.1253 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

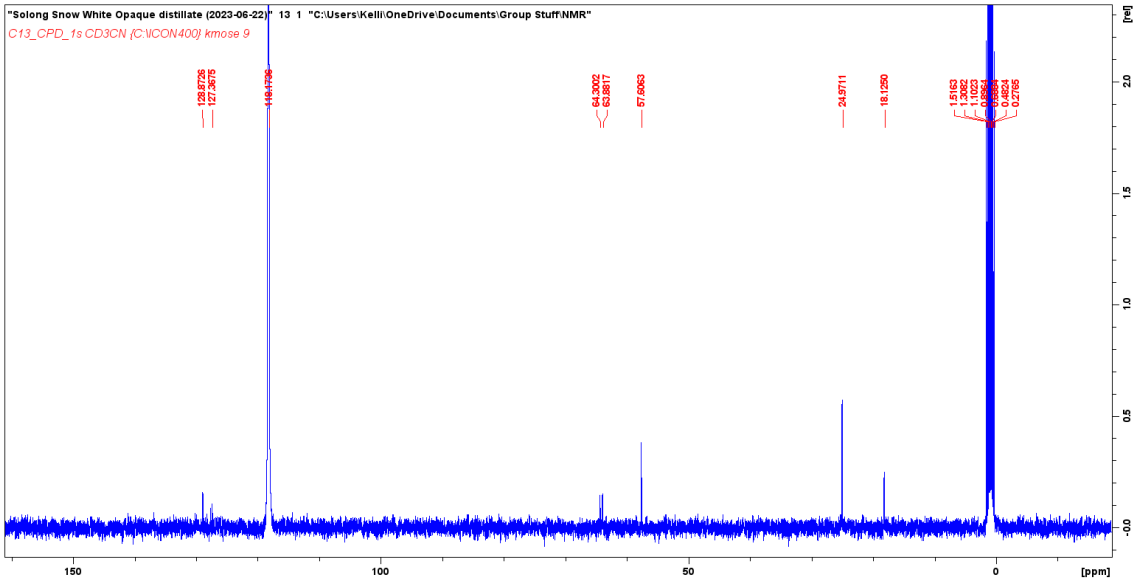

Figure S259. *^{13}C NMR of Solong Snow White Opaque distillate in acetonitrile-d3*

Benzyl alcohol produces peaks at δ128.8726 ppm, δ127.3675 ppm, and δ64.3002 ppm. Additional peaks are expected at δ140 ppm and δ126 ppm but are not observed due to low concentration of benzyl alcohol. Isopropanol produces signals at δ63.8817 ppm and δ24.9711 ppm while ethanol produces peaks at δ57.6063 ppm and δ18.1250 ppm. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

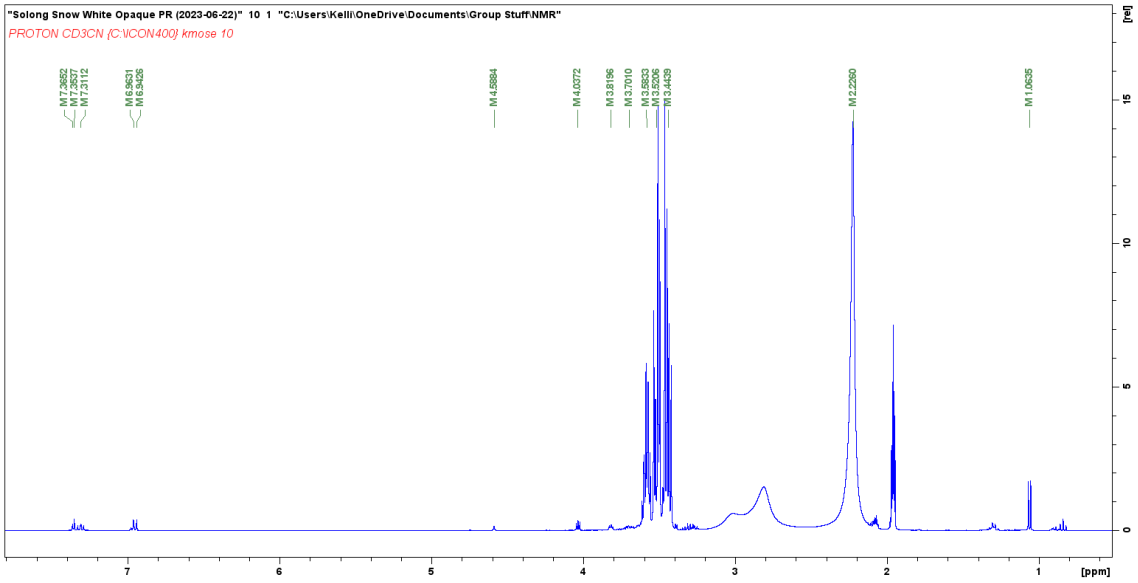

Figure S260. *^{1}H NMR of Solong Snow White Opaque pot residue in acetonitrile-d3*

Singlets at δ4.5884 ppm, δ7.3537 ppm and δ7.3652 ppm are likely from benzyl alcohol. 2-phenoxyethanol produces peaks at δ3.8196 ppm, δ4.0372 ppm, δ6.9426 ppm, δ6.9631 ppm, and δ7.3112 ppm. Glycerol produces multiplets at δ3.4439 ppm, δ3.5206 ppm, and δ3.5833 ppm. Propylene glycol may produce small signals at δ1.0635 ppm and δ3.7010 ppm, although low concentrations make this difficult to verify. The acetonitrile solvent peak is located at δ1.94 ppm.

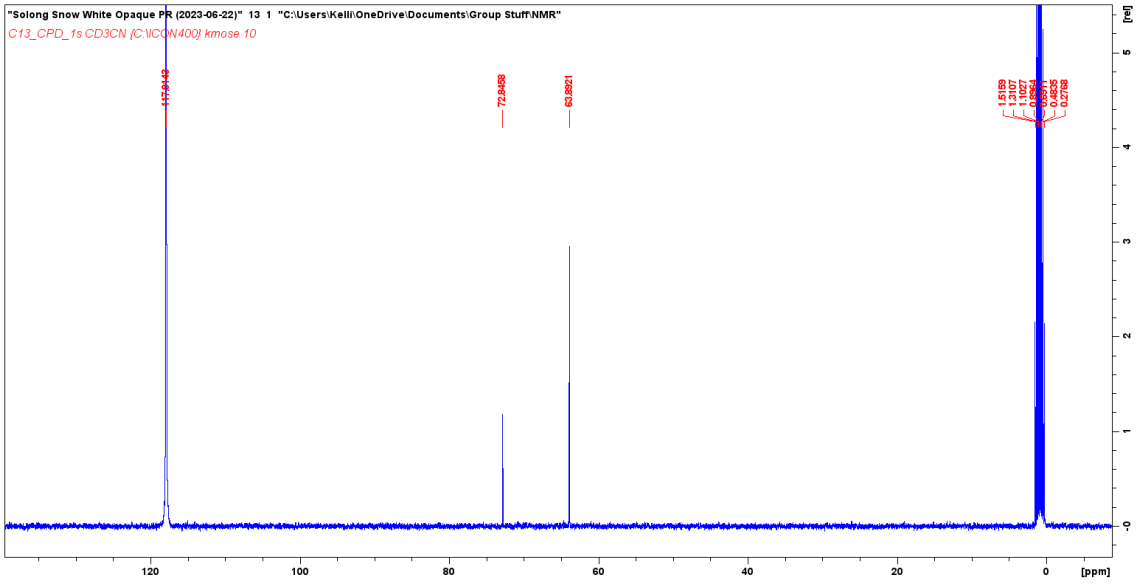

Figure S261. *^{13}C NMR of Solong Snow White Opaque pot residue in acetonitrile-d3*

Signals at δ63.8921 ppm and δ72.8458 ppm are produced by glycerol. Peaks for benzyl alcohol, 2-phenoxyethanol, and propylene glycol are not observed, possibly due to low concentrations. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

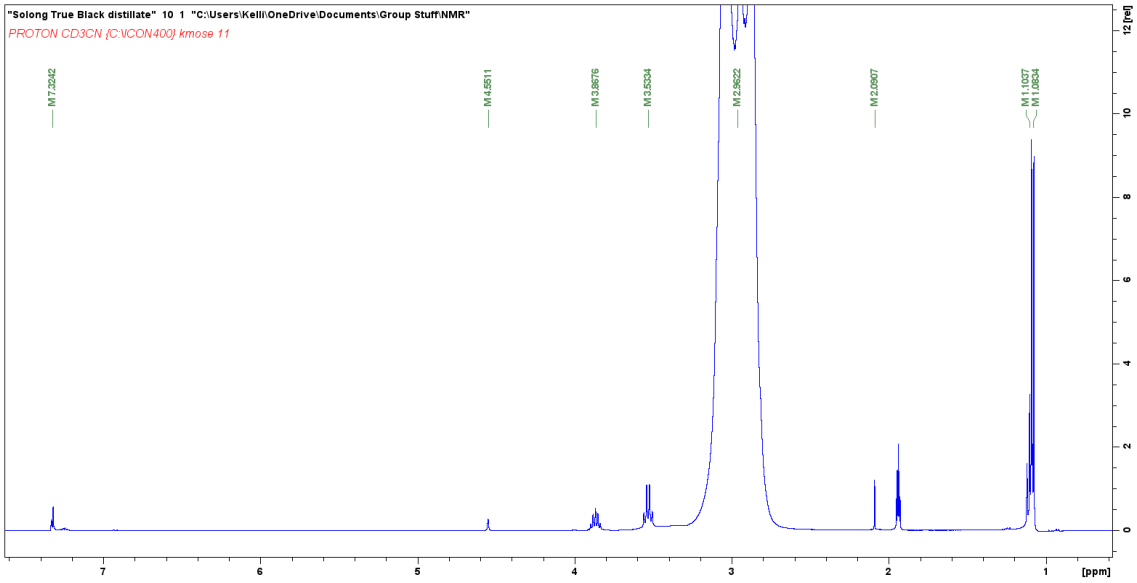

Figure S262. *[1]H NMR of Solong True Black distillate in acetonitrile-d3*

Peaks at δ7.3242 ppm and δ4.5511 ppm are produced by benzyl alcohol. A septet at δ3.8676 ppm and doublet at δ1.0834 ppm are attributed to isopropanol. Ethanol produced a quartet at δ3.5334 ppm and triplet at δ1.1037 ppm. Though the signals upfield overlap, the J-coupling constants of isopropanol and ethanol (6.10 Hz and 7.00 Hz, respectively) were used for identification. A signal at δ2.0907 ppm remains unidentified. The acetonitrile solvent peak is located at δ1.94 ppm.

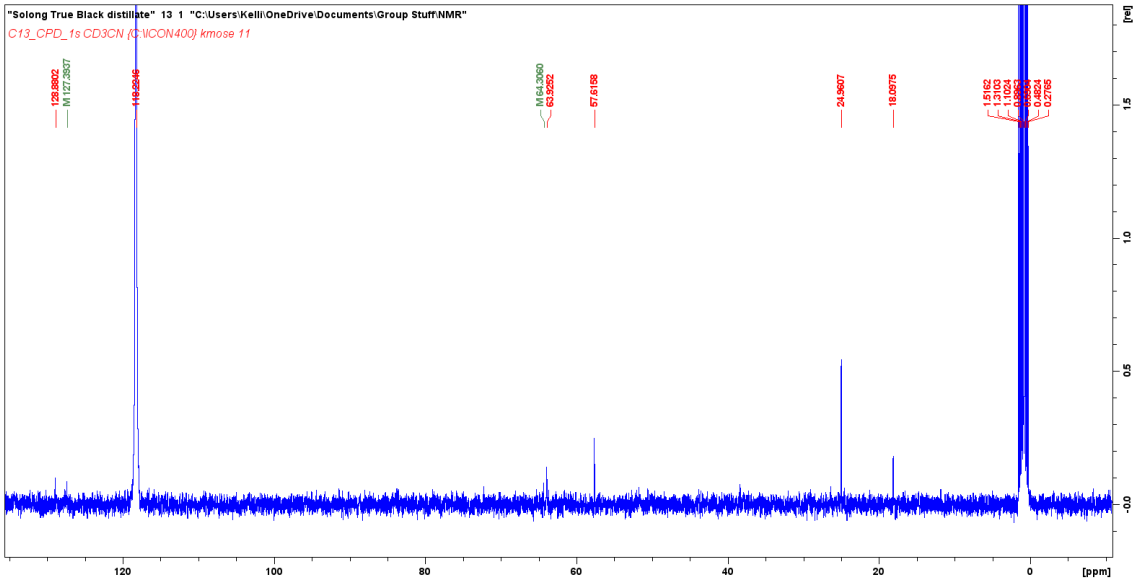

Figure S263. *[13]C NMR of Solong True Black distillate in acetonitrile-d3*

Peaks at δ128.8802 ppm, δ127.3937 ppm, and δ64.3060 ppm are produced by benzyl alcohol. Isopropanol produced peaks at δ63.9252 ppm and δ24.9607 ppm while ethanol produces the ones at δ57.6158 ppm and δ18.0975. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

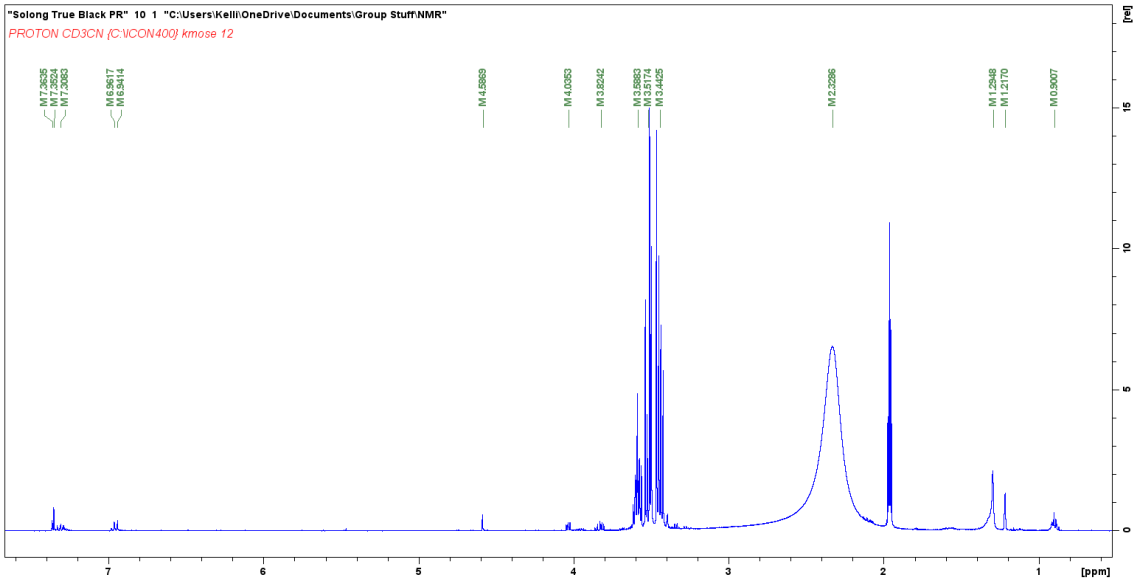

Figure S264. *^{1}H NMR of Solong True Black pot residue in acetonitrile-d3*

Peaks at δ4.5869 ppm, δ7.3524 ppm, δ7.3635 ppm, and δ4.5969 ppm are likely from benzyl alcohol. The signals at δ3.8242 ppm, δ4.0353 ppm, δ6.9414 ppm, δ6.9617 ppm, and δ7.3083 ppm are consistent with 2-phenoxyethanol. Glycerol produces multiplets at δ3.4425 ppm, δ3.5174 ppm, and δ3.5883 ppm. Other peaks present at δ0.90 ppm and δ1.12 ppm were not able to be identified. The acetonitrile solvent peak is located at δ1.94 ppm.

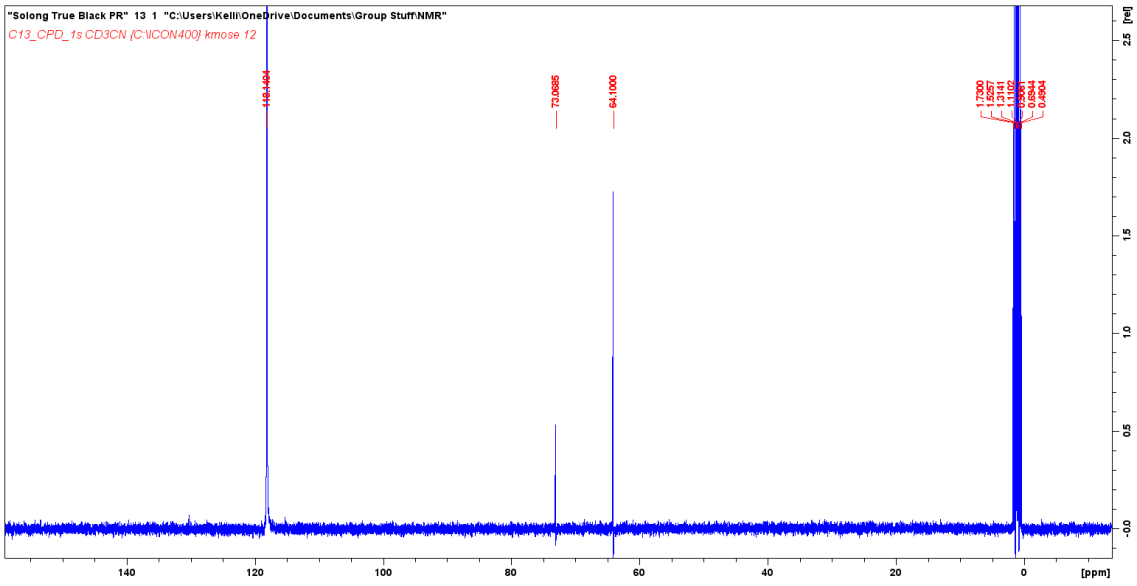

Figure S265. *^{13}C NMR of Solong True Black pot residue in acetonitrile-d3*

Signals at δ64.1000 ppm and δ73.0685 ppm are produced by glycerol. Peaks for benzyl alcohol and 2-phenoxyethanol are not present due to their low concentrations. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

8.2 Raman Data

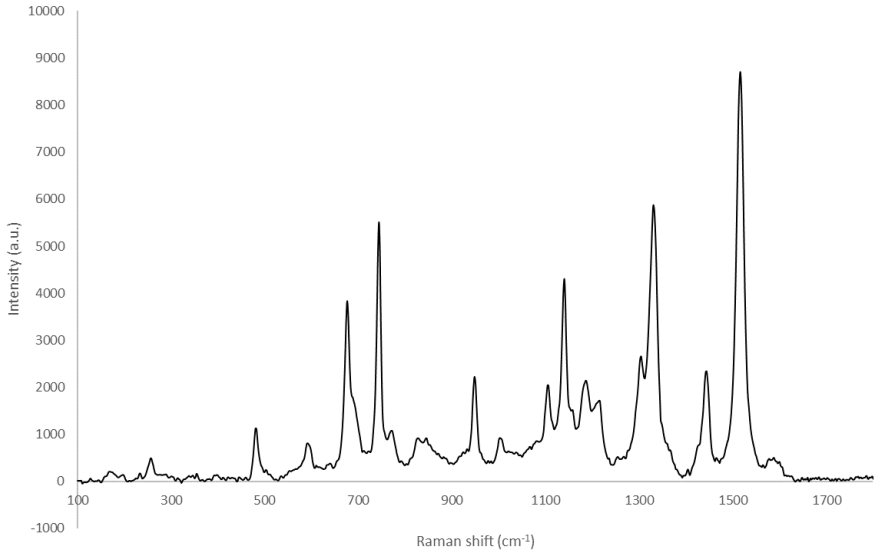

Figure S266. *Raman spectrum of Solong Light Green*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 1 average, 0 boxcar, auto-baseline on. Major peaks at 1516 cm^{-1}, 1444 cm^{-1}, 1330 cm^{-1}, 1304 cm^{-1}, 1214 cm^{-1}, 1138 cm^{-1}, 1140 cm^{-1}, 1106 cm^{-1}, 948 cm^{-1}, 744 cm^{-1}, and 676 cm^{-1} correspond to the Pigment Blue 15 Raman spectrum from the SOPRANO spectrum database.[1] A yellow pigment would be expected to be in this sample to make it green, but Raman spectroscopy cannot confirm this.

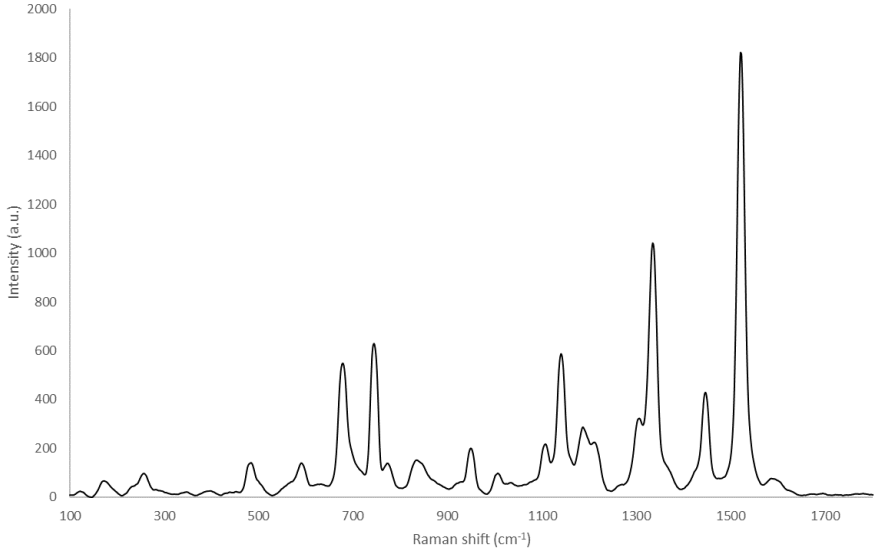

Figure S267. *Raman spectrum of Solong Mario's Blue*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 4 second integration, 3 average, 3 boxcar, auto-baseline on. Peaks at 1522 cm^{-1}, 1446 cm^{-1}, 1334 cm^{-1}, 1188 cm^{-1}, 1144 cm^{-1}, 746 cm^{-1}, and 678 cm^{-1}, match the spectrum of Pigment Blue 15 from the SOPRANO Raman spectra database.[1]

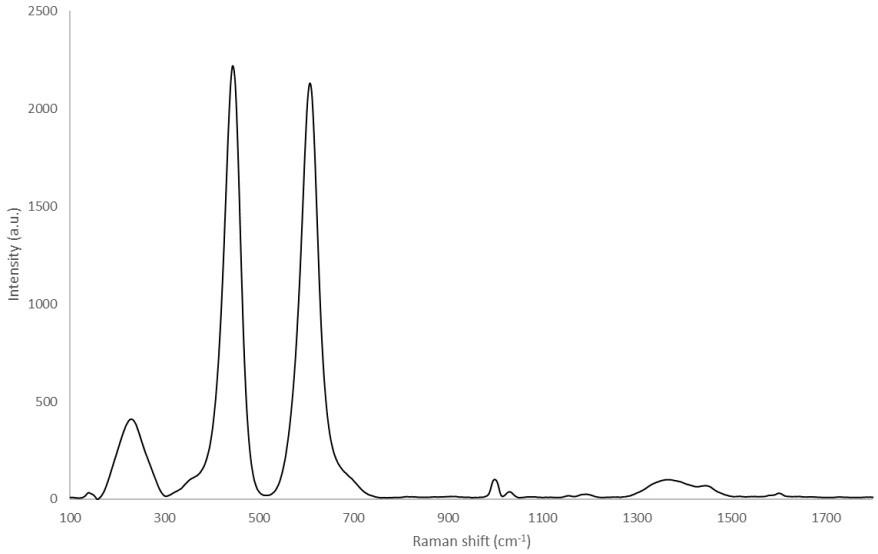

Figure S268. *Raman spectrum of Solong Snow White Opaque*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 4 second integration, 3 average, 3 boxcar, auto-baseline on. Peaks at 610 cm^{-1}, 444 cm^{-1}, and 232 cm^{-1} match the spectrum of Pigment White 6 (TiO_2) (see section 10).

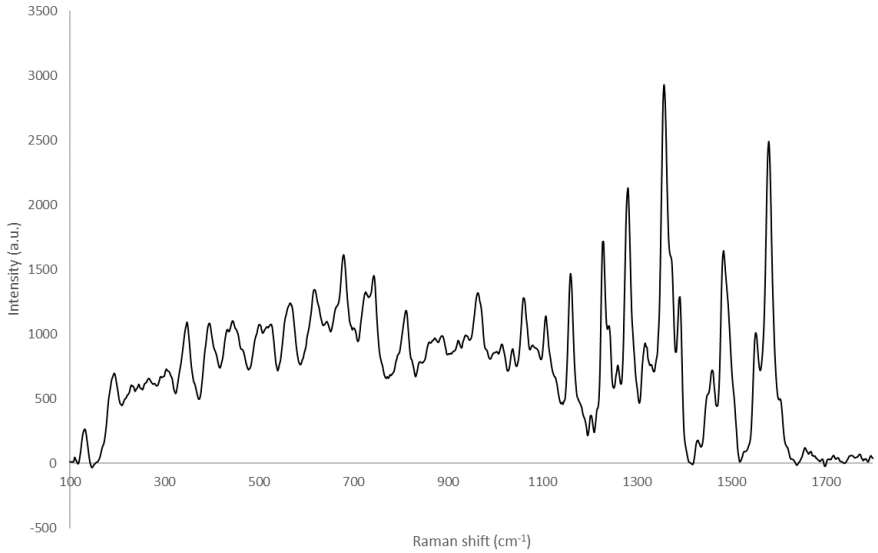

Figure S269. *Raman spectrum of Solong Bright Red*

Parameters used to obtain this spectrum are as follows: 785 nm, 100 mW, 8 second integration, 3 average, 1 boxcar, auto-baseline on. Although the spectrum is unresolved at lower wavenumbers, there are still clear peaks present. Major peaks at 1580 cm^{-1}, 1552 cm^{-1}, 1484 cm^{-1}, 1460 cm^{-1}, 1360 cm^{-1}, 1282 cm^{-1}, 1230 cm^{-1}, and 1162 cm^{-1} are similar to those in Pigment Red 112 spectrum from the SOPRANO Raman spectra database.[1]

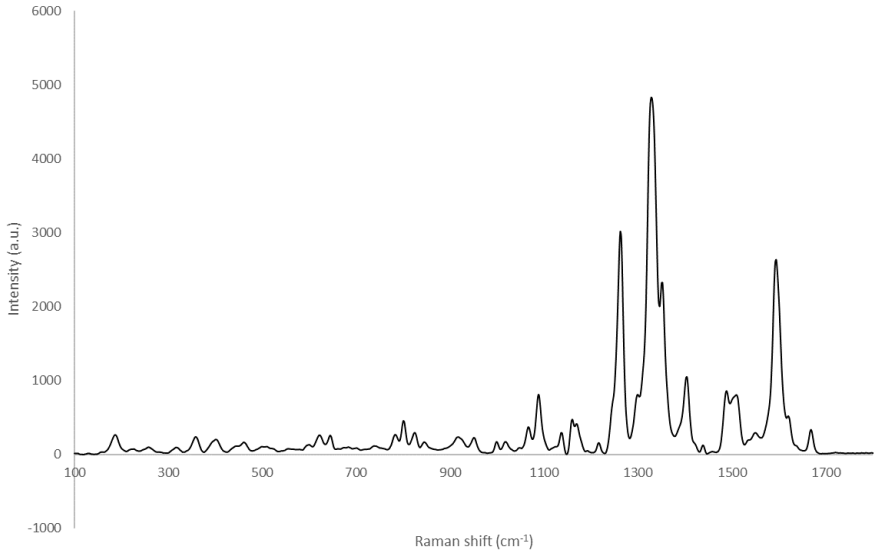

Figure S270. *Raman spectrum of Solong Lemon Yellow*

Parameters used to obtain this spectrum are as follows: 785 nm, 150 mW, 5 second integration, 2 average, 1 boxcar, auto-baseline on. Peaks at 1592 cm^{-1}, 1404 cm^{-1}, 1330 cm^{-1}, and 1262 cm^{-1} match closely to those in the Pigment Yellow 74 Raman spectrum from the SOPRANO Raman spectra database.[1]

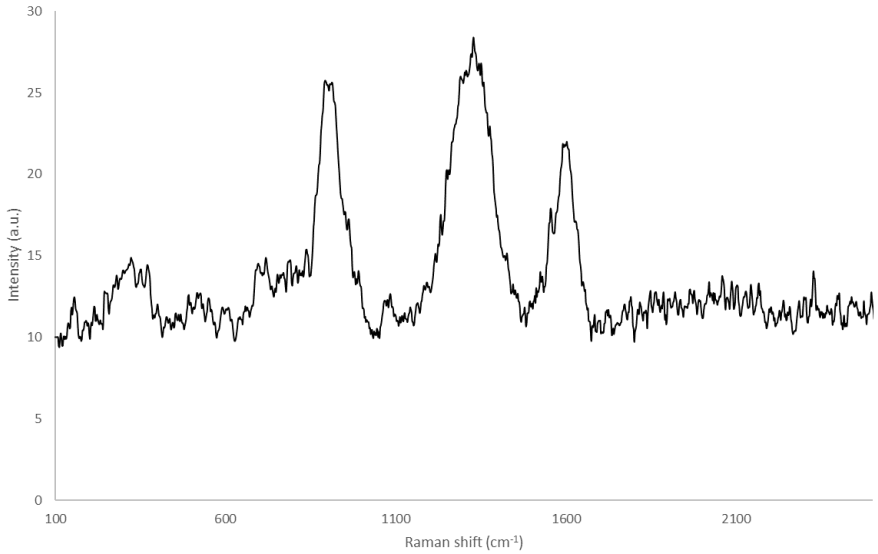

Figure S271. *X-ray fluorescence spectrum of Solong True Black*

Parameters used to obtain this spectrum are as follows: 785 nm, 200.mW, 10 second integration, 3 average, 2 boxcar, auto-baseline on. Peaks at 1582 cm^{-1}, 1326 cm^{-1}, and 908 cm^{-1}, match the peaks from a carbon black Raman spectrum (see section 10).

8.3 XRF Data

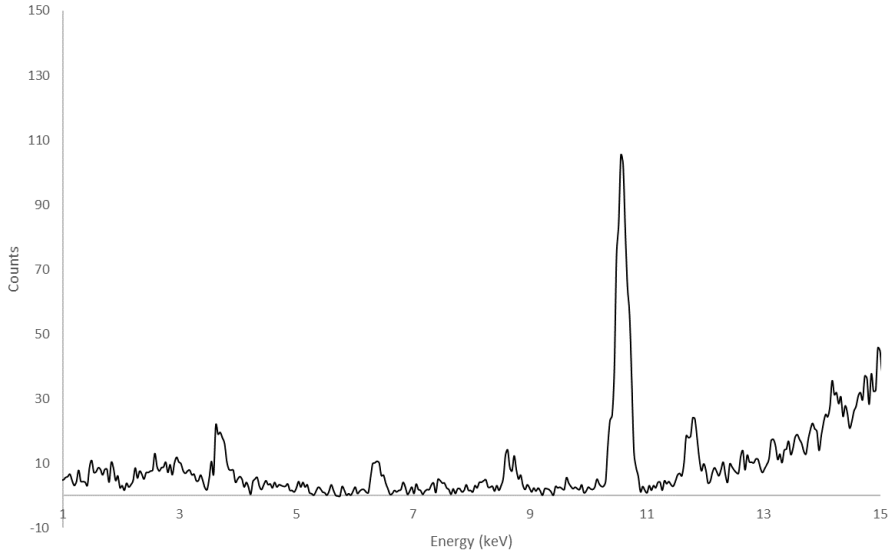

Figure S272. *X-ray fluorescence spectrum of Solong Bright Red*

The only major peaks at 10.56 keV and 11.83 keV correspond to the $K\alpha_1$ and $K\beta_1$ lines of arsenic which is present in the glass microscope slide used to dry the ink sample on.

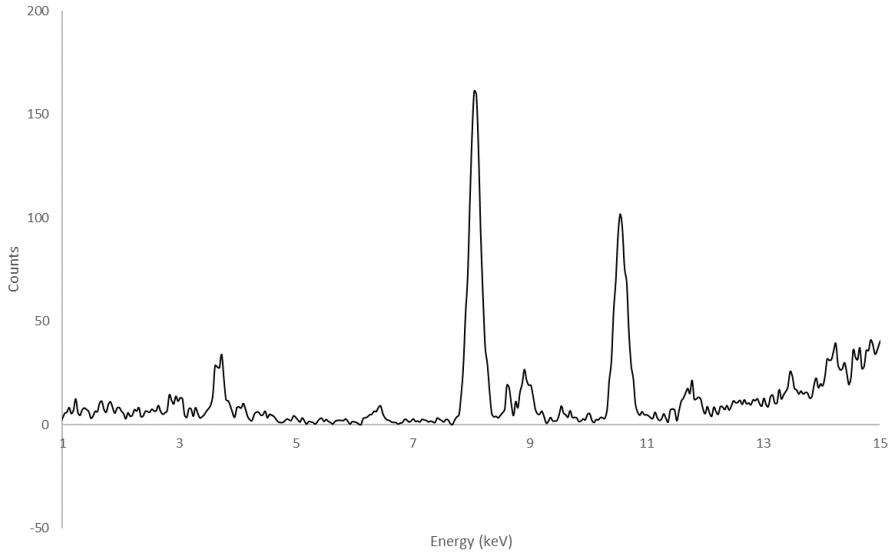

Figure S273. *X-ray fluorescence spectrum of Solong Mario's Blue*

Peaks at 8.10 keV and 8.92 keV correspond to the $K\alpha_1$ and $K\beta_1$ lines of copper, confirming the presence of the copper containing Pigment Blue 15. Other peaks at 10.56 keV and 11.79 keV correspond to the $K\alpha_1$ and $K\beta_1$ lines of arsenic that is present in the glass microscope slide used to dry the ink on.

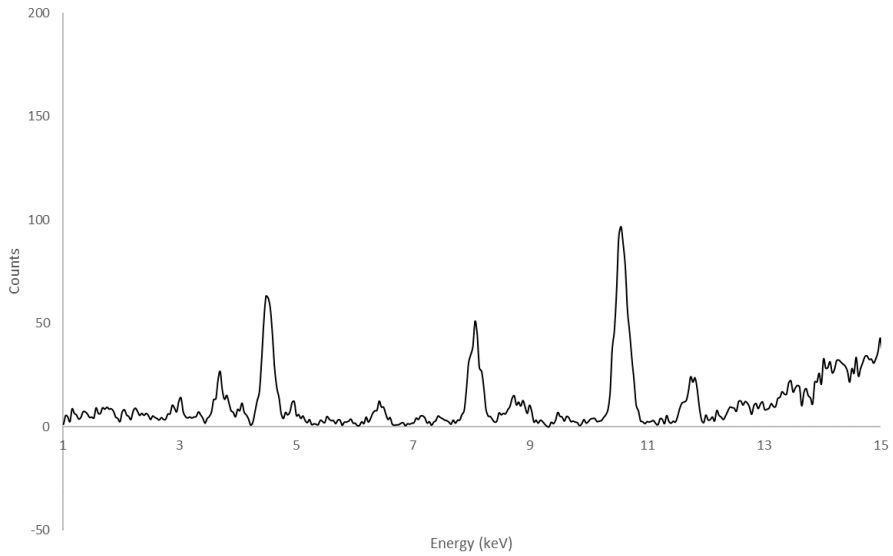

Figure S274. *X-ray fluorescence spectrum of Solong Light Green*

A peak pair at 4.52 keV and 4.96 keV are attributed to titanium, likely from Pigment White 6. Peaks at 8.06 keV and 8.73 keV are attributed to the $K\alpha_1$ and $K\beta_1$ lines of copper. Peaks at 10.56 keV and 11.83 keV correspond to the $K\alpha_1$ and $K\beta_1$ lines of arsenic present in the glass microscope slide the sample is dried on.

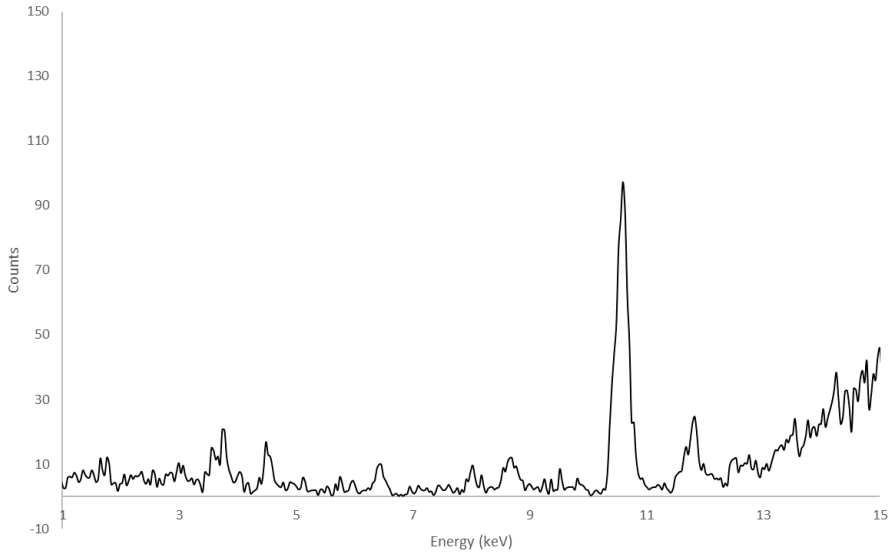

Figure S275. *X-ray fluorescence spectrum of Solong Lemon Yellow*

Peaks at 10.60 keV and 11.83 keV are attributed to the $K\alpha_1$ and $K\beta_1$ lines of arsenic that is present in the glass microscope slide on which the sample is dried.

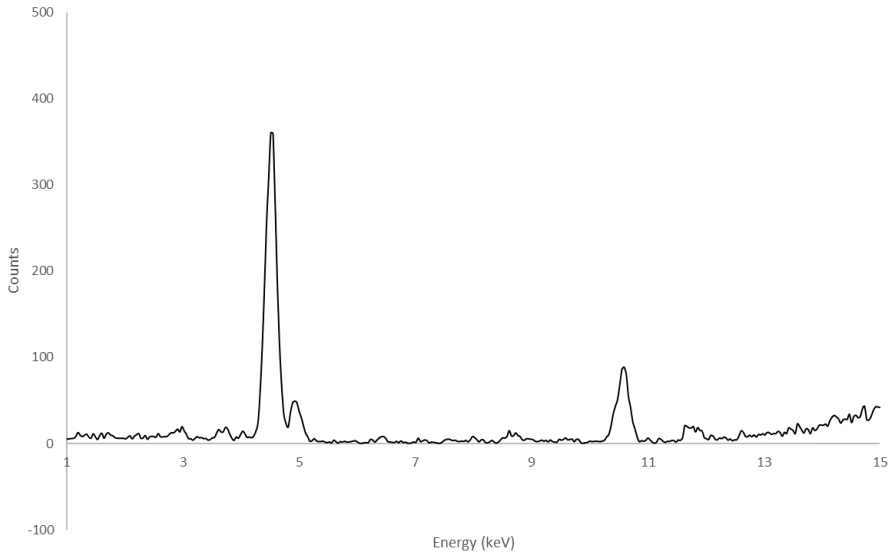

Figure S276. *X-ray fluorescence spectrum of Solong Snow White Opaque*

Peaks at 4.55 keV and 4.96 keV are attributed to the $K\alpha_1$ and $K\beta_1$ lines of titanium, confirming the presence of Pigment White 6 (titanium dioxide). Peaks at 10.60 keV and 11.86 keV correspond to the $K\alpha_1$ and $K\beta_1$ lines of arsenic which is present in the glass microscope slide used to dry the sample on.

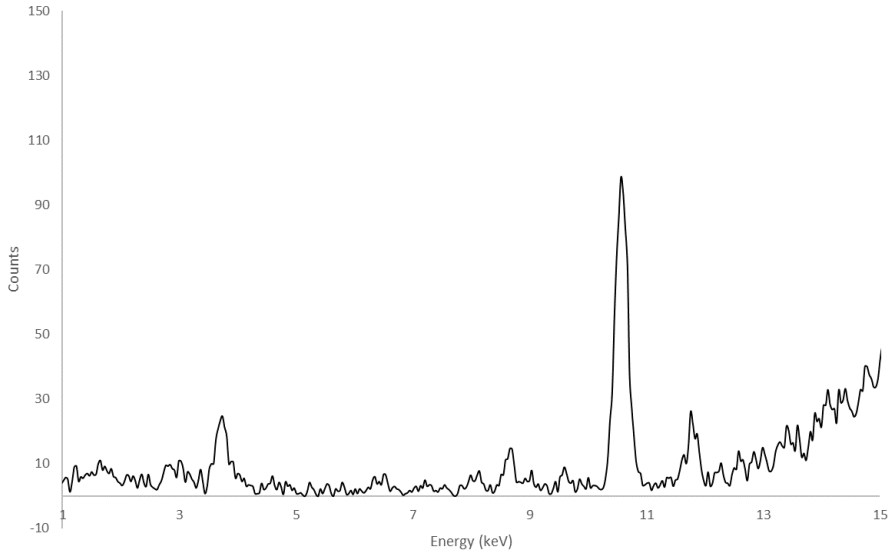

Figure S277. *X-ray fluorescence spectrum of Solong True Black*

The only major peak pair, occurring at 10.56 keV and 11.75 keV, is attributed to the $K\alpha_1$ and $K\beta_1$ lines of arsenic. Arsenic can be found in the glass microscope slide used to dry the sample on.

9. One Tattoo World

9.1 NMR Data

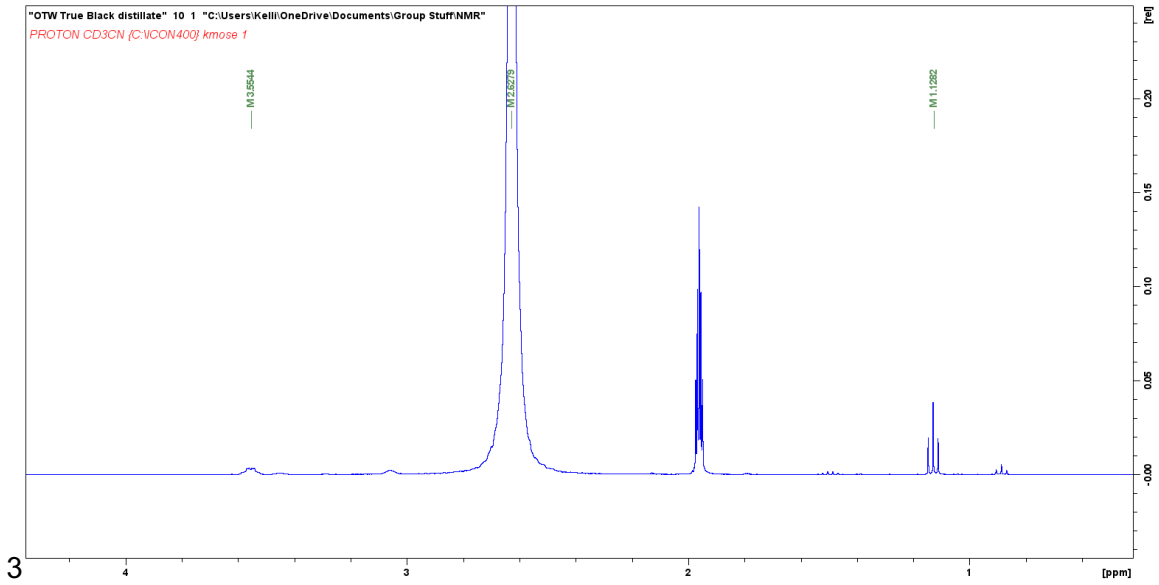

Figure S278. *^{1}H NMR of One Tattoo World True Black distillate in acetonitrile-d3*

A triplet at δ1.1282 ppm and multiplet at δ3.5544 ppm indicate that ethanol is present in the carrier solution of this tattoo ink. A large singlet at δ2.6279 ppm can be attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

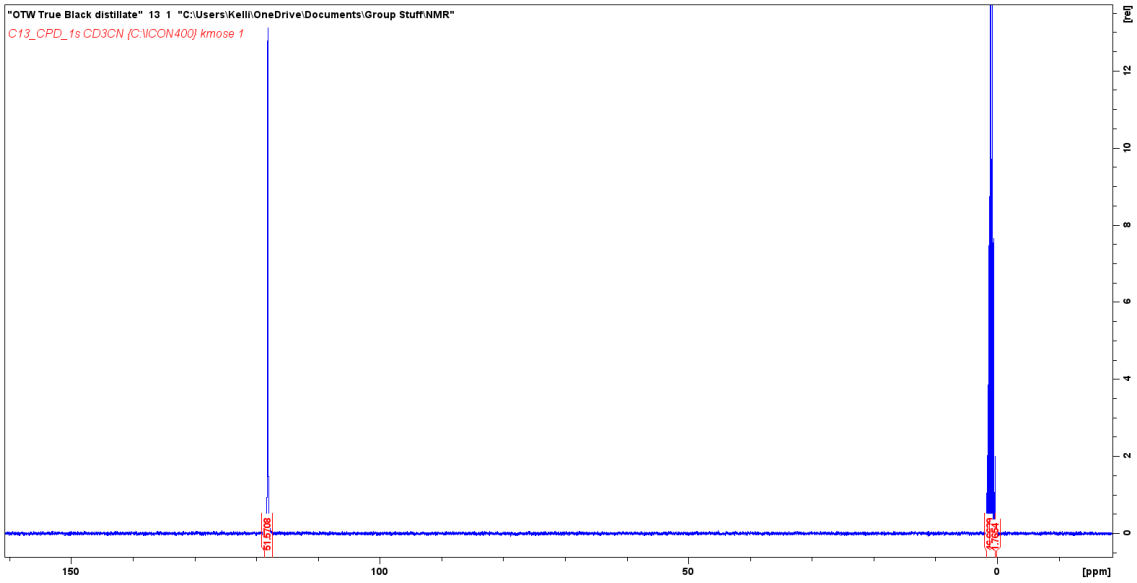

Figure S279. *^{13}C NMR of One Tattoo World True Black distillate in acetonitrile-d3*

There are no peaks present in this spectrum, likely due to the low concentration of ethanol. Additionally, the lack of peaks supports water being present. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

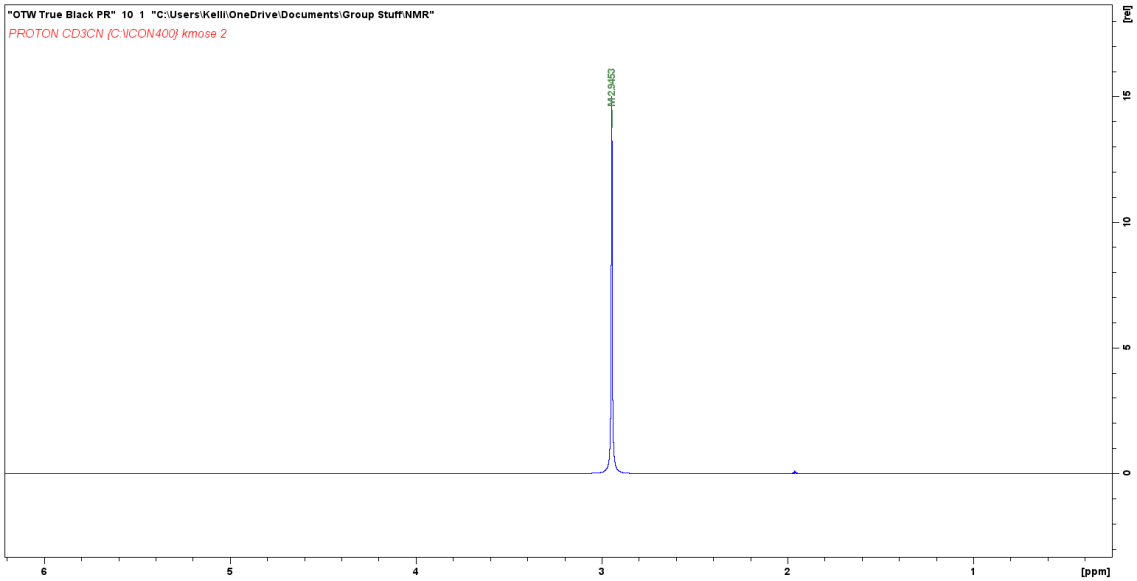

Figure S280. *^{1}H NMR of One Tattoo World True Black pot residue in acetonitrile-d3*

The only peak found in this sample appears at δ2.9453 ppm which is indicative of water present in this sample.

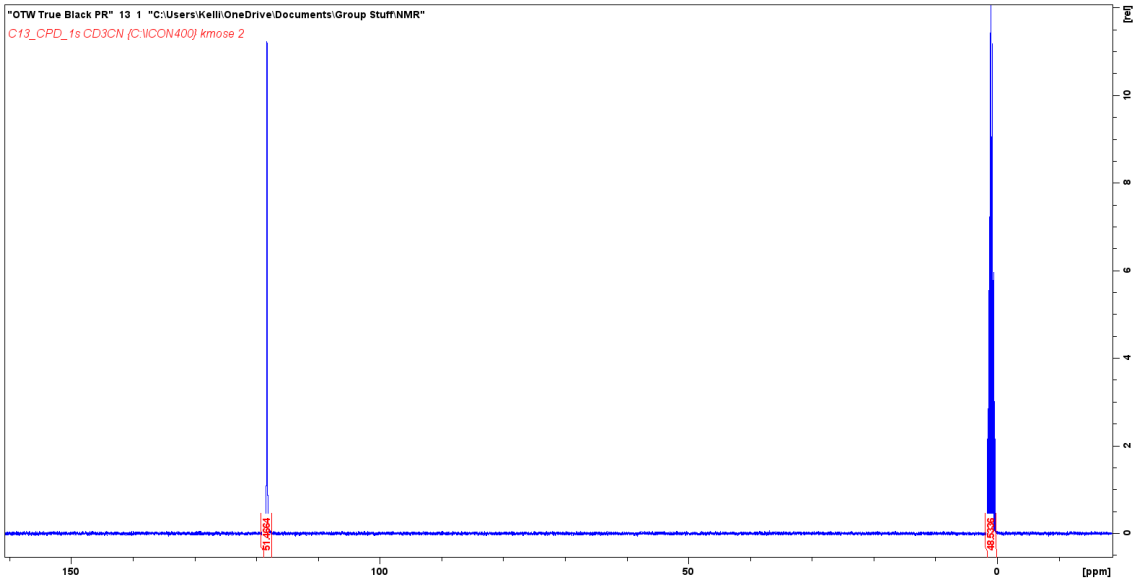

Figure S281. *^{13}C NMR of One Tattoo World True Black pot residue in acetonitrile-d3*

No other peaks, besides solvent peaks, are present in the spectrum which confirms the presence of water in the tattoo ink. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

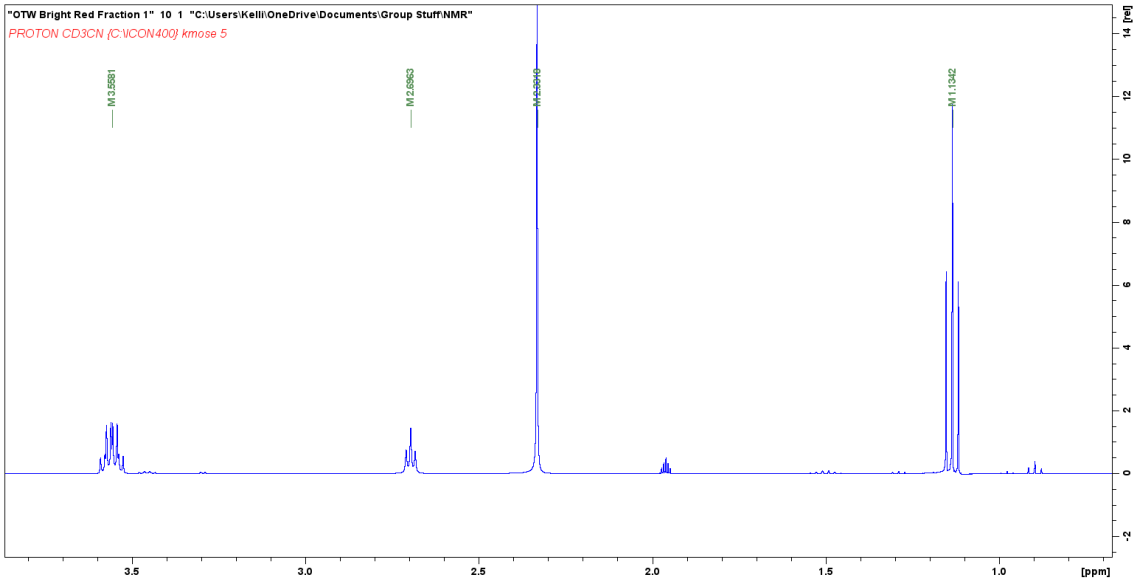

Figure S282. *^{1}H NMR of One Tattoo World Bright Red distillate in acetonitrile-d3*

Peaks at δ1.1342 ppm (triplet), δ2.6963 ppm (triplet) and δ3.5581 ppm (multiplet) are attributed to ethanol. The singlet at δ2.3318 ppm is produced by water. The acetonitrile solvent peak is located at δ1.94 ppm.

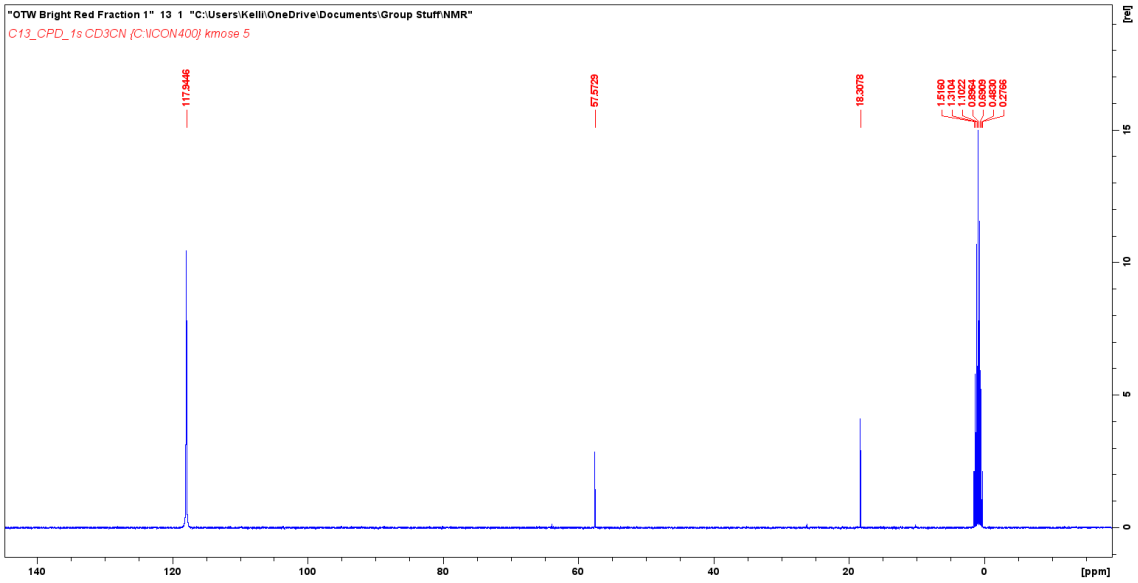

Figure S283. *^{13}C NMR of One Tattoo World Bright Red distillate in acetonitrile-d3*

Peaks at δ18.3078 ppm and δ57.5729 ppm are attributed to ethanol. The lack of other peaks indicate that water is present in the sample. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

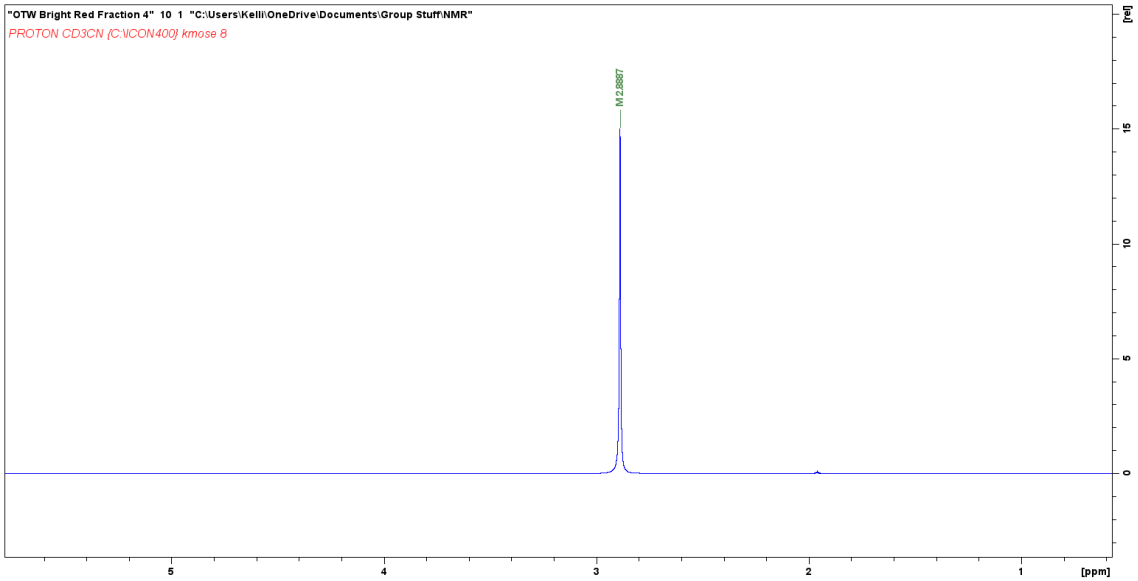

Figure S284. *^{1}H NMR of One Tattoo World Bright Red pot residue in acetonitrile-d3*

A singlet at δ2.8887 ppm is attributed to water.

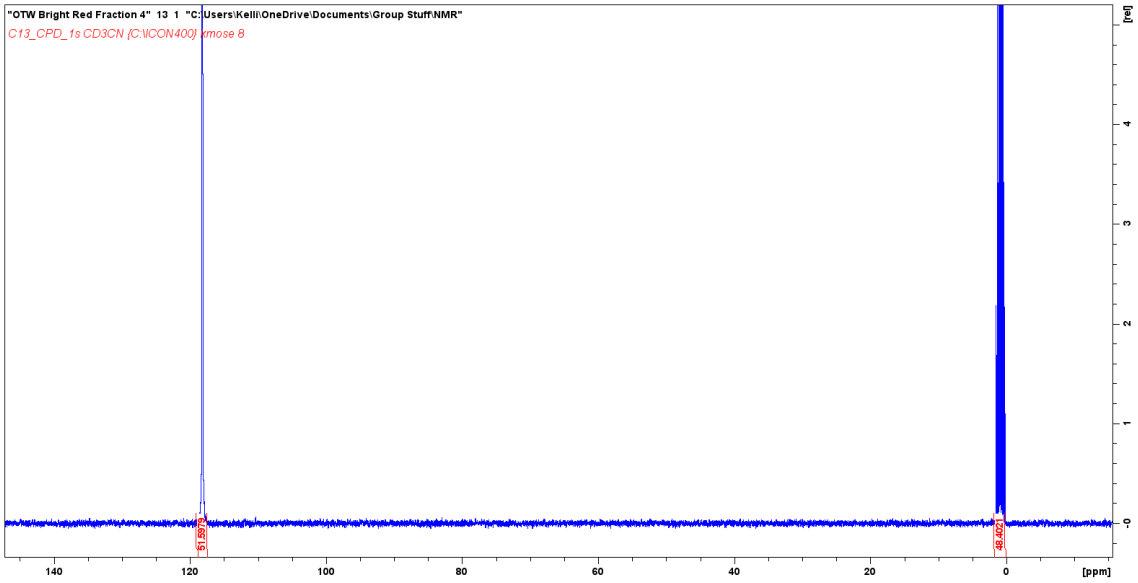

Figure S285. *^{13}C NMR of One Tattoo World Bright Red pot residue in acetonitrile-d3*

No other peaks, besides solvent peaks, are present in the spectrum which confirms the presence of water in the tattoo ink. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

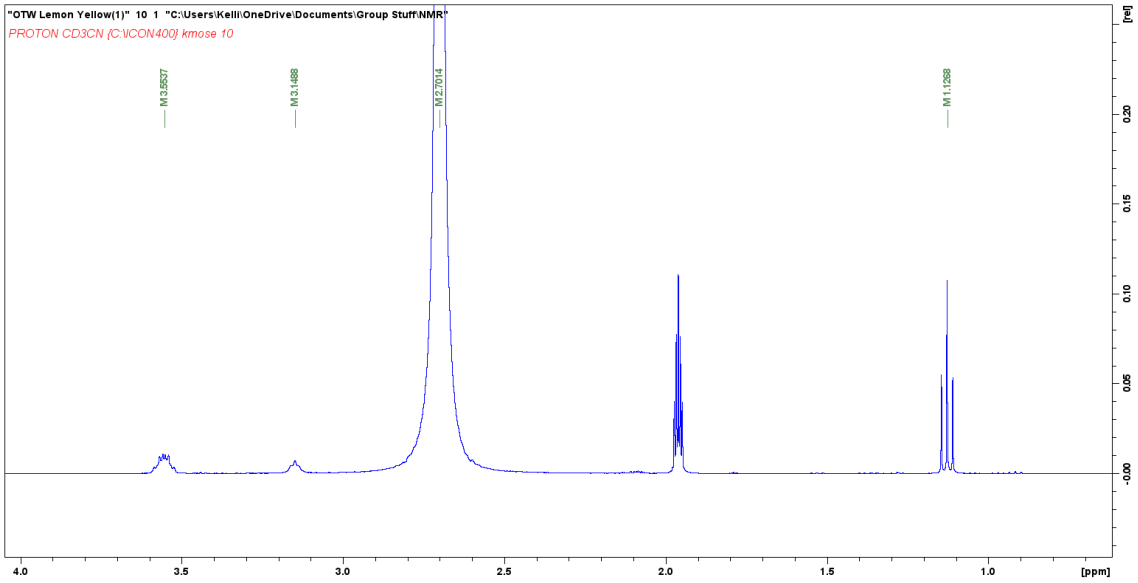

Figure S286. *^{1}H NMR of One Tattoo World Lemon Yellow distillate in acetonitrile-d3*

Triplets at δ1.1268 ppm and δ3.1488 ppm and the multiplet at δ3.5537 ppm are produced by ethanol. Water produces a singlet at δ2.7014 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

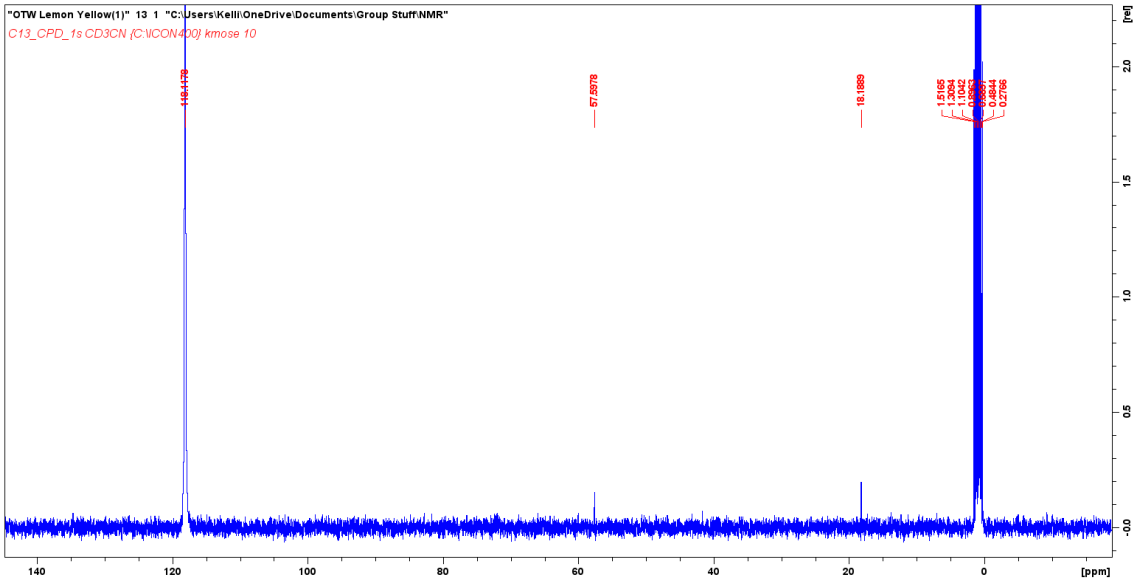

Figure S287. *^{13}C NMR of One Tattoo World Lemon Yellow distillate in acetonitrile-d3*

Peaks at δ18.1889 ppm and δ57.5978 ppm are produced by ethanol. The lack of other signals confirms that the singlet at δ2.7014 ppm from the ^{1}H NMR spectrum is water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

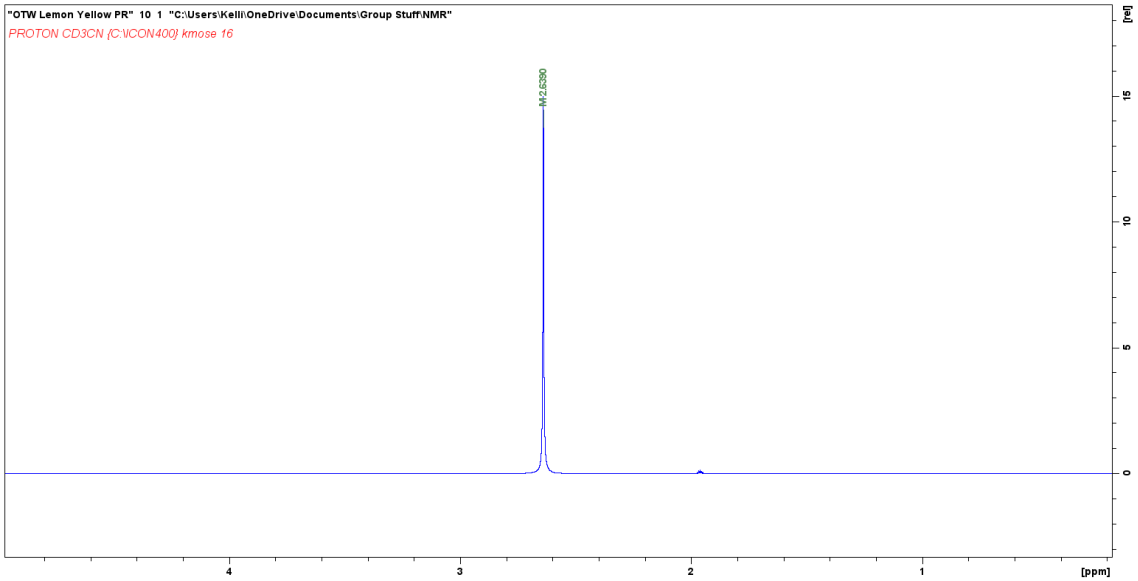

Figure S288. *^{1}H NMR of One Tattoo World Lemon Yellow pot residue in acetonitrile-d3*

A singlet at δ2.6390 ppm can be attributed to water.

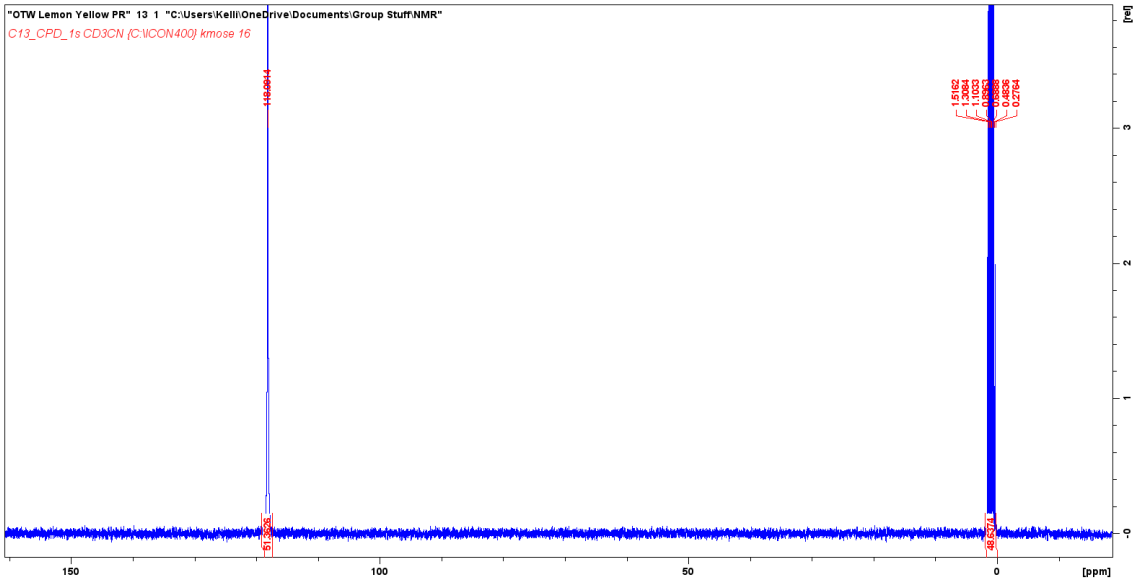

Figure S289. *^{13}C NMR of One Tattoo World Lemon Yellow pot residue in acetonitrile-d3*

No other peaks, besides solvent peaks, are present in the spectrum which confirms the presence of water in the tattoo ink. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

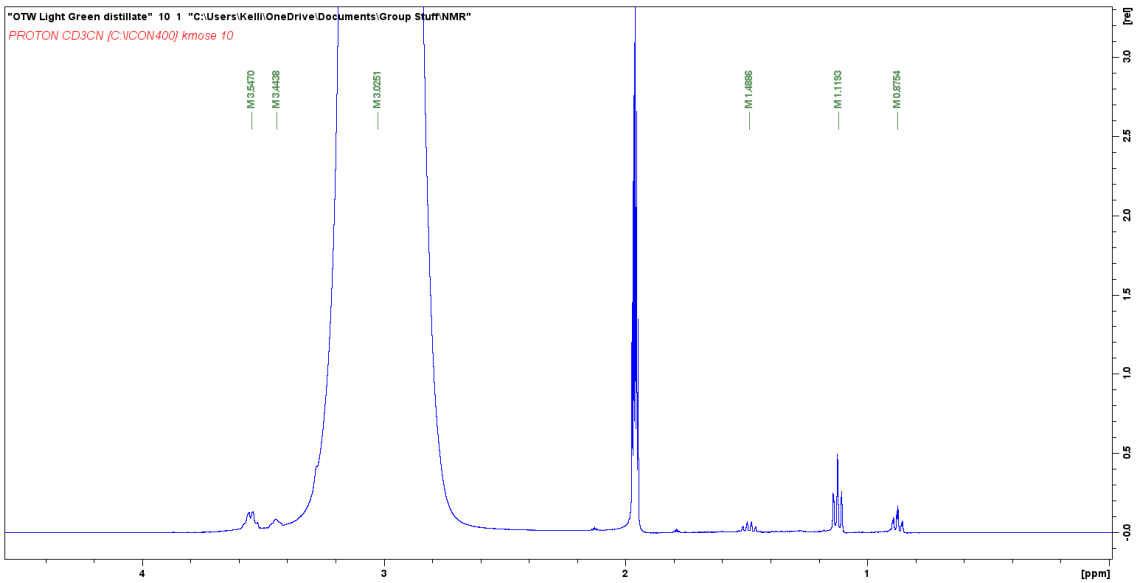

Figure S290. *^{1}H NMR of One Tattoo World Light Green distillate in acetonitrile-d3*

Peaks at δ1.1193 ppm (triplet) and δ3.5470 ppm (quartet) are attributed to ethanol. A triplet at δ0.8754 ppm, triplet at δ3.4438 ppm and sextet at δ1.4886 ppm may be produced by 1-propanol. The acetonitrile solvent peak is located at δ1.94 ppm.

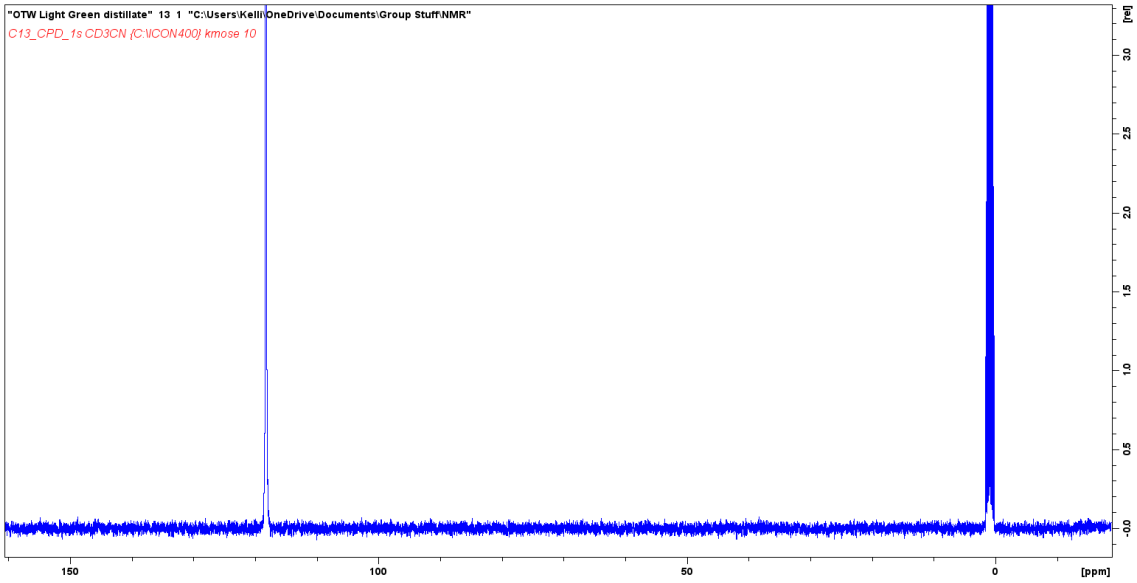

Figure S291. *^{13}C NMR of One Tattoo World Light Green distillate in acetonitrile-d3*

Peaks would be expected at δ18 ppm and δ57 ppm for ethanol and δ10 ppm, δ26 ppm, and δ64 ppm for 1-propanol but are not detected due to their low concentrations. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

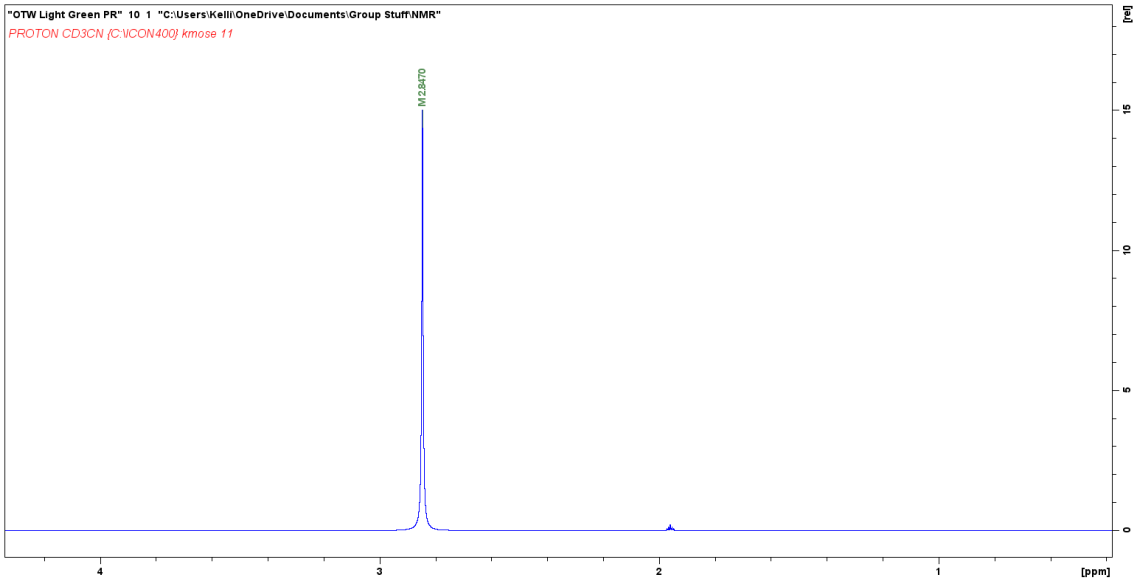

Figure S292. *^{1}H NMR of One Tattoo World Light Green pot residue in acetonitrile-d3*

The singlet at δ2.8470 ppm can be attributed to water.

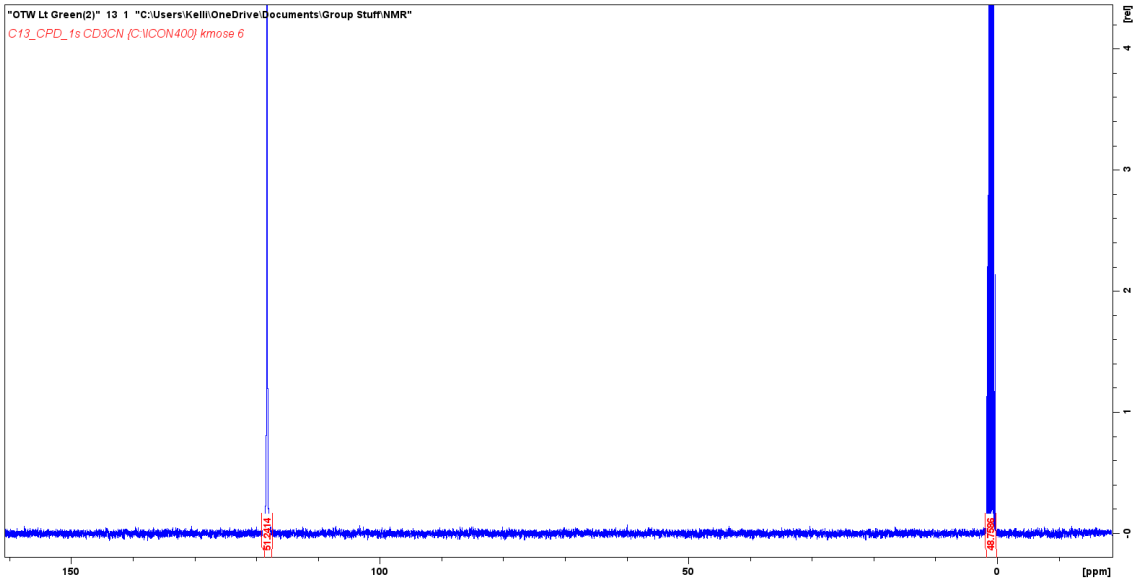

Figure S293. *^{13}C NMR of One Tattoo World Light Green pot residue in acetonitrile-d3*

No other peaks, besides solvent peaks, are present in the spectrum which confirms the presence of water in the tattoo ink. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

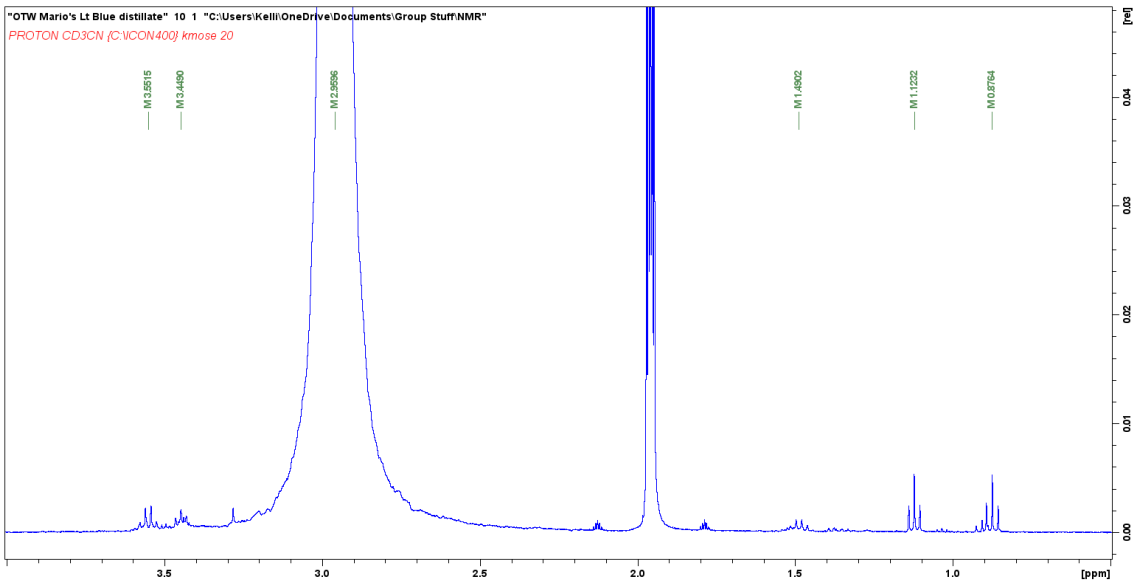

Figure S294. *^{1}H NMR of One Tattoo World Mario's Light Blue distillate in acetonitrile-d3*

Trace amounts of ethanol and 1-propanol are present in the sample. Ethanol presents a triplet at δ1.1232 ppm and a quartet at δ3.5515 ppm. 1-propanol presents a triplet at δ0.8764 ppm, a multiplet at δ1.4902 ppm, and a triplet at δ3.4490 ppm. Water produces a large singlet at δ2.9596 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

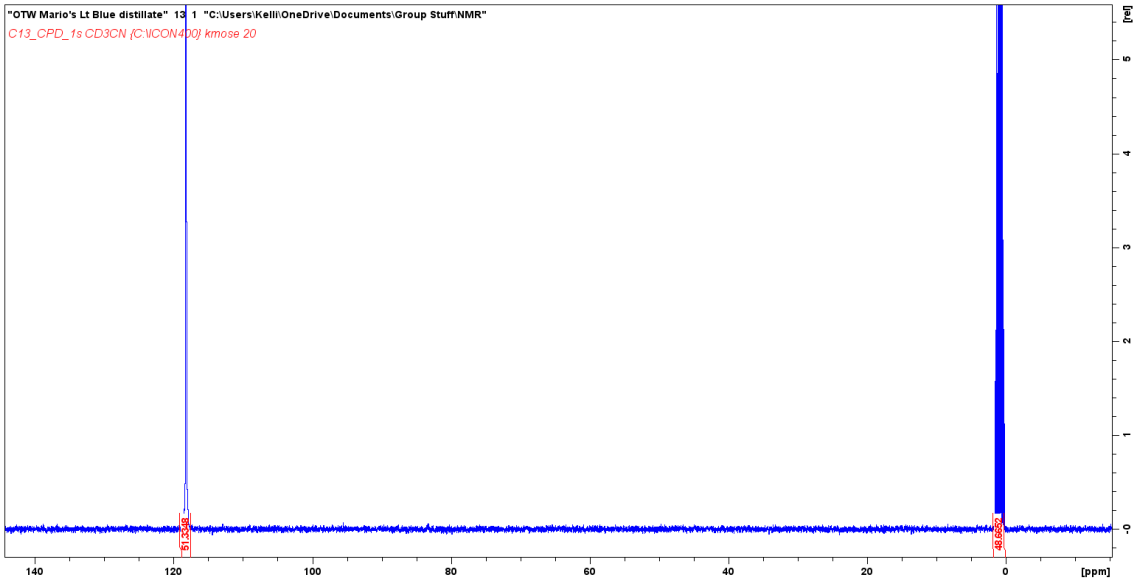

Figure S295. *^{13}C NMR of One Tattoo World Mario's Light Blue distillate in acetonitrile-d3*

Signals are expected at δ18 ppm and δ57 ppm for ethanol and at δ10 ppm, δ26 ppm, and δ64 ppm for 1-propanol. There are no signals due to the very small concentrations of each component. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

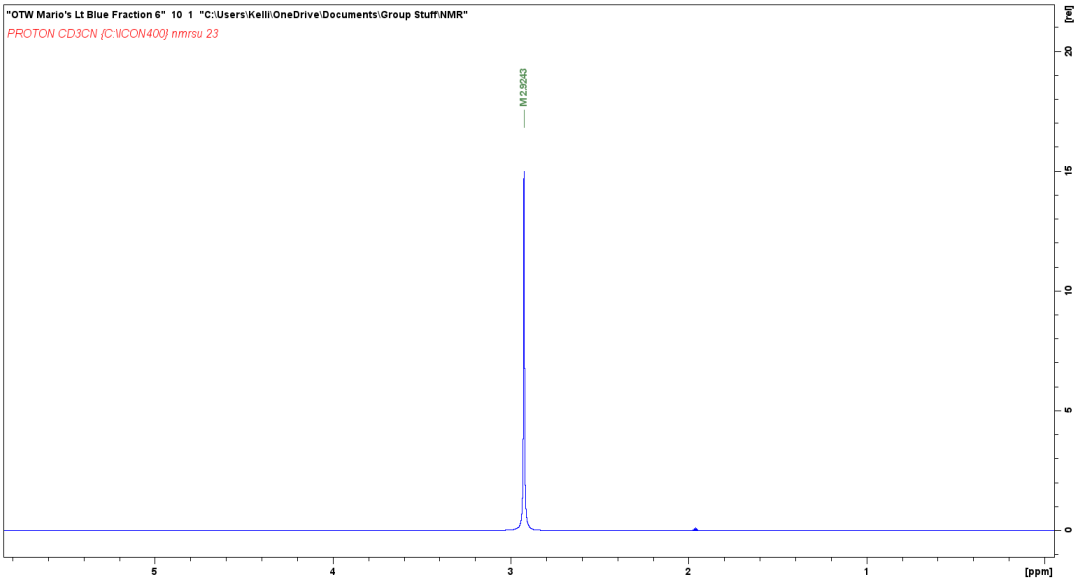

Figure S296. *^{1}H NMR of One Tattoo World Mario's Light Blue pot residue in acetonitrile-d3*

A large peak at δ2.9243 ppm corresponds to water being present in the sample.

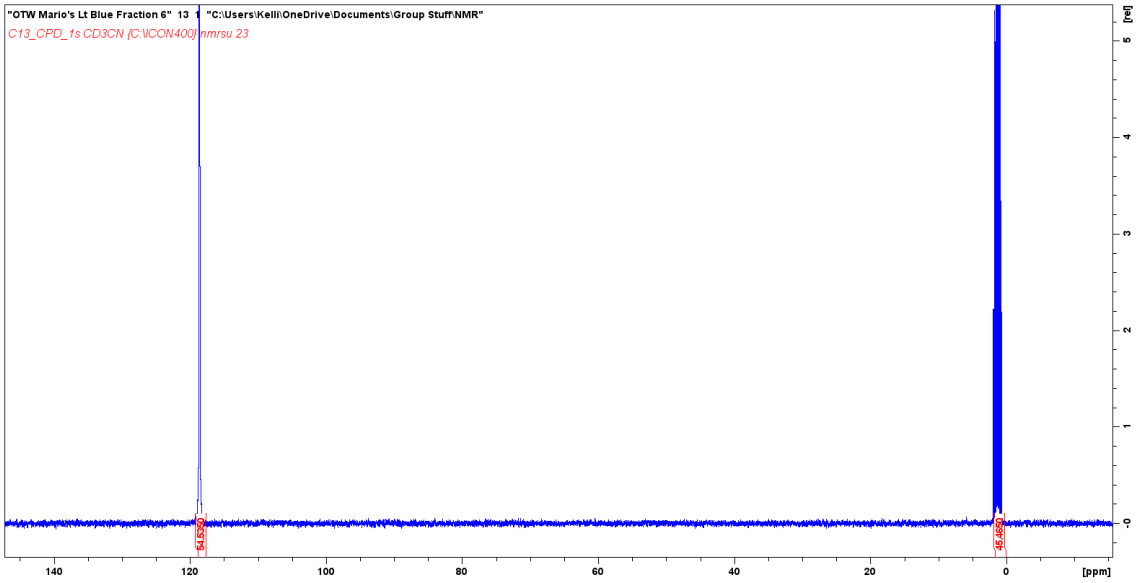

Figure S297. *^{13}C NMR of One Tattoo World Mario's Light Blue pot residue in acetonitrile-d3*

No other peaks, besides solvent peaks, are present in the spectrum which confirms the presence of water in the tattoo ink. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

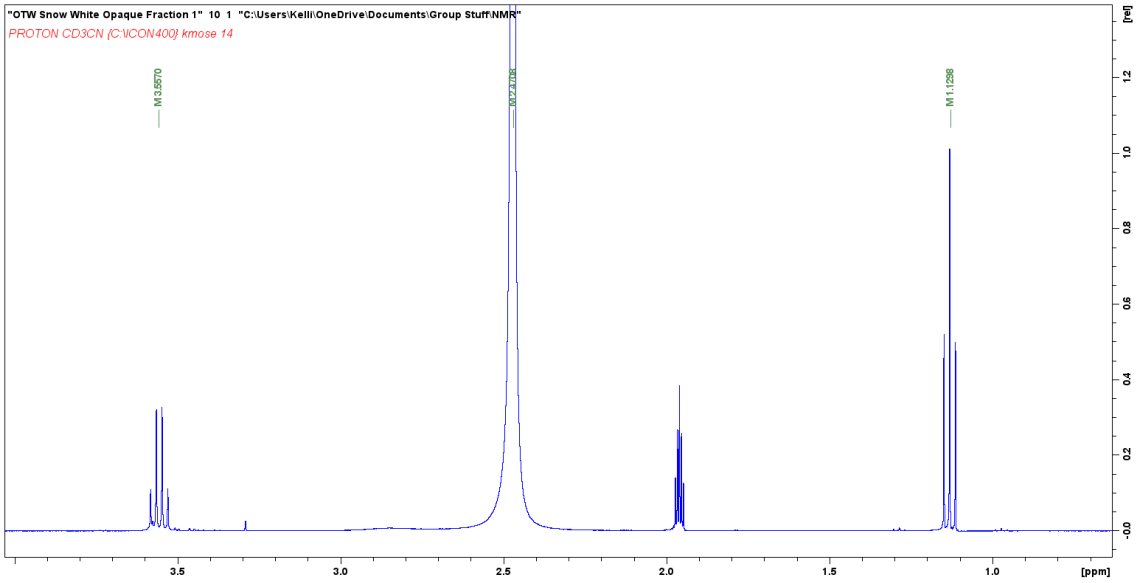

Figure S298. *^{1}H NMR of One Tattoo World Snow White Opaque distillate in acetonitrile-d3*

The triplet at δ1.1298 ppm and quartet at δ3.5570 ppm are produced by ethanol. Water produces the peak at δ2.4708 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

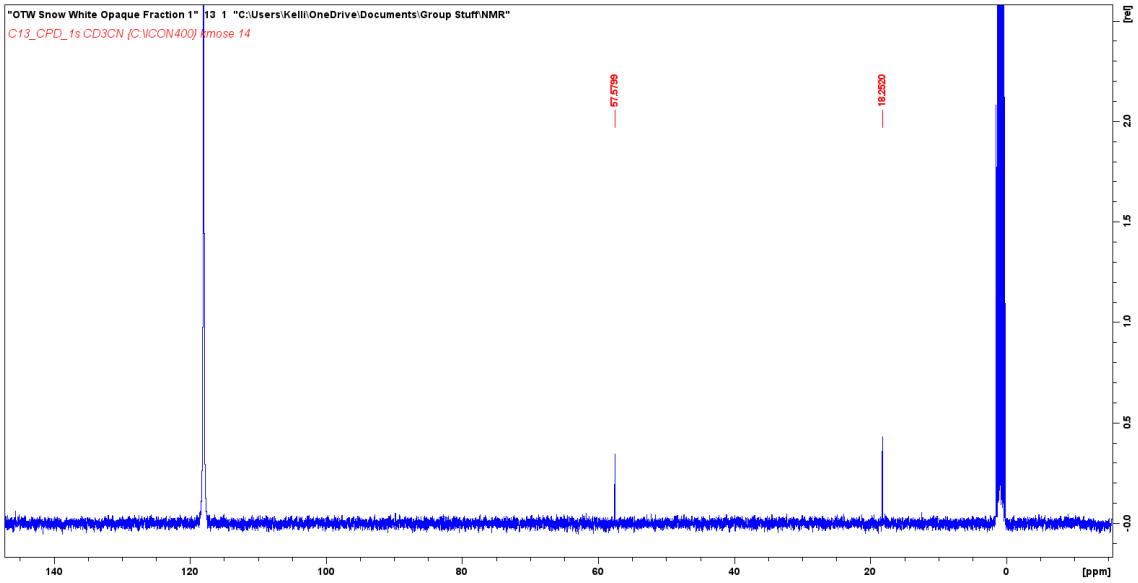

Figure S299. *^{13}C NMR of One Tattoo World Snow White Opaque distillate in acetonitrile-d3*

Peaks at δ18.2520 ppm and δ57.5799 ppm are produced by ethanol. The lack of other peaks, besides the solvent, indicates that water is also present in the sample. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

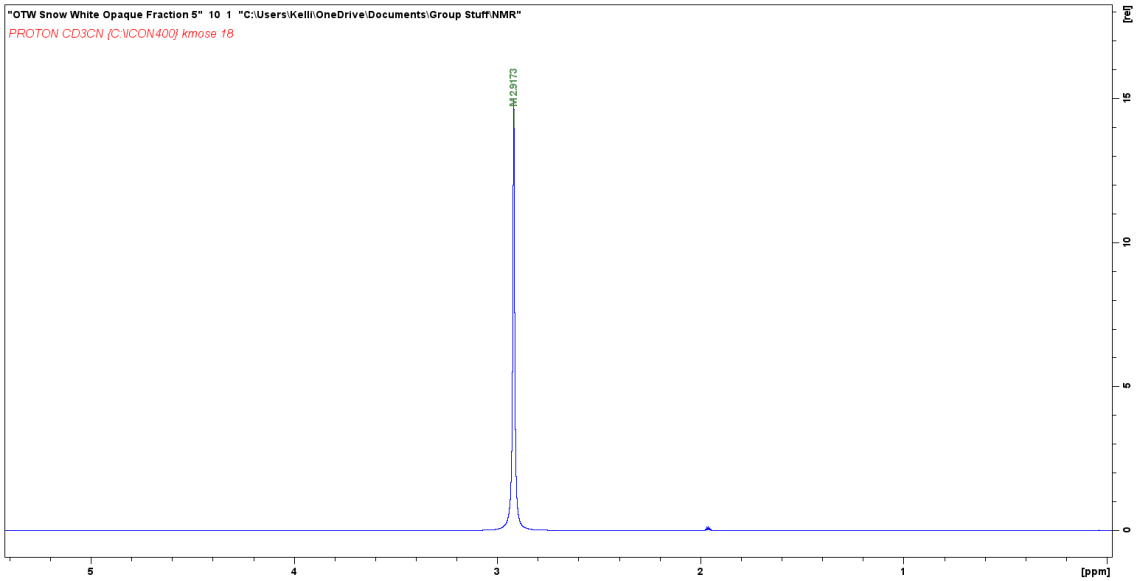

Figure S300. *^{1}H NMR of One Tattoo World Snow White Opaque pot residue in acetonitrile-d3*

The only peak present at δ2.9173 ppm is attributed to water.

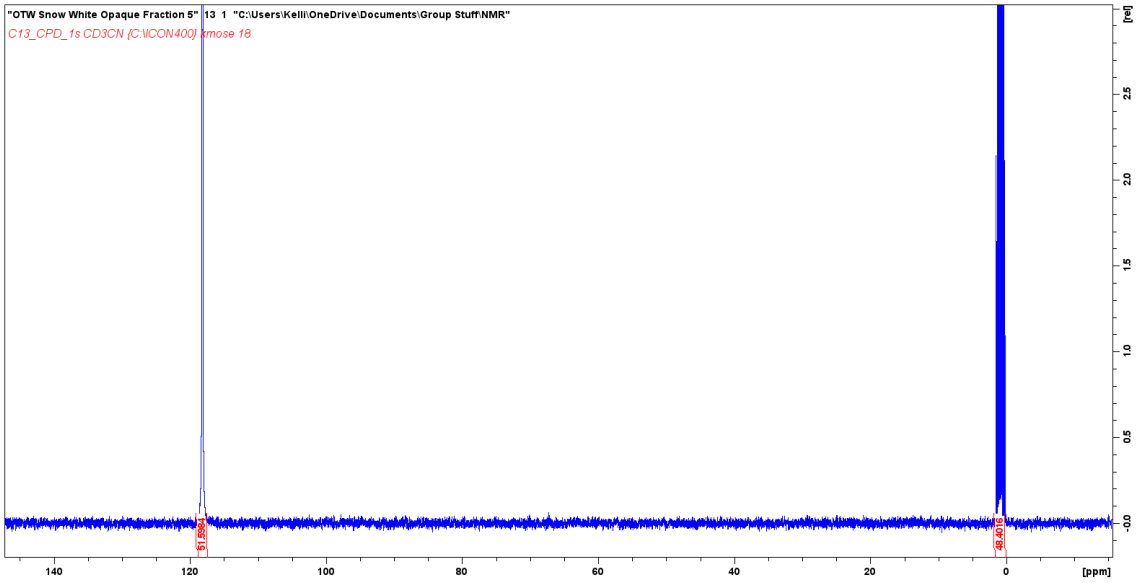

Figure S301. *^{13}C NMR of One Tattoo World Snow White Opaque pot residue in acetonitrile-d3*

No peaks, besides solvent peaks, are present in the spectrum which confirms the presence of water in the tattoo ink. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

9.2 Raman Data

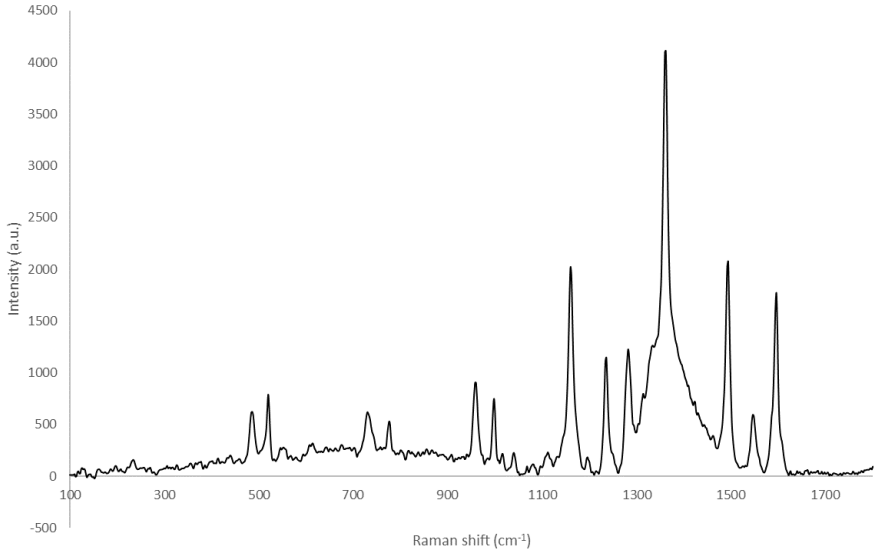

Figure S302. *Raman spectrum of One Tattoo World Bright Red*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 1 average, 0 boxcar, auto-baseline on. Peaks at 1596 cm^{-1}, 1546 cm^{-1}, 1494 cm^{-1}, 1360 cm^{-1}, 1282 cm^{-1}, 1236 cm^{-1}, 1160 cm^{-1}, 998 cm^{-1}, 960 cm^{-1}, 778 cm^{-1}, 734 cm^{-1}, 520 cm^{-1}, and 488 cm^{-1} match closely to Pigment Red 170 from the SOPRANO Raman spectra database.[1]

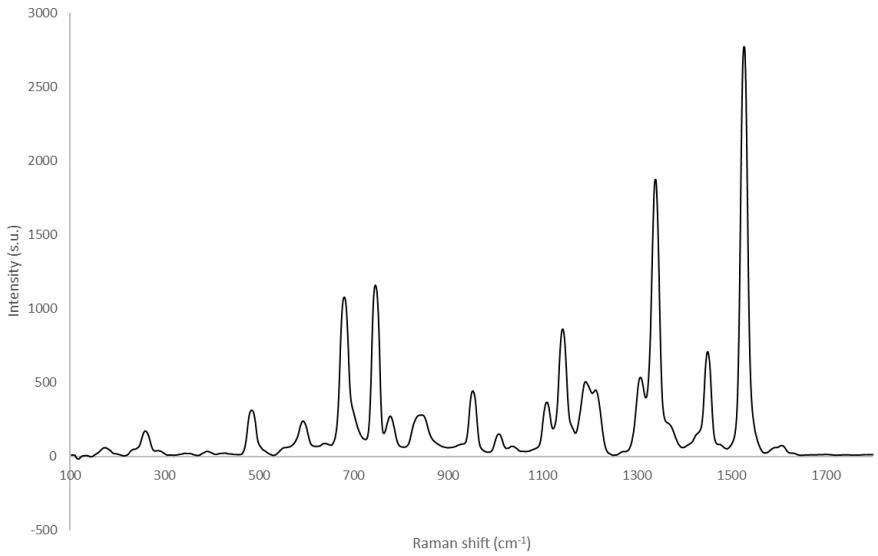

Figure S303. *Raman spectrum of One Tattoo World Mario's Light Blue*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 3 average, 3 boxcar, auto-baseline on. Peaks at 1526 cm^{-1}, 1450 cm^{-1}, 1338 cm^{-1}, 1306 cm^{-1}, 1192 cm^{-1}, 1144 cm^{-1}, 952 cm^{-1}, 746 cm^{-1}, and 680 cm^{-1} match the spectrum of Pigment Blue 15 from the SOPRANO Raman spectra database.[1]

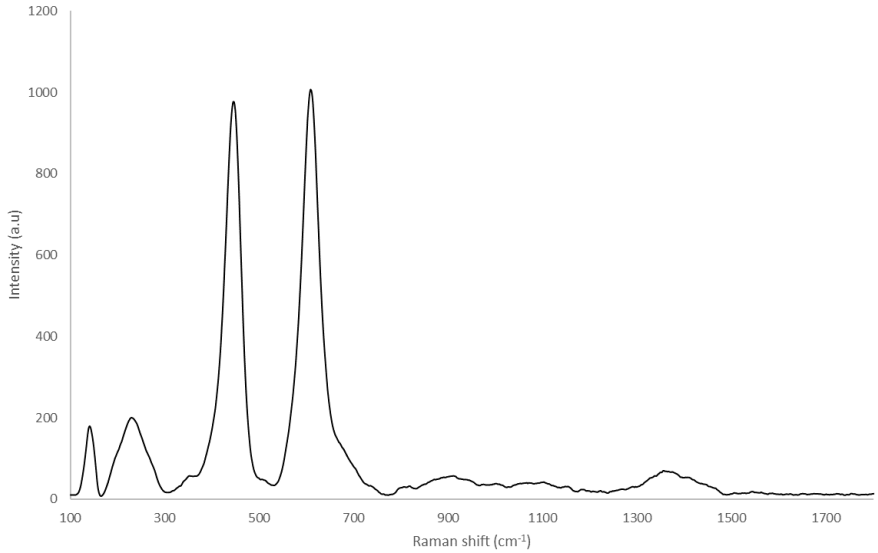

Figure S304. *Raman spectrum of One Tattoo World Snow White Opaque*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 3 average, 3 boxcar, auto-baseline on. Peaks at 608 cm^{-1}, 446 cm^{-1}, 234 cm^{-1}, and 144 cm^{-1} correspond to Pigment White 6 (TiO_2) (see section 10).

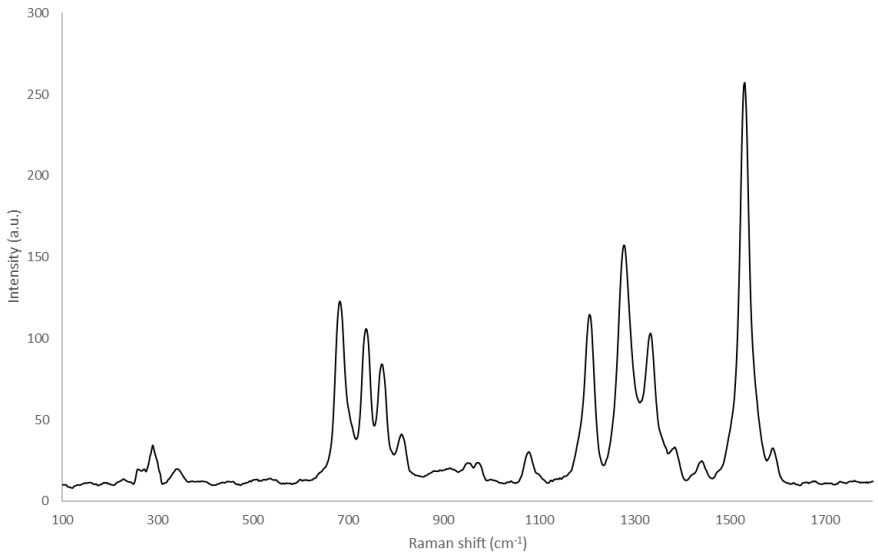

Figure S305. *Raman spectrum of One Tattoo World Light Green*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 3 second integration, 3 average, 3 boxcar, auto-baseline on. Peaks at 1532 cm^{-1}, 1334 cm^{-1}, 1278 cm^{-1}, 1206 cm^{-1}, 772 cm^{-1}, 738 cm^{-1}, and 682 cm^{-1} match the peaks of Pigment Green 7 from the SOPRANO Raman spectra database.[1]

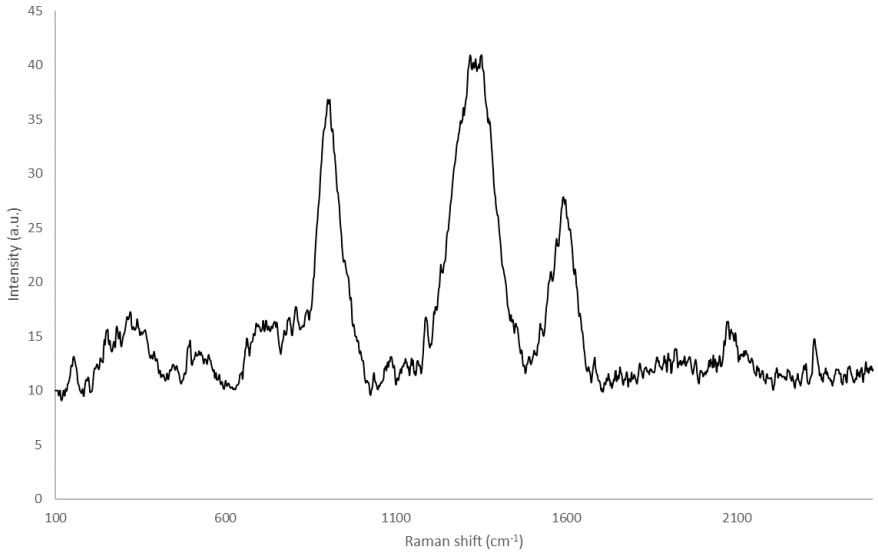

Figure S306. *Raman spectrum of One Tattoo World True Black*

Parameters used to obtain this spectrum are as follows: 785 nm, 225 mW, 10 second integration, 3 average, 2 boxcar, auto-baseline on. Peaks at 1590 cm^{-1}, 1352 cm^{-1}, and 906 cm^{-1} correspond to the Raman spectrum for carbon black (see section 10).

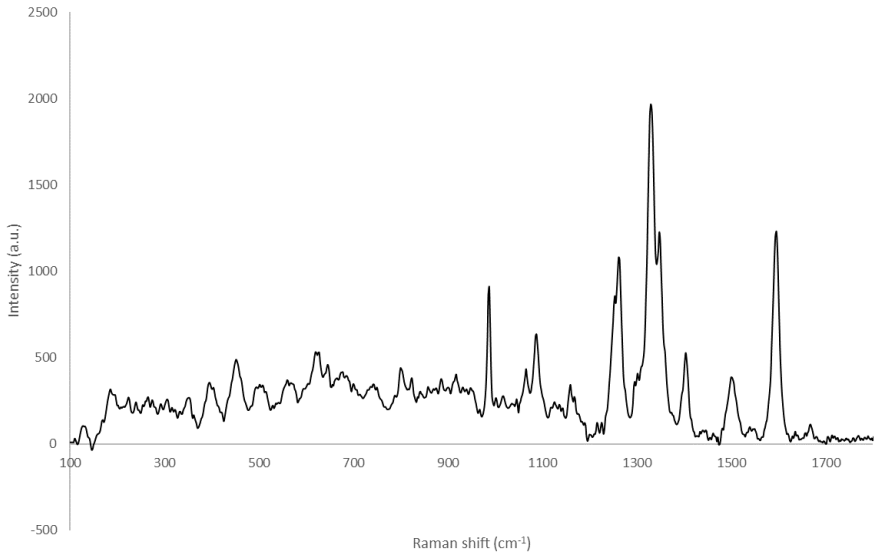

Figure S307. *Raman spectrum of One Tattoo World Lemon Yellow*

Parameters used to obtain this spectrum are as follows: 785 nm, 200 mW, 6 second integration, 2 average, 0 boxcar, auto-baseline on. Peaks at 1596 cm^{-1}, 1504 cm^{-1}, 1404 cm^{-1}, 1332 cm^{-1}, 1262 cm^{-1}, and 1088 cm^{-1} match the Raman spectrum of Pigment Yellow 74 in the SOPRANO Raman spectra database.[1]

9.3 XRF Data

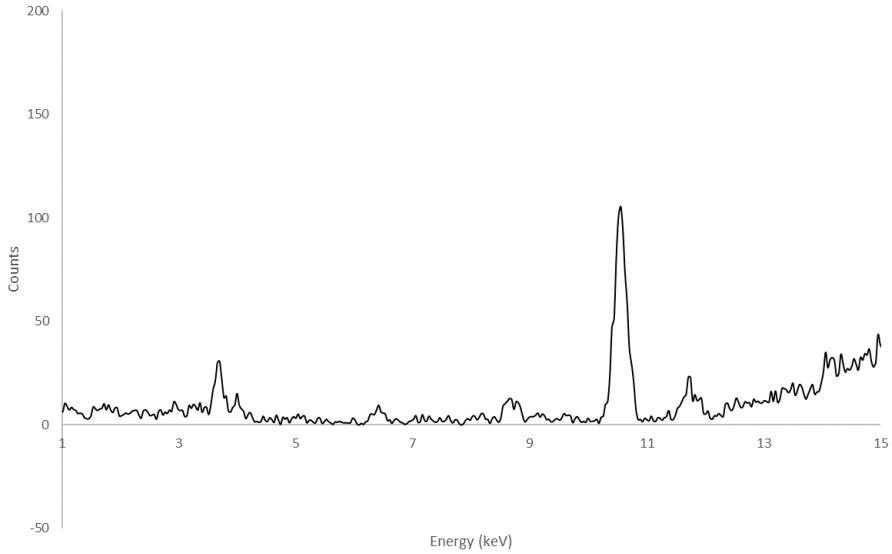

Figure S308. *X-ray fluorescence spectrum of One Tattoo Work Bright Red*

Peaks at 10.56 keV and 11.75 keV are attributed to the $K\alpha_1$ and $K\beta_1$ lines of arsenic which is present in the glass microscope slide used to dry the tattoo ink on. Small peaks at 3.70 keV and 4.00 keV could be assigned to the $K\alpha_1$ and $K\beta_1$ lines of calcium but cannot be confirmed due to the low signal.

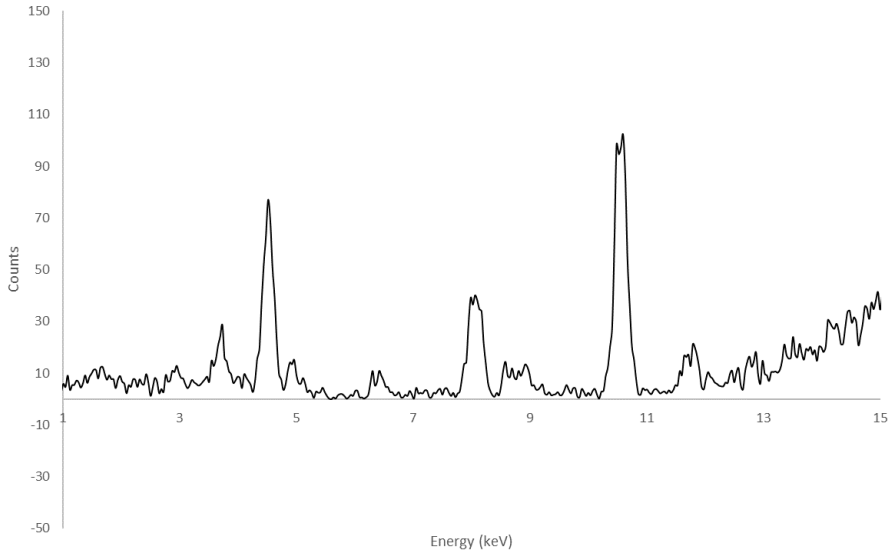

Figure S309. *X-ray fluorescence spectrum of One Tattoo World Mario's Light Blue*

A peak pair at 4.52 keV and 4.96 keV are assigned to the $K\alpha_1$ and $K\beta_1$ lines of titanium. The peak pair at 8.06 keV and 8.69 keV match the $K\alpha_1$ and $K\beta_1$ lines for copper. Signals from both titanium and copper confirm the presence of Pigment White 6 (TiO_2) and Pigment Blue 15, respectively, in the tattoo ink.

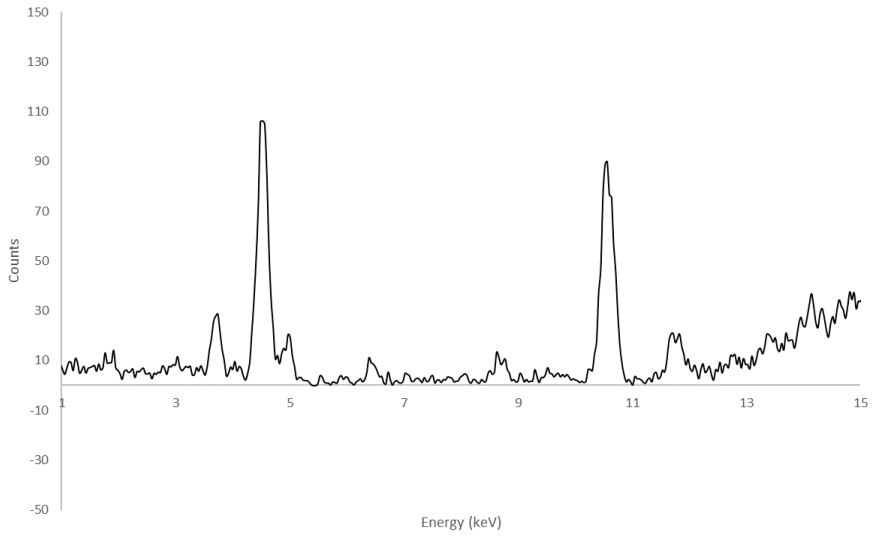

Figure S310. *X-ray fluorescence spectrum of One Tattoo World Snow White Opaque*

Peaks at 4.52 keV and 4.96 keV correspond to the $K\alpha_1$ and $K\beta_1$ lines of titanium, indicating the presence of Pigment White 6 (TiO_2). Additionally, a small peak pair at 3.73 keV and 4.03 keV suggests calcium is in the tattoo ink, but due to low concentrations it cannot be confirmed. A peak pair at 10.56 keV and 11.83 keV matches the $K\alpha_1$ and $K\beta_1$ lines of arsenic that is present in the glass microscope slide used to dry the tattoo ink on.

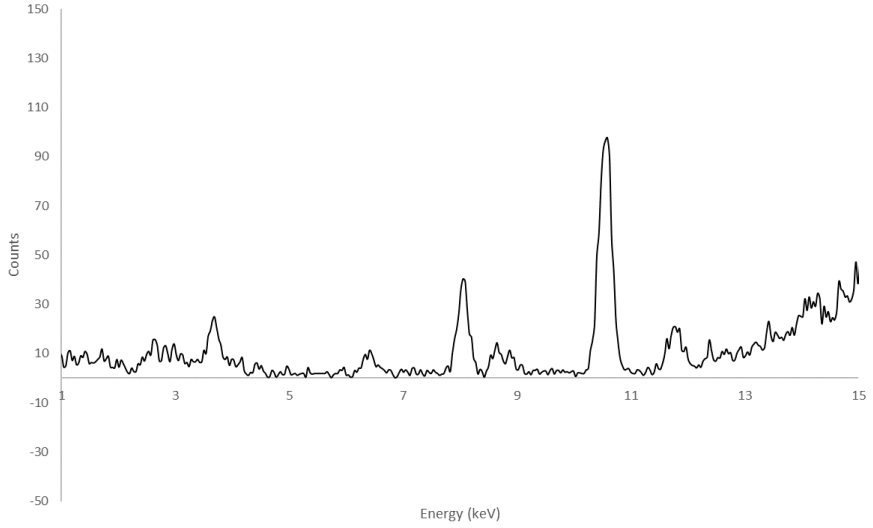

Figure S311. *X-ray fluorescence spectrum of One Tattoo World Light Green*

Small peaks at 8.10 keV and 8.65 keV correspond to the $K\alpha_1$ and $K\beta_1$ lines of copper, confirming the presence of the copper-containing Pigment Blue 15. Additional peaks at 10.60 keV and 11.79 keV match the $K\alpha_1$ and $K\beta_1$ lines of arsenic which is present in the glass microscope slide used to mount the tattoo ink sample.

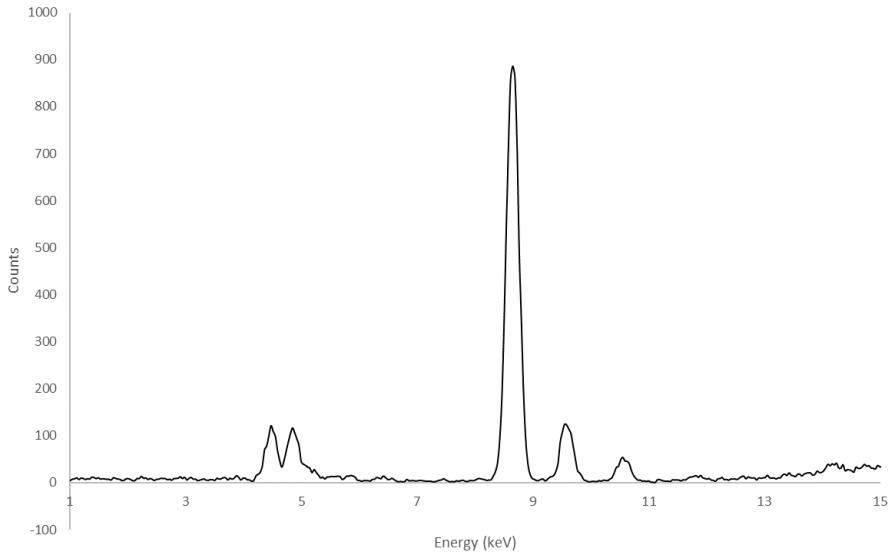

Figure S312. *X-ray fluorescence spectrum of One Tattoo World Lemon Yellow*

Signals at 8.66 keV and 9.55 keV indicate the presence of a zinc compound in the tattoo ink. Additional peaks at 4.48 keV and 4.85 keV match the $K\alpha_1$ and $K\beta_1$ lines of titanium, confirming the presence of Pigment White 6 (TiO_2) in the ink.

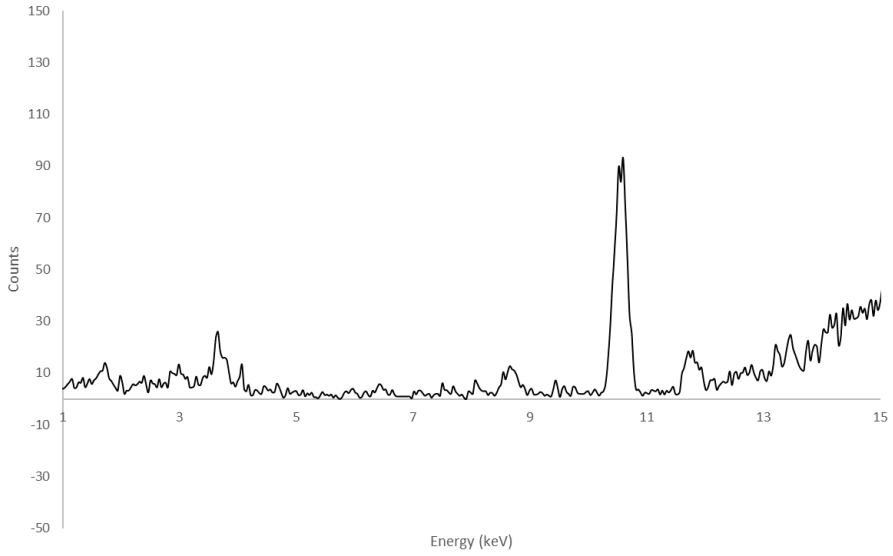

Figure S313. *X-ray fluorescence spectrum of One Tattoo World True Black*

Peaks at 10.60 keV and 11.79 keV match the $K\alpha_1$ and $K\beta_1$ lines of arsenic which is present in the glass microscope slide used to dry the tattoo ink sample on.

10. Raw Ink

10.1 NMR Data

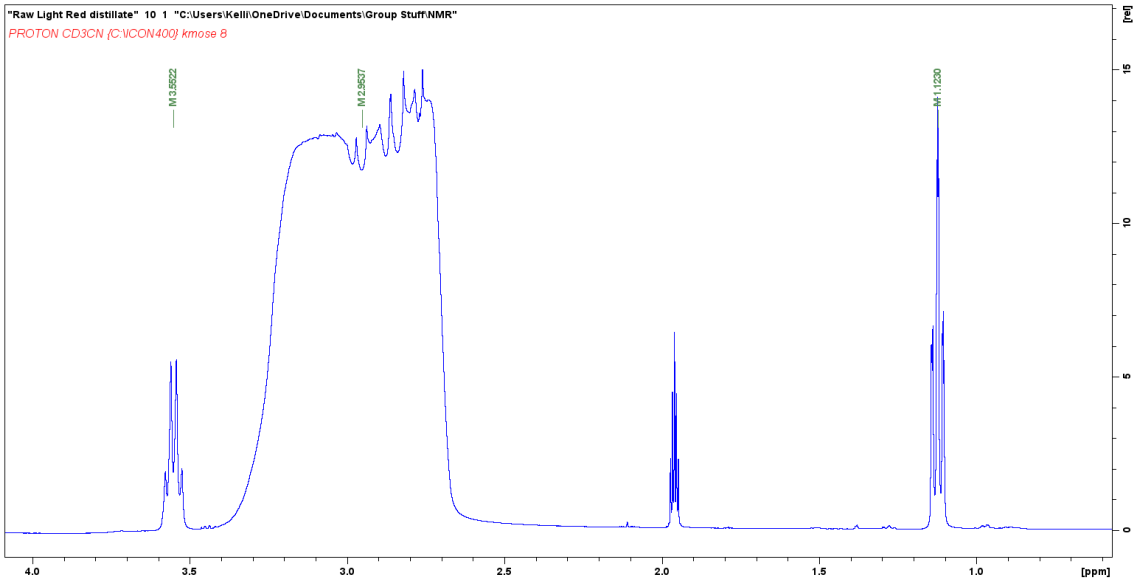

Figure S314. *^{1}H NMR of Raw Light Red distillate in acetonitrile-d3*

The triplet at δ1.1230 ppm and quartet at δ3.5522 ppm are attributed to ethanol. Water produces a large, broad signal at δ2.9537 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

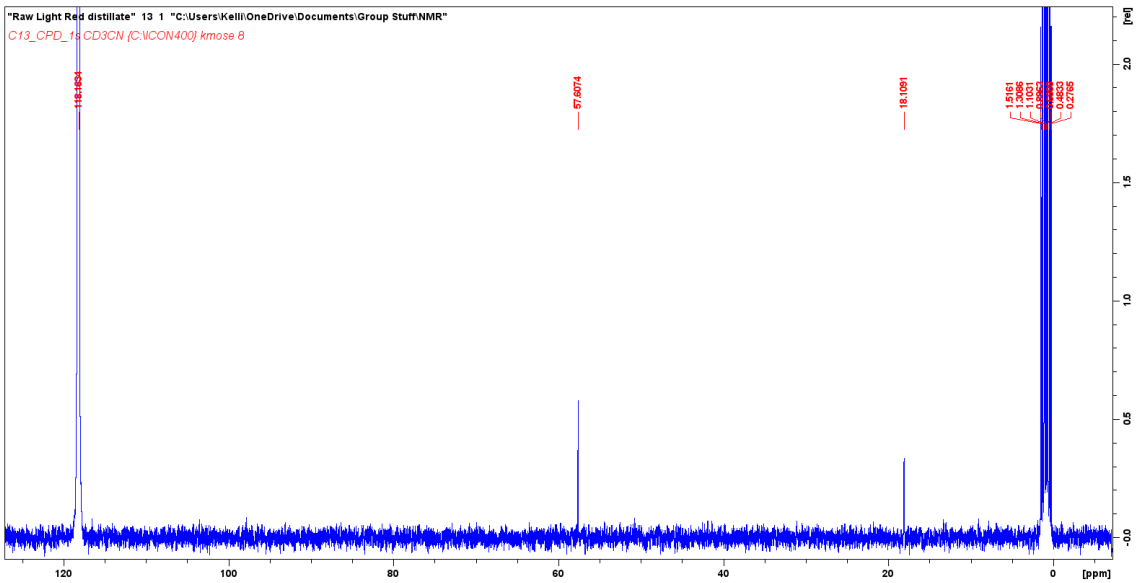

Figure S315. *^{13}C NMR of Raw Light Red distillate in acetonitrile-d3*

Peaks at δ18.1091 ppm and δ57.6074 ppm correspond to ethanol. The lack of other signals, besides from the solvent, confirms the presence of water. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

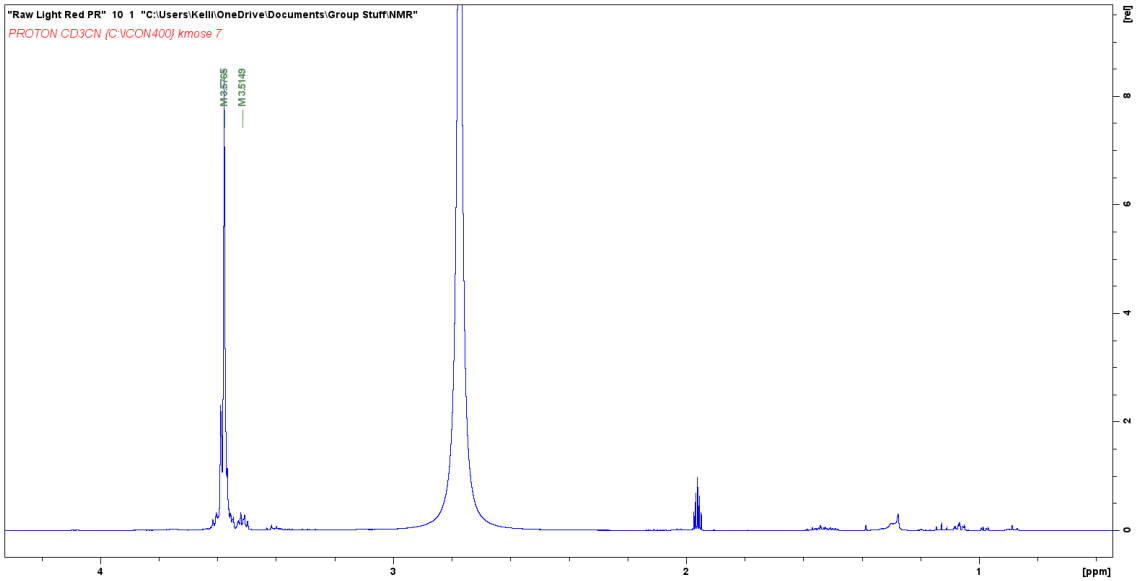

Figure S316. *^{1}H NMR of Raw Light Red pot residue in acetonitrile-d3*

Small amounts of glycerol may be present in this sample, producing small signals around δ3.5898 ppm, δ3.5153 ppm, and δ3.4083 ppm. These peaks are drowned out by an intense peak at δ3.5771 ppm that is assigned to poly(ethylene glycol). Other small signals down field also could not be identified due to their intensity. The acetonitrile solvent peak is located at δ1.94 ppm.

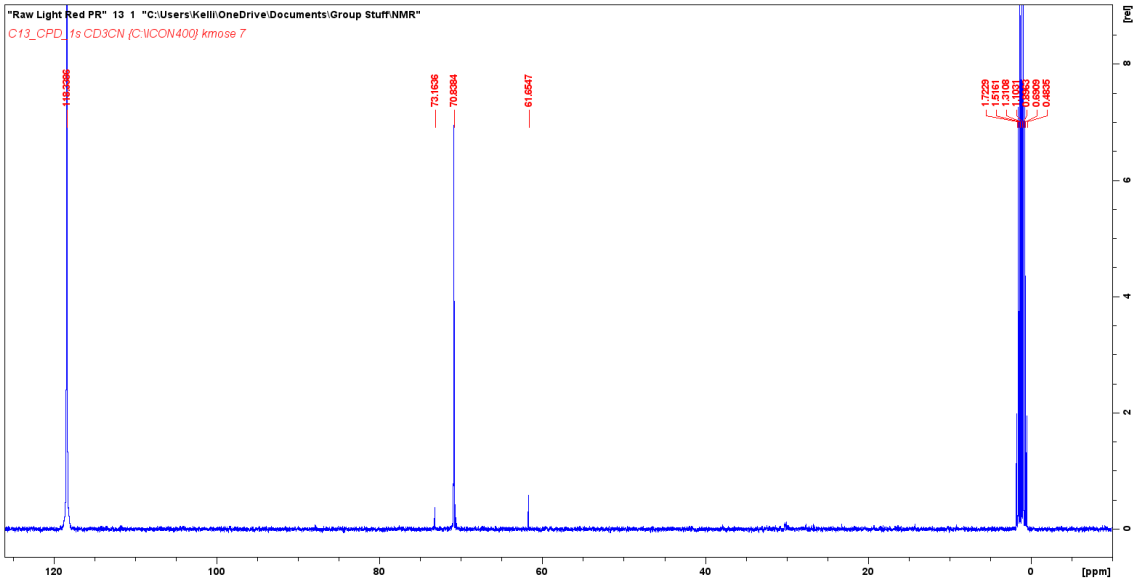

Figure S317. *^{13}C NMR of Raw Light Red pot residue in acetonitrile-d3*

Peaks at δ73.1636 ppm and δ61.6547 ppm are characteristic of glycerol. The large signal at δ70.8384 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

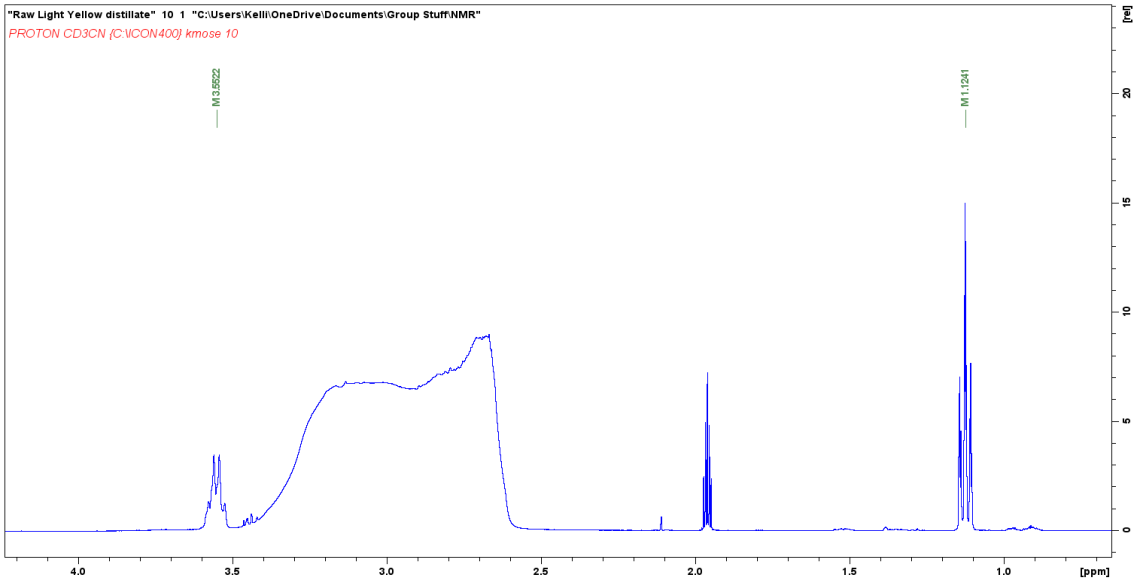

Figure S318. *^{1}H NMR of Raw Light Yellow distillate in acetonitrile-d3*

A triplet at δ1.1241 ppm and quartet at δ3.5522 ppm are produced by ethanol. Water produces the large signal centered around δ3 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

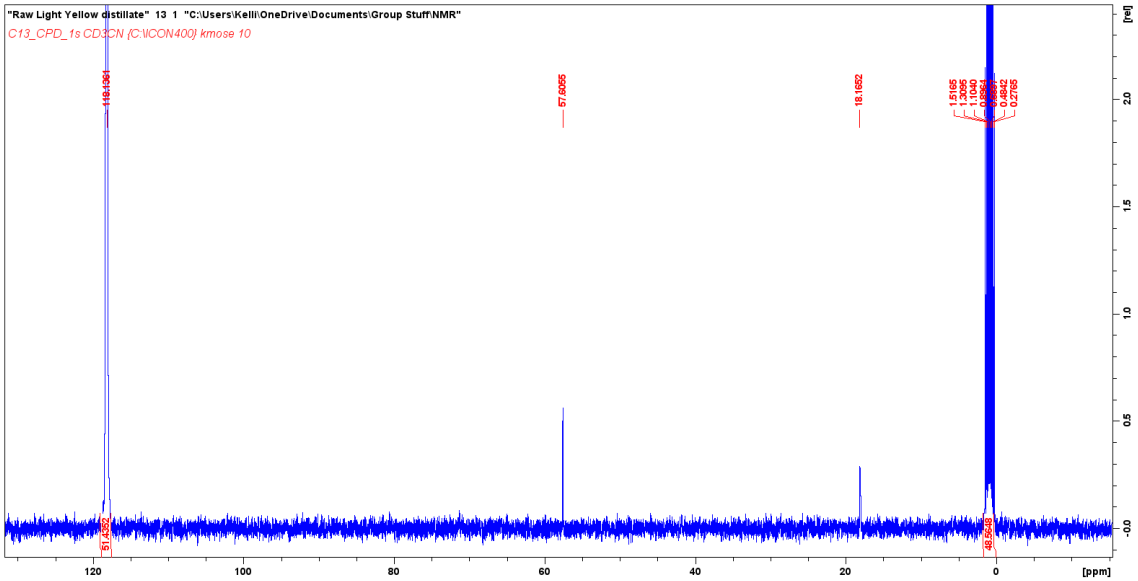

Figure S319. *^{13}C NMR of Raw Light Yellow distillate in acetonitrile-d3*

Peaks at δ18.1652 ppm and δ57.60 ppm confirm the presence of ethanol. The lack of other peaks, besides from the solvents, indicates that water is present in the carrier solution. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

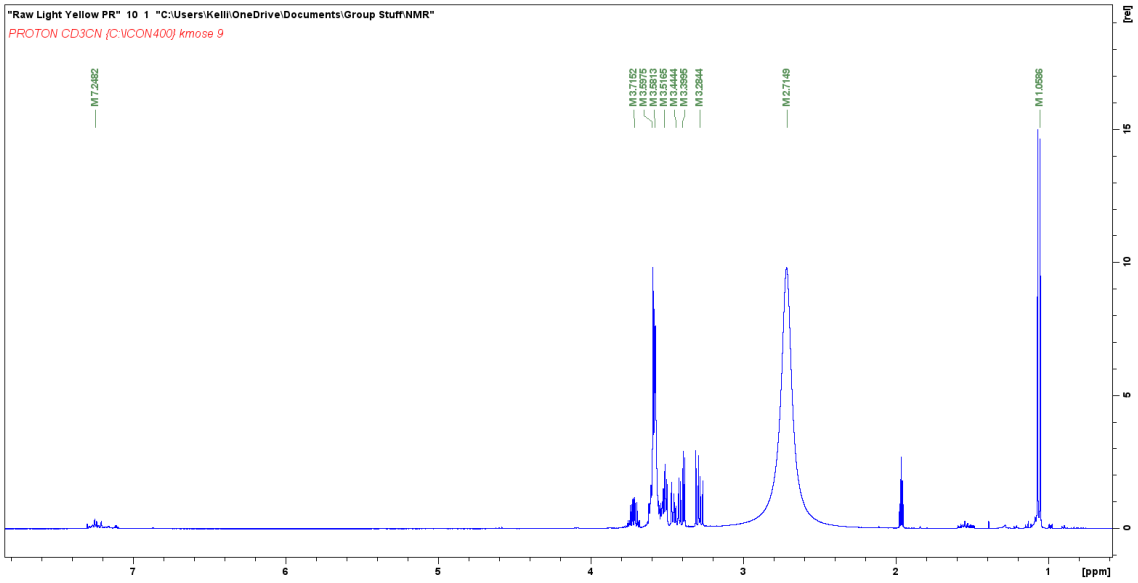

Figure S320. *[1]H NMR of Raw Light Yellow pot residue in acetonitrile-d3*

Peaks at δ1.10586 ppm, δ3.2844 ppm, δ3.3995 ppm, and δ3.7152 ppm are consistent with propylene glycol and peaks at δ3.4444 ppm, δ3.5165 ppm, and δ3.5975 ppm are produced by glycerol. The peak at δ3.5813 ppm is assigned to poly(ethylene glycol). Additional peaks downfield at δ7.2482 ppm may be produced by benzyl alcohol. The acetonitrile solvent peak is located at δ1.94 ppm.

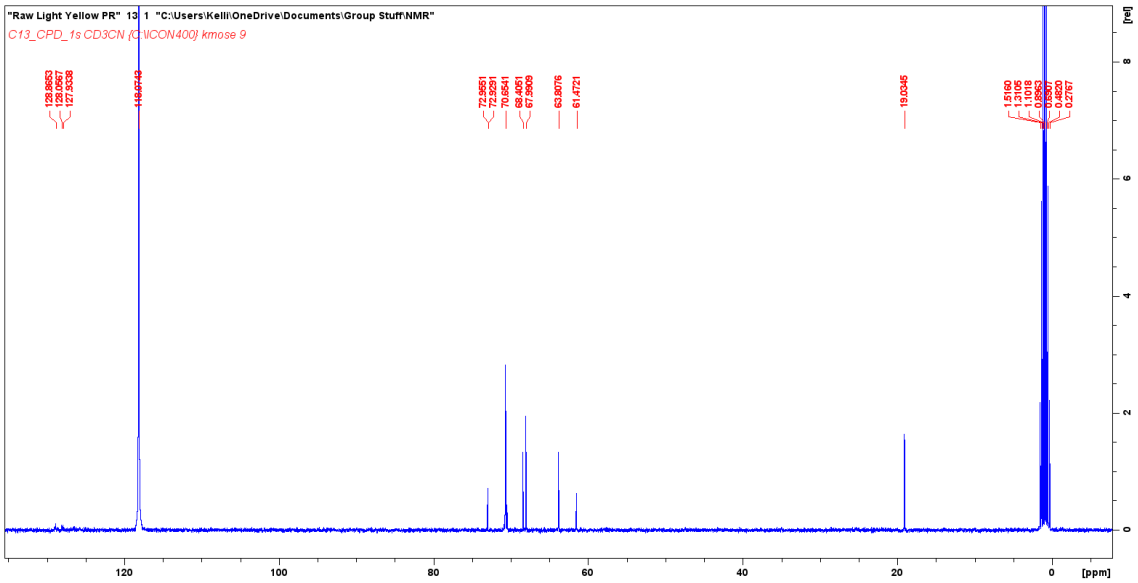

Figure S321. *[13]C NMR of Raw Light Yellow pot residue in acetonitrile-d3*

Signals downfield at δ128.9653 ppm, δ128.0567 ppm, and δ127.9338 ppm may be produced by benzyl alcohol. Signals at δ72.29.91 ppm and δ63.8076 ppm are produced by glycerol. Peaks at δ68.4051 ppm, δ67.9909 ppm, and δ19.0345 ppm are consistent with propylene glycol. The peak at δ70.6541 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

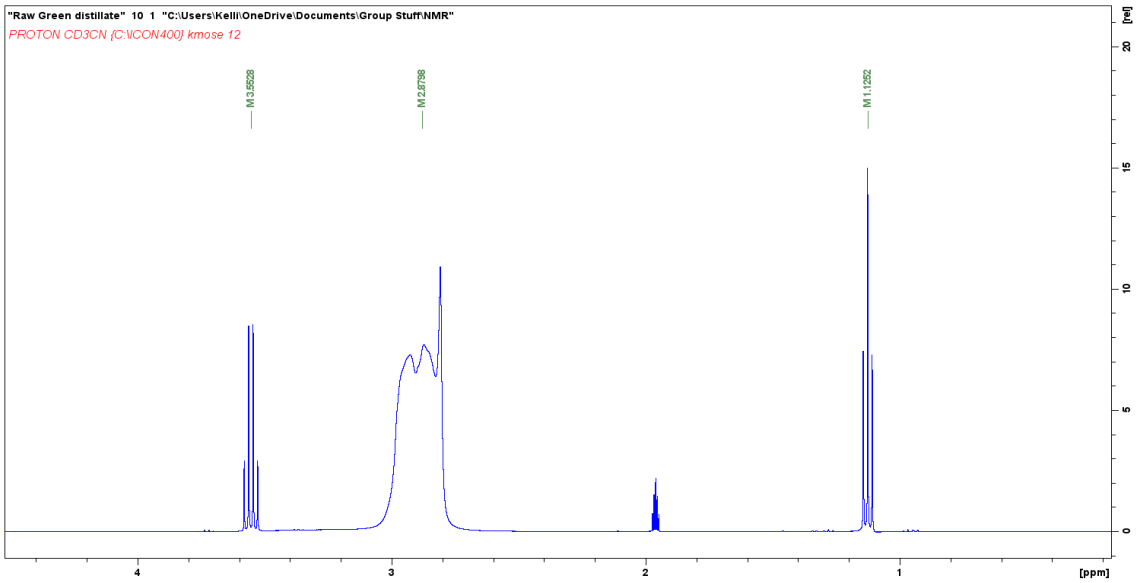

Figure S322. *[1]H NMR of Raw Green distillate in acetonitrile-d3*

Peaks at δ1.1252 ppm (triplet) and δ3.5528 ppm (quartet) are produced by ethanol. The signal at δ2.8798 ppm is attributed to water. The acetonitrile solvent peak is located at δ1.94 ppm.

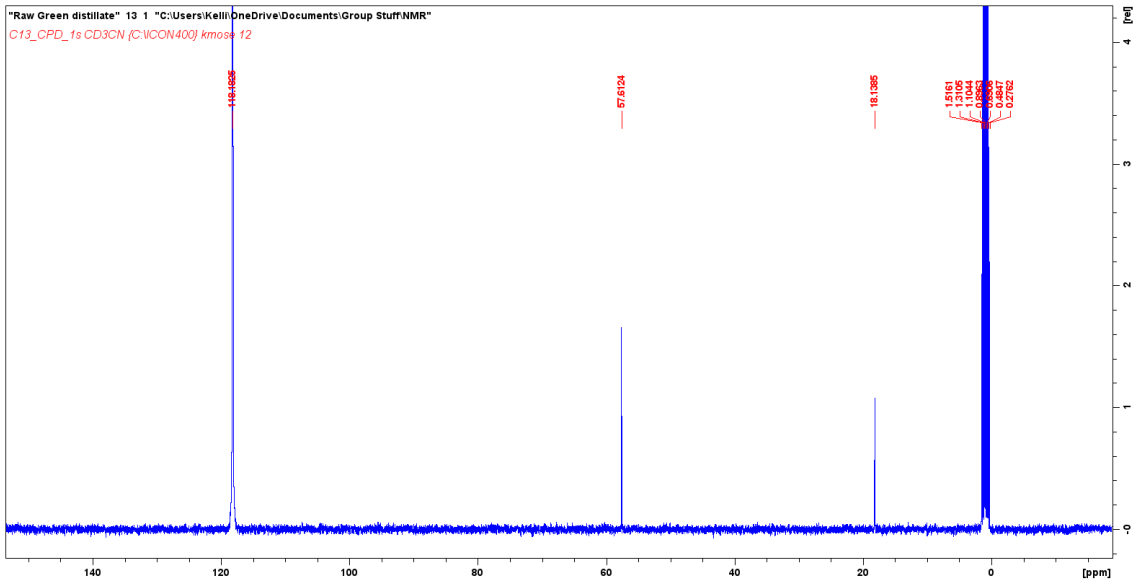

Figure S323. *[13]C NMR of Raw Green distillate in acetonitrile-d3*

Peaks at δ18.1385 ppm and δ57.6124 ppm confirm the presence of ethanol. The lack of other peaks, besides the solvents, indicates that water is present in the carrier solution. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

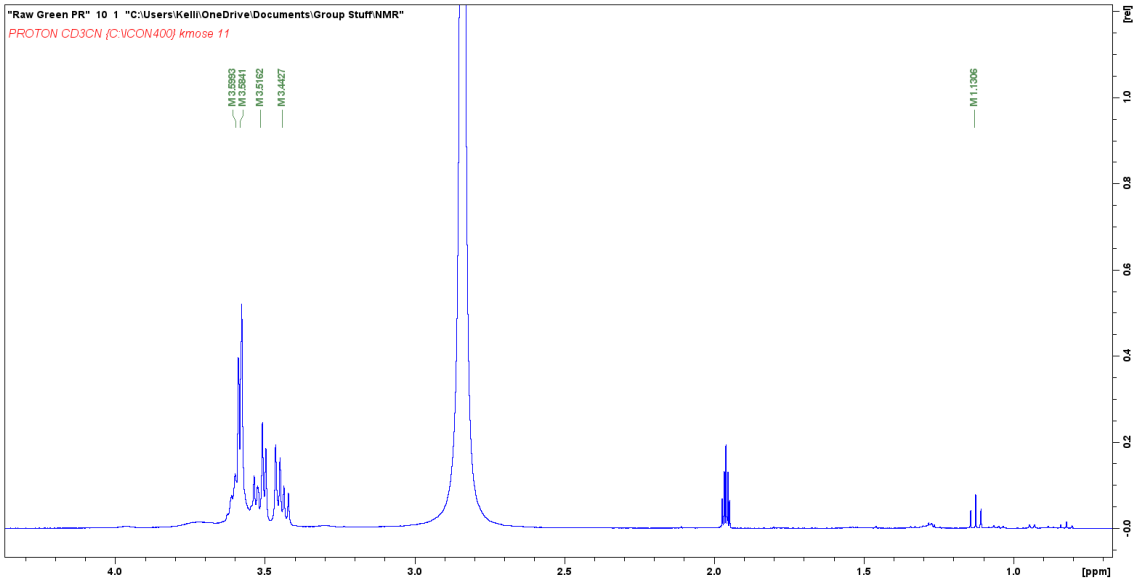

Figure S324. *[1]H NMR of Raw Green pot residue in acetonitrile-d3*

Peaks at δ3.4427 ppm, δ3.5162 ppm, and δ3.5993 ppm are produced by glycerol. The peak at δ3.5841 is assigned to poly(ethylene glycol). The triplet at δ1.13060 may be from ethanol, though it is not possible to see it's corresponding quartet around δ3.5 ppm due to overlapping signals. The acetonitrile solvent peak is located at δ1.94 ppm.

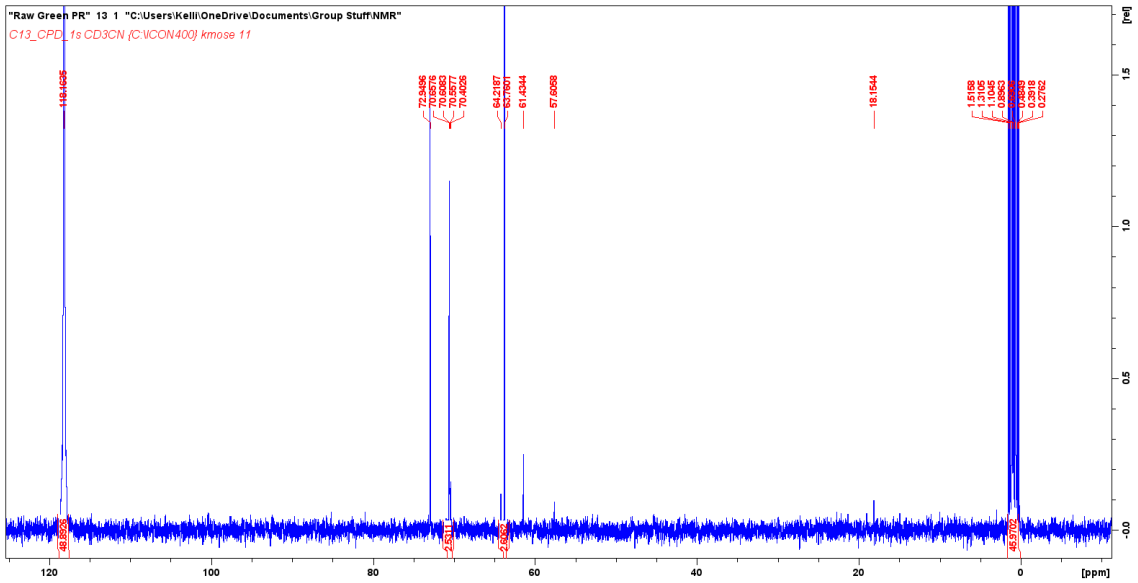

Figure S325. *[13]C NMR of Raw Green pot residue in acetonitrile-d3*

Peaks at δ18.1544 ppm and δ57.6058 ppm correspond to ethanol being present. Additionally, signals at δ72.9498 ppm and δ63.7601 ppm are produced by glycerol. The peak at δ70.6083 ppm is assigned to poly(ethylene glycol). The peak at δ61.4344 ppm could not be identified. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

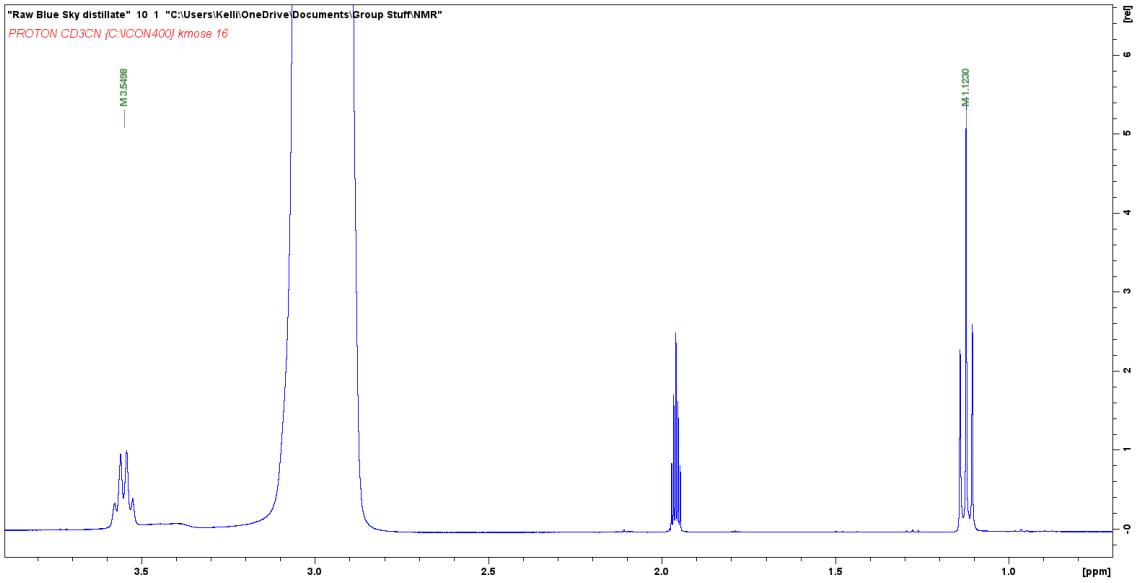

Figure S326. *^{1}H NMR of Raw Blue Sky distillate in acetonitrile-d3*

A triplet at δ1.1320 ppm and quartet at δ3.5498 ppm are produced by ethanol. Water produces the peak centered around δ3.00 ppm. The acetonitrile solvent peak is located at δ1.94 ppm.

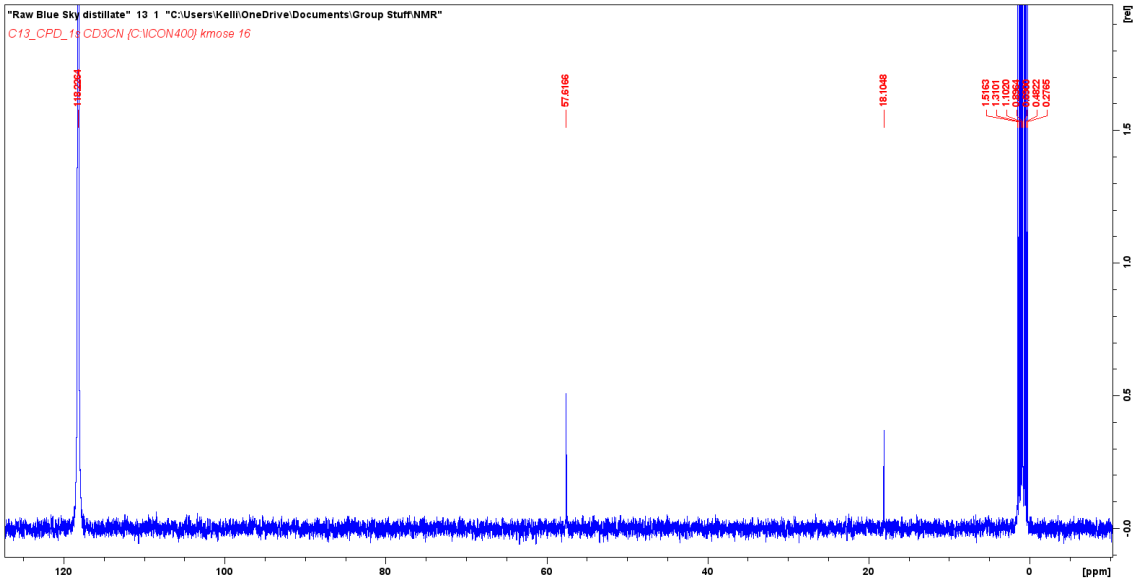

Figure S327. *^{13}C NMR of Raw Blue Sky distillate in acetonitrile-d3*

Signals at δ18.1048 ppm and δ57.6166 ppm confirm the presence of ethanol in the sample. The lack of other peaks, besides the solvents, indicates that water is present in the carrier solution. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

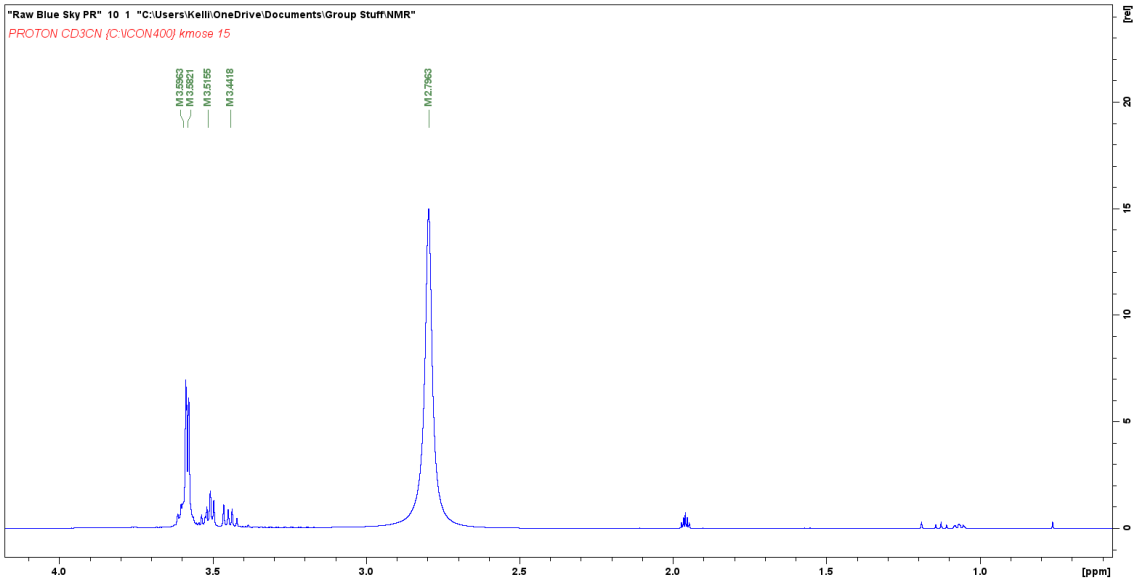

Figure S328. *^{1}H NMR of Raw Blue Sky pot residue in acetonitrile-d3*

Peaks at δ3.4418 ppm, δ3.5155 ppm, and δ3.5963 ppm are produced by glycerol. The peak at δ3.5821 ppm is assigned to poly(ethylene glycol). The acetonitrile solvent peak is located at δ1.94 ppm.

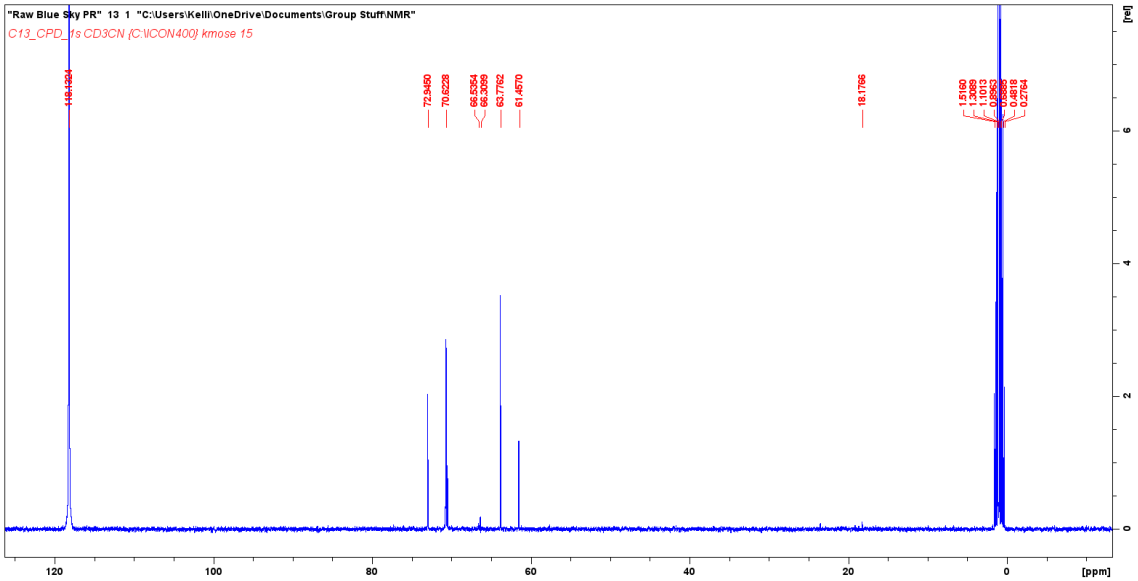

Figure S329. *^{13}C NMR of Raw Blue Sky pot residue in acetonitrile-d3*

Peaks at δ72.9450 ppm and δ63.7762 ppm are produced by glycerol in this sample. The peaks at δ70.5898 ppm is assigned to poly(ethylene glycol). The peak at δ61.4570 ppm remains unidentified. Peaks at δ66.5354 ppm, δ66.3099 ppm, and δ18.1766 ppm may be from small amounts of propylene glycol, but this cannot be confirmed due to low concentration. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

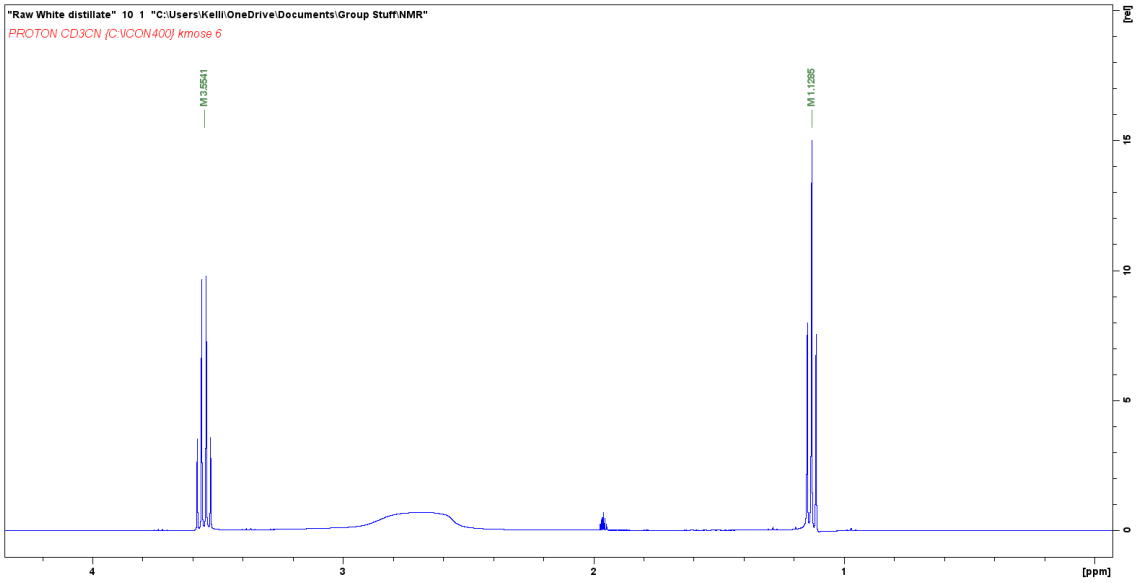

Figure S330. *^{1}H NMR of Raw White distillate in acetonitrile-d3*

Peaks at δ1.1285 ppm (triplet) and δ3.5541 ppm (quartet) are attributed to ethanol. The acetonitrile solvent peak is located at δ1.94 ppm.

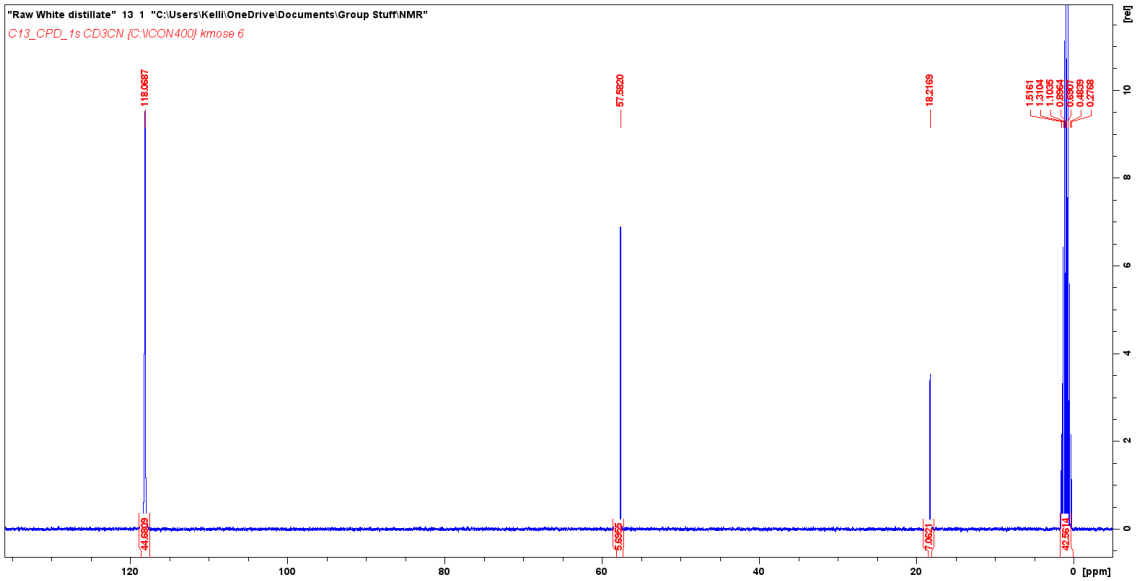

Figure S331. *^{13}C NMR of Raw White distillate in acetonitrile-d3*

Peaks at δ18.2169 ppm and δ57.5820 ppm are produced by ethanol. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

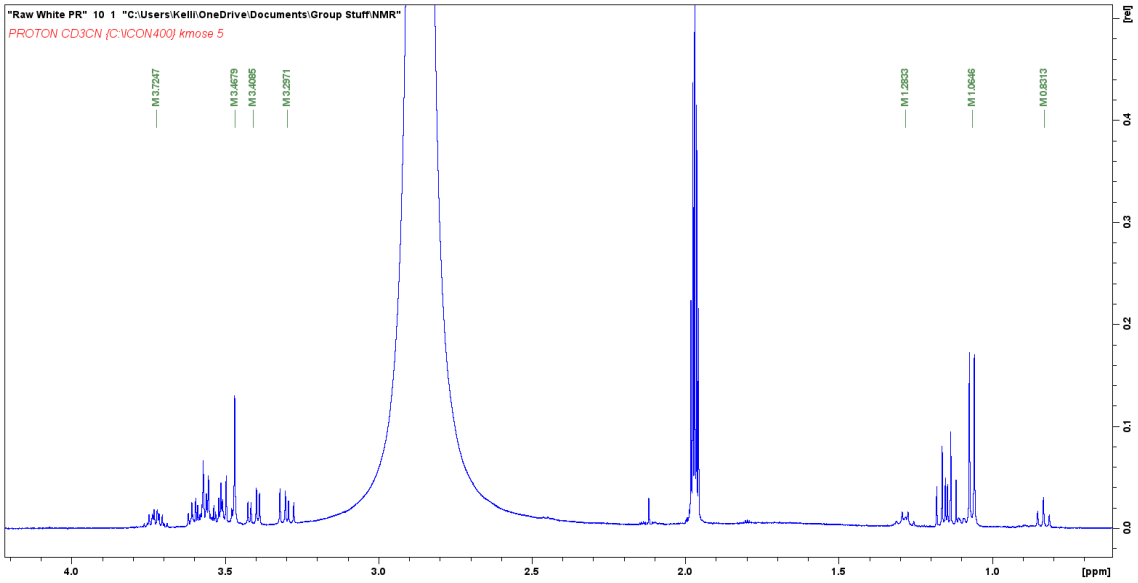

Figure S332. *^{1}H NMR of Raw White pot residue in acetonitrile-d3*

A multiplet at δ3.7247 ppm, multiplets at δ3.2971 ppm and δ3.4085 ppm, and doublet at δ1.0646 ppm are consistent with propylene glycol. Three additional components remain unidentified. One of them produces a singlet at δ3.4679 ppm. Another produces signals at δ0.8313 ppm and δ1.2833 ppm. The last one produces signals at δ1.1341, δ1.1622 ppm, and δ3.5992 ppm. ^{1}H-^{1}H COSY was used to confirm the coupling of these signals to ensure they are produced by different components. The acetonitrile solvent peak is located at δ1.94 ppm.

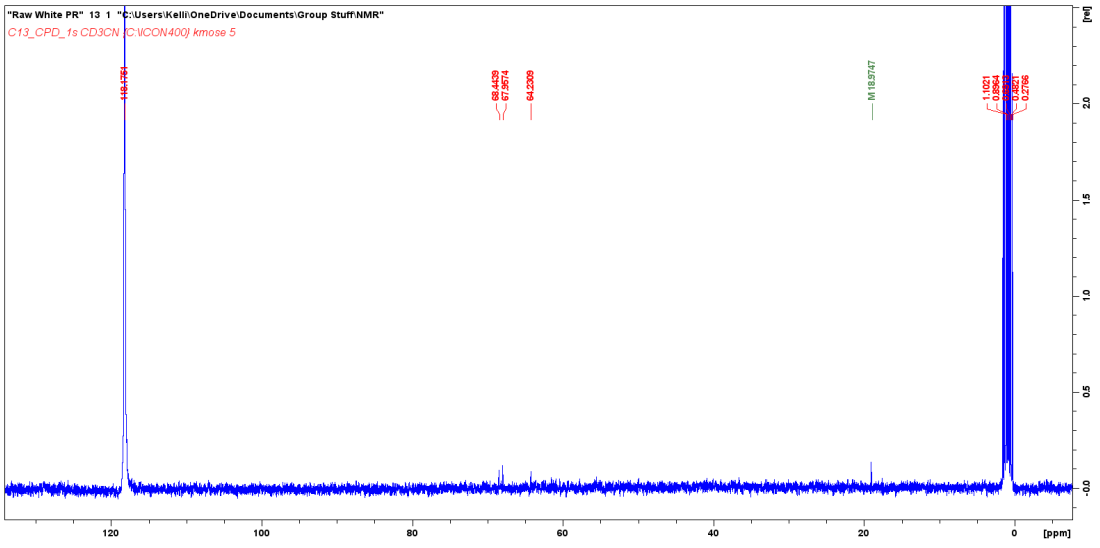

Figure S333. *^{13}C NMR of Raw White pot residue in acetonitrile-d3*

Signals consistent with propylene glycol appear at δ68.4469 ppm, δ67.9628 ppm, and δ18.9747 ppm. The peak at δ64.2309 ppm remains unidentified. The lack of other signals contributes to the challenge of identifying the remaining unidentified components of this ink sample. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

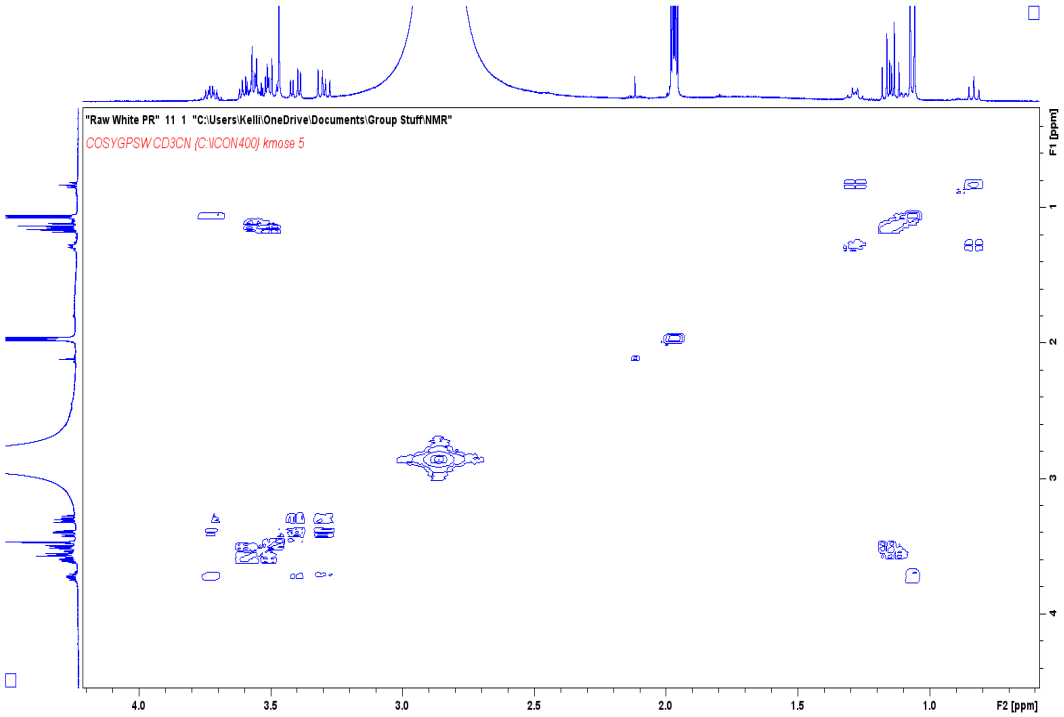

Figure S334. *^{1}H-^{1}H COSY spectrum of Raw White pot residue acetonitrile-d3*

Coupling occurs between peaks at δ3.7247 ppm, δ3.2971 ppm and δ3.4085 ppm, and δ1.0646 ppm are characteristic of propylene glycol. Additionally, coupling is seen between peaks at δ0.8313 ppm and δ1.2833 ppm, as well as δ1.1341, δ1.1622 ppm, and δ3.5992 ppm. This supports two other unidentified components. Additionally, a peak appearing at δ3.4679 ppm does not couple with other peaks.

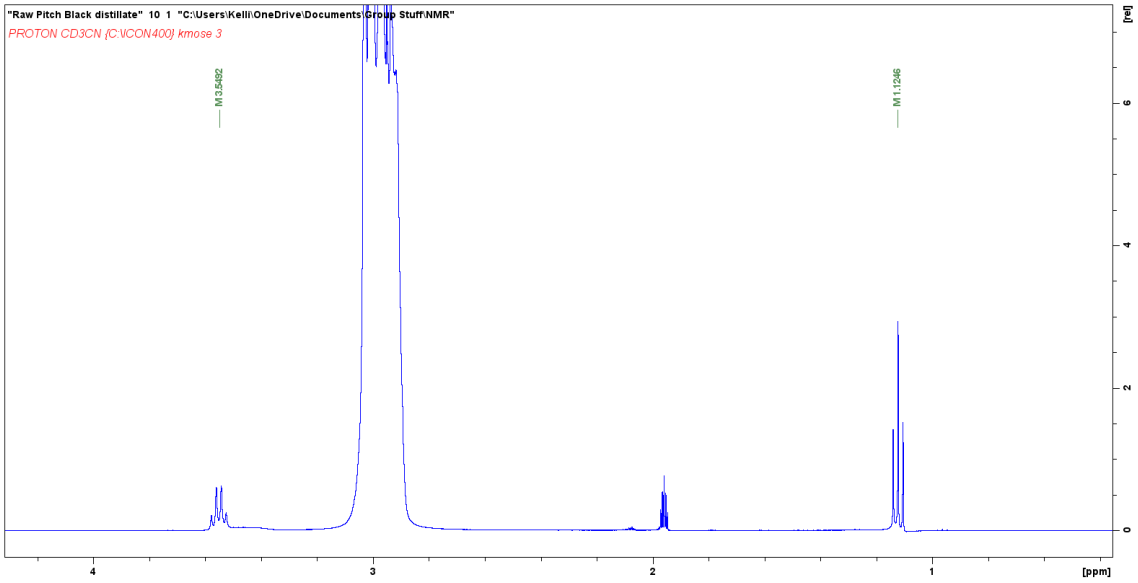

Figure S335. *^{1}H NMR of Raw Pitch Black distillate in acetonitrile-d3*

The triplet at δ1.1246 ppm and quartet at δ3.5492 ppm are produced by ethanol. The large peak centered around δ3 ppm is attributed to water in the sample. The acetonitrile solvent peak is located at δ1.94 ppm.

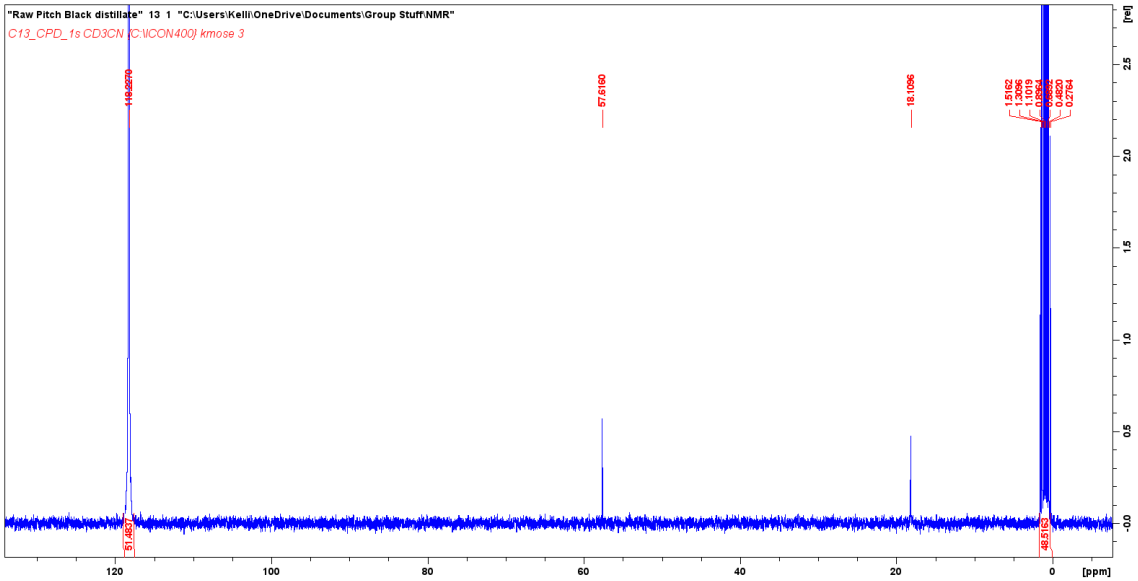

Figure S336. *^{13}C NMR of Raw Pitch Black distillate in acetonitrile-d3*

Peaks at δ18.1096 ppm and δ57.6160 ppm are attributed to ethanol. The lack of other peaks, besides those produced by the solvent, indicates that water is present in the solution. The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

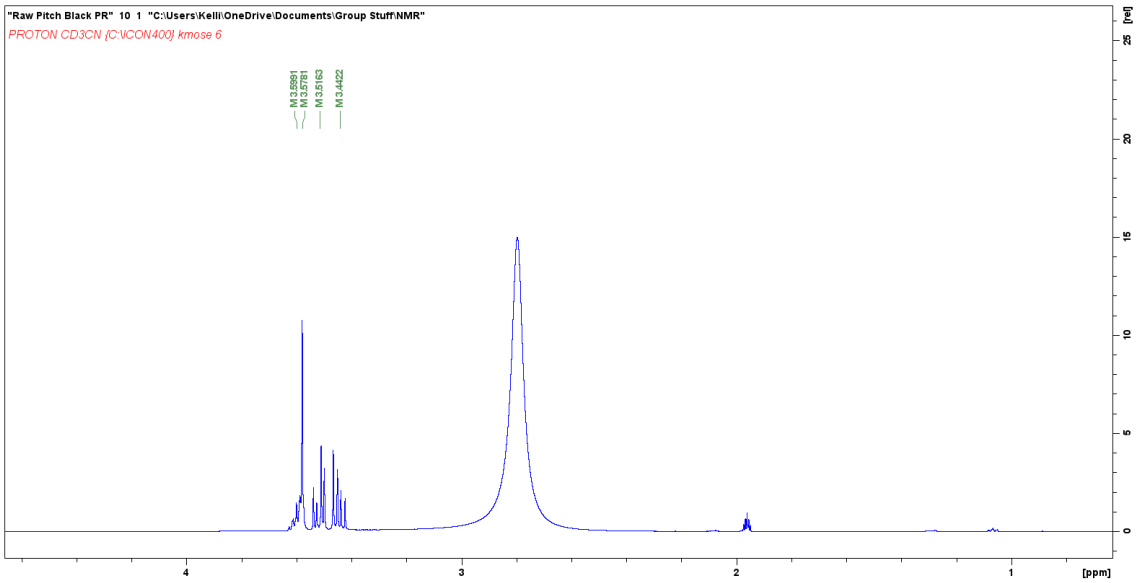

Figure S337. *^{1}H NMR of Raw Pitch Black pot residue in acetonitrile-d3*

Peaks at δ3.4422 ppm, δ3.5163 ppm and δ3.5.991 ppm all correspond to glycerol. The large peak at δ3.5781 ppm is assigned to poly(ethylene glycol). The acetonitrile solvent peak is located at δ1.94 ppm.

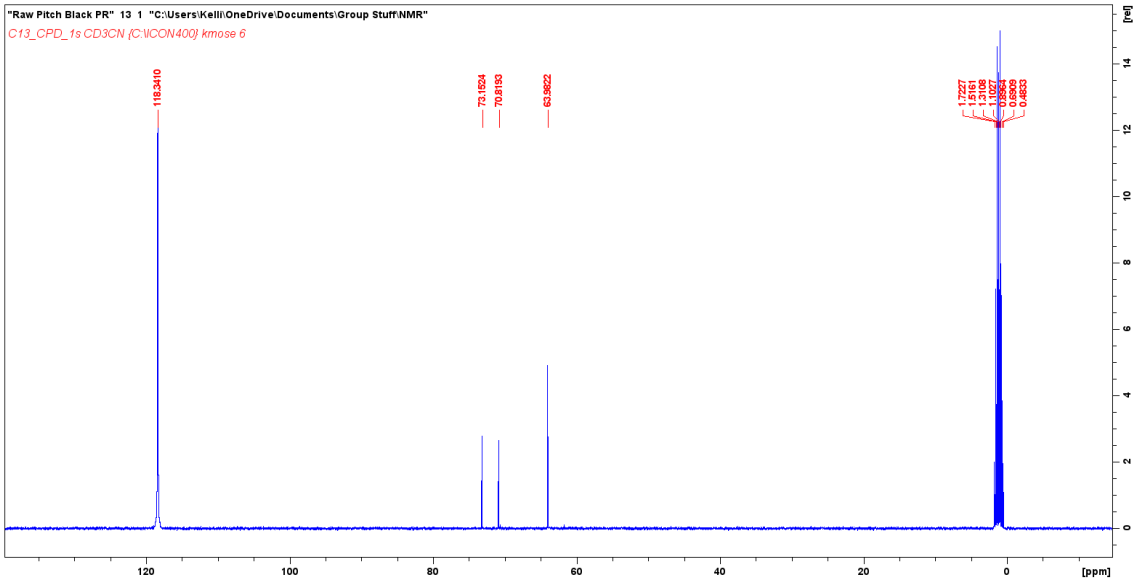

Figure S338. *^{13}C NMR of Raw Pitch Black pot residue in acetonitrile-d3*

Peaks at δ63.9822 ppm and δ73.1524 ppm are produced by glycerol and the peak at δ70.8193 ppm is assigned to poly(ethylene glycol). The acetonitrile-d3 solvent peaks are found around δ1 ppm and δ118 ppm.

10.2 Raman Data

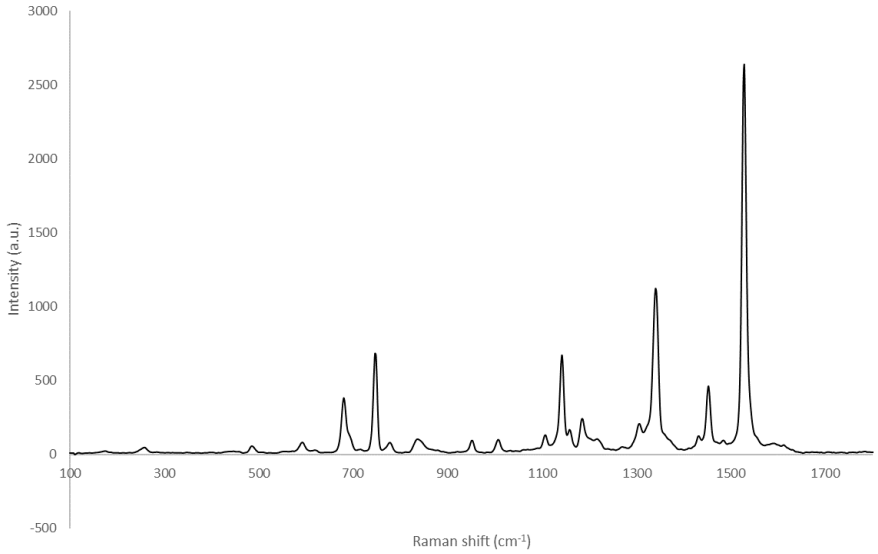

Figure S339. *Raman spectrum of Raw Blue*

Parameters used to obtain this spectrum are as follows: 785 nm, 175 mW, 5 second integration, 2 average, 1 boxcar, auto-baseline on. Peaks at 1528 cm^{-1}, 1452 cm^{-1}, 1340 cm^{-1}, 1142 cm^{-1}, 748 cm^{-1}, and 680 cm^{-1} match the Raman spectrum for Pigment Blue 15 from the SOPRANO spectra database.[1]

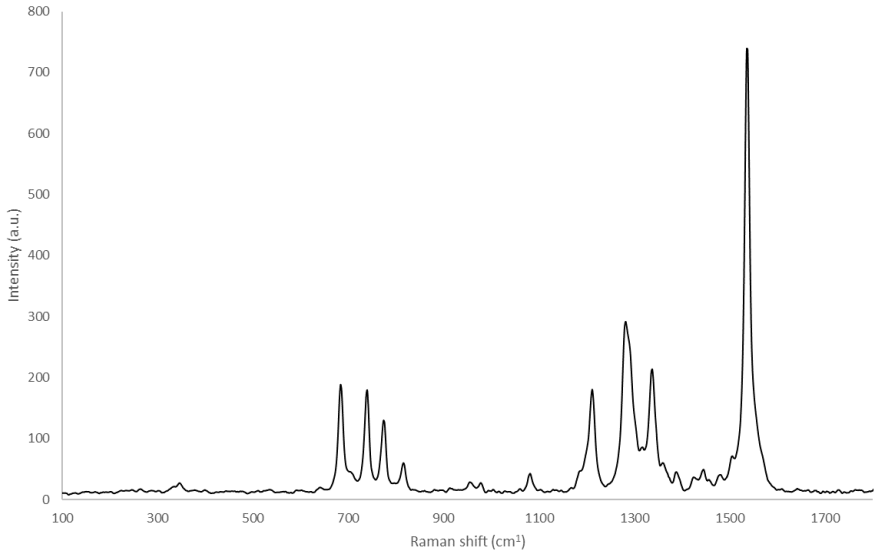

Figure S340. *Raman spectrum of Raw Green*

Parameters used to obtain this spectrum are as follows: 785 nm, 175 mW, 5 second 2 average, 1 boxcar, auto-baseline on. Peaks at 1538 cm^{-1}, 1338 cm^{-1}, 1282 cm^{-1}, 1212 cm^{-1}, 774 cm^{-1}, 740 cm^{-1}, and 684 cm^{-1} match the Raman spectrum of Pigment Green 7 from the SOPRANO Raman spectra database.[1]

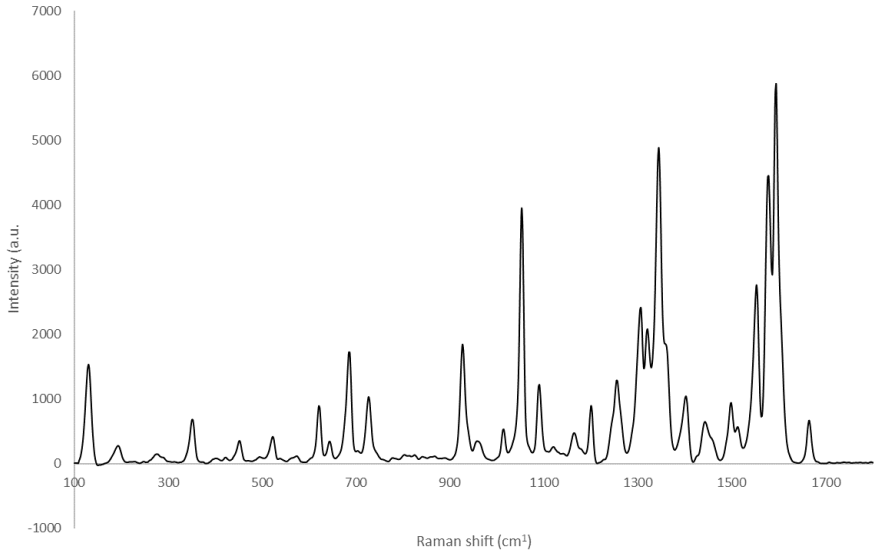

Figure S341. *Raman spectrum of Raw Light Red*

Parameters used to obtain this spectrum are as follows: 785 nm, 175 mW, 5 second, 2 average, 1 boxcar, auto-baseline on. Major peaks at 1594 cm^{-1}, 1578 cm^{-1}, 1552 cm^{-1}, 1344 cm^{-1}, 1304 cm^{-1}, 1052 cm^{-1}, 926 cm^{-1}, 686 cm^{-1}, and 130 cm^{-1} match the Raman spectrum of Pigment Red 254 from the SOPRANO Raman spectra database.[1]

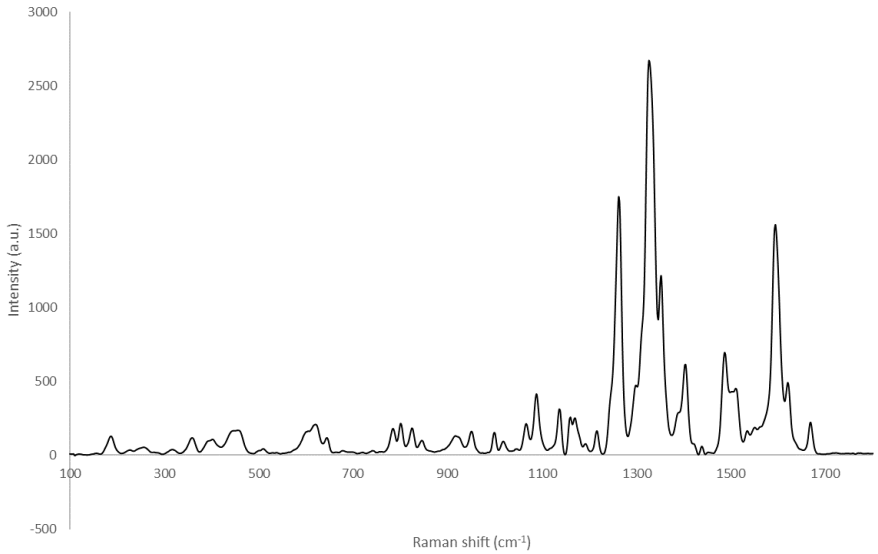

Figure S342. *Raman spectrum of Raw Light Yellow*

Parameters used to obtain this spectrum are as follows: 785 nm, 175 mW, 5 second integration, 2 average, 1 boxcar, auto-baseline on. Peaks at 1594 cm^{-1}, 1486 cm^{-1}, 1404 cm^{-1}, 1352 cm^{-1}, 1326 cm^{-1}, and 1262 cm^{-1} match the peaks for Pigment Yellow 74 from the SOPRANO Raman spectra database.[1]

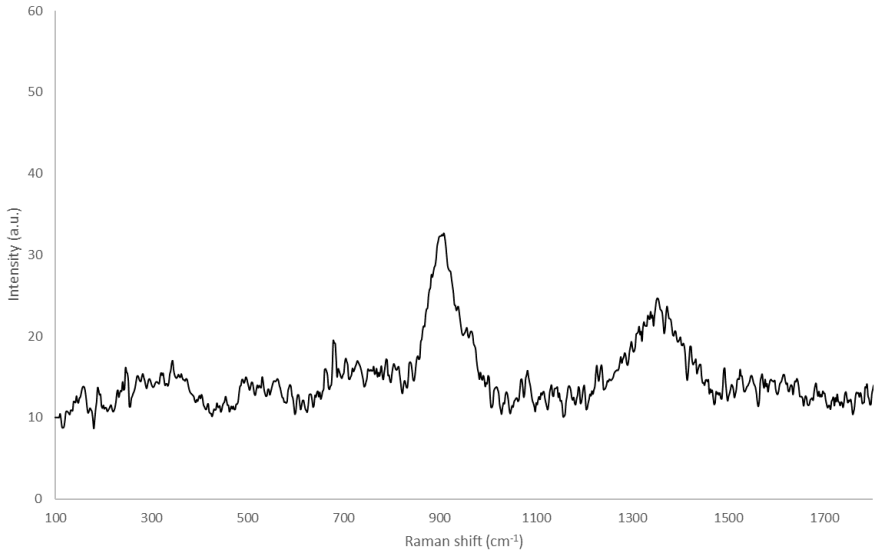

Figure S343. *Raman spectrum of Raw Pitch Black*

Parameters used to obtain this spectrum are as follows: 785 nm, 175 mW, 12 second integration, 2 average, 1 boxcar, auto-baseline on. Peaks at 1354 cm^{-1} and 908 cm^{-1} indicate the presence of carbon black (see section 10).

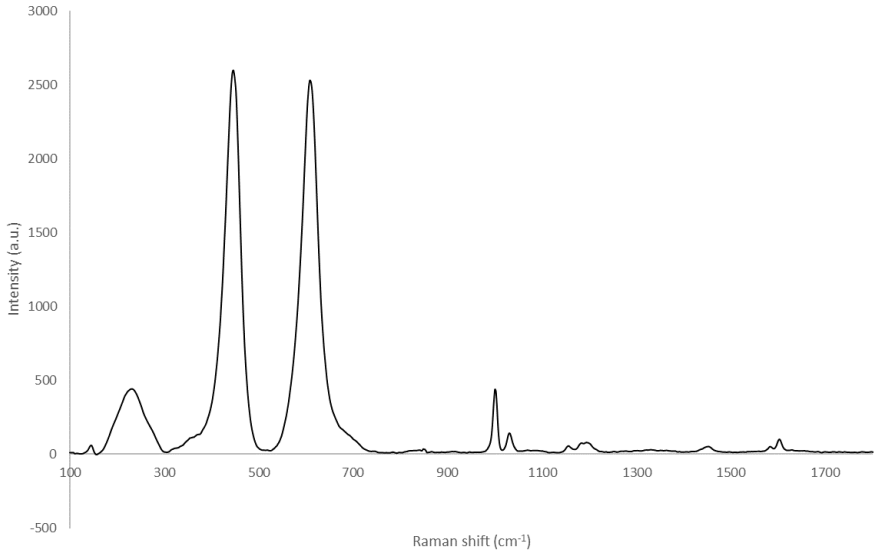

Figure S344. *Raman spectrum of Raw White*

Parameters used to obtain this spectrum are as follows: 785 nm, 175 mW, 5 second integration, 2 average, 1 boxcar, auto-baseline on. Peaks at 610 cm^{-1}, 446 cm^{-1}, and 230 cm^{-1} match the Raman spectrum of Pigment White 6 (TiO_2) (see section 10).

10.3 XRF Data

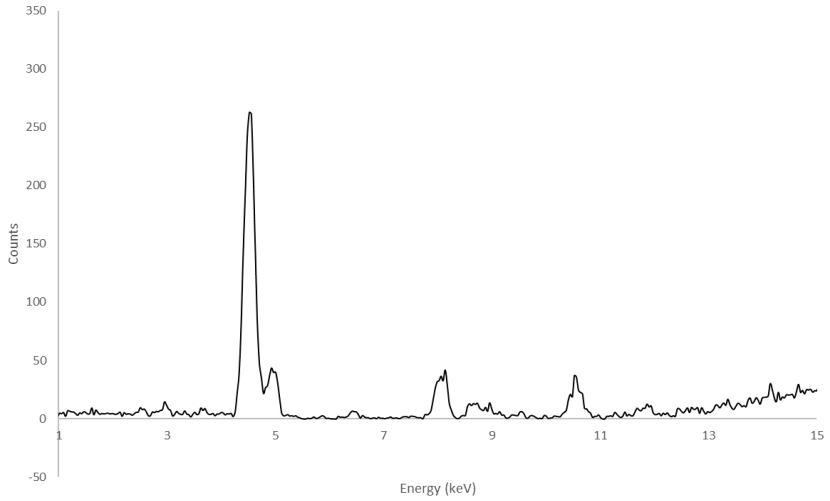

Figure S345. *X-ray fluorescence spectrum of Raw Ink Blue Sky*

A peak pair at 4.55 keV and 5.00 keV correspond to the $K\alpha_1$ and $K\beta_1$ lines of titanium, indicating the presence of titanium in the tattoo ink. Small peaks at 8.13 keV and 8.73 keV are attributed to the $K\alpha_1$ and $K\beta_1$ lines of copper, confirming that Pigment Blue 15 is in the tattoo ink. Additional peaks at 10.56 keV and 11.86 keV indicate arsenic present. Arsenic is found in the glass microscope slide used to dry the sample on.

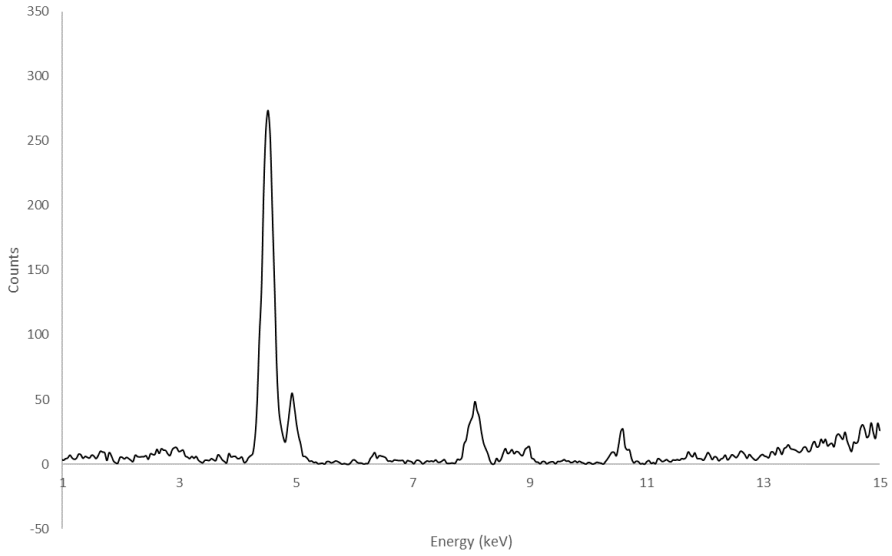

Figure S346. *X-ray fluorescence spectrum of Raw Ink Green*

Signals at 4.52 keV and 4.93 keV correspond to the $K\alpha_1$ and $K\beta_1$ lines of titanium, likely from Pigment White 6 (TiO_2). A peak pair at 8.06 keV and 8.99 keV is indicative of copper, a major component of Pigment Blue 15. A peak at 10.60 keV is likely from the arsenic present in the glass microscope slide used to dry the tattoo ink on.

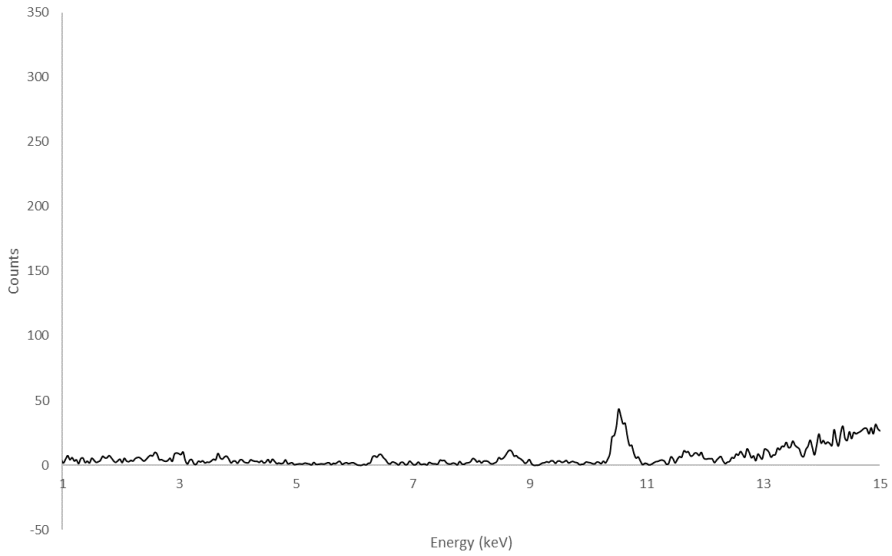

Figure S347. *X-ray fluorescence spectrum of Raw Ink Light Red*

Peaks at 10.52 keV and 11.82 keV is indicative of arsenic that is present in the glass microscope slide used to mount the sample.

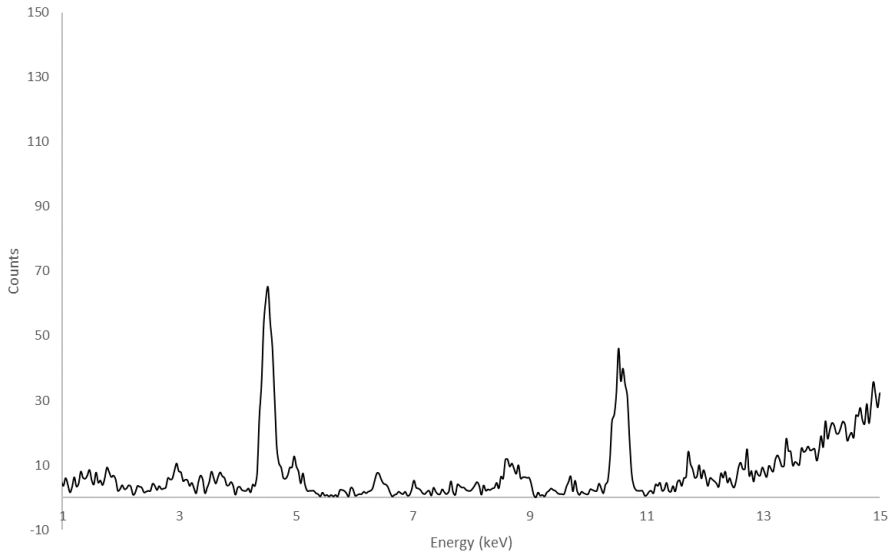

Figure S348. *X-ray fluorescence spectrum of Raw Ink Light Yellow*

Peaks at 4.52 keV and 4.96 keV correspond to the $K\alpha_1$ and $K\beta_1$ lines of titanium, confirming the presence of Pigment White 6 (TiO_2). Additional peaks at 10.52 keV and 11.72 keV likely comes from arsenic that is present in the glass microscope slide used to dry the sample on.

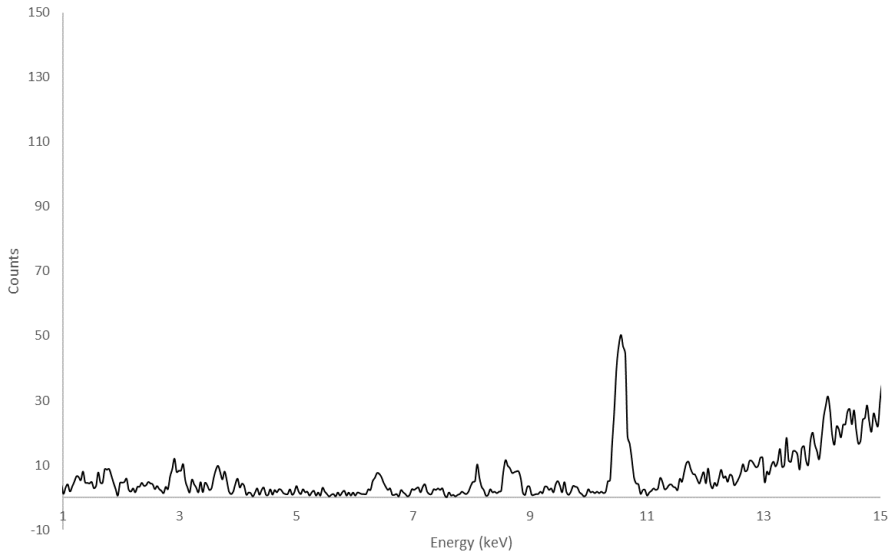

Figure S349. *X-ray fluorescence spectrum of Raw Ink Pitch Black*

Major peaks at 10.56 keV and 11.72 keV correspond to arsenic, likely from arsenic present in the glass microscope slide used to dry the sample on.

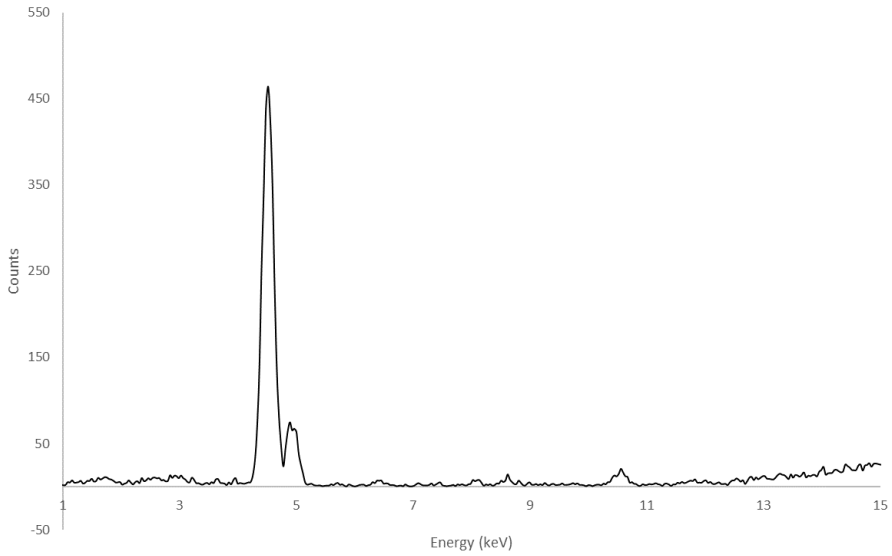

Figure S350. *X-ray fluorescence spectrum of Raw Ink White*

Peaks at 4.52 keV and 4.89 keV correspond to the $K\alpha_1$ and $K\beta_1$ of titanium, confirming the presence of Pigment White 6 (TiO_2) in the tattoo ink.

11. Standard Pigments

11.1 Raman Data

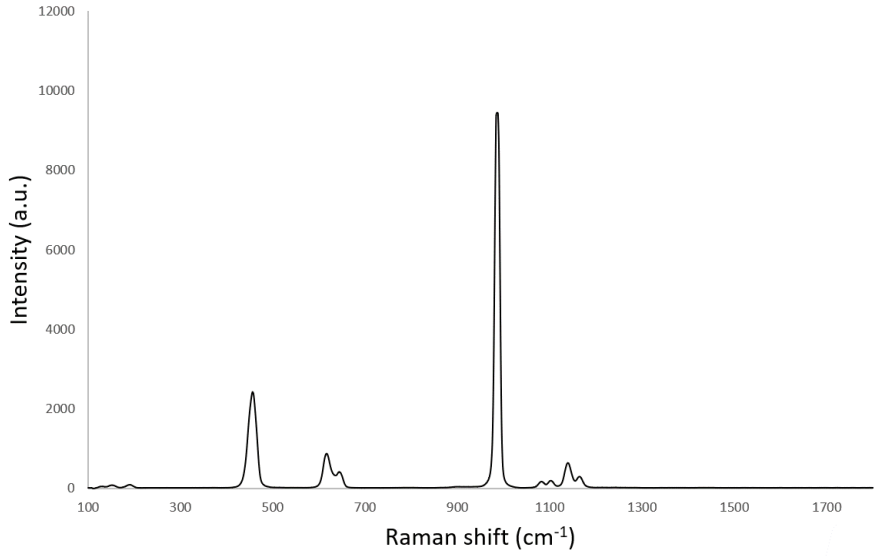

Figure S351. *Raman spectrum of barium sulfate pigment*

Parameters used to obtain this spectrum are as follows: 785 nm, 175 mW, 3 second integration, 2 average, 2 boxcar, auto-baseline on. Major peaks occur at 988 cm^{-1}, 620 cm^{-1}, and 456 cm^{-1}.

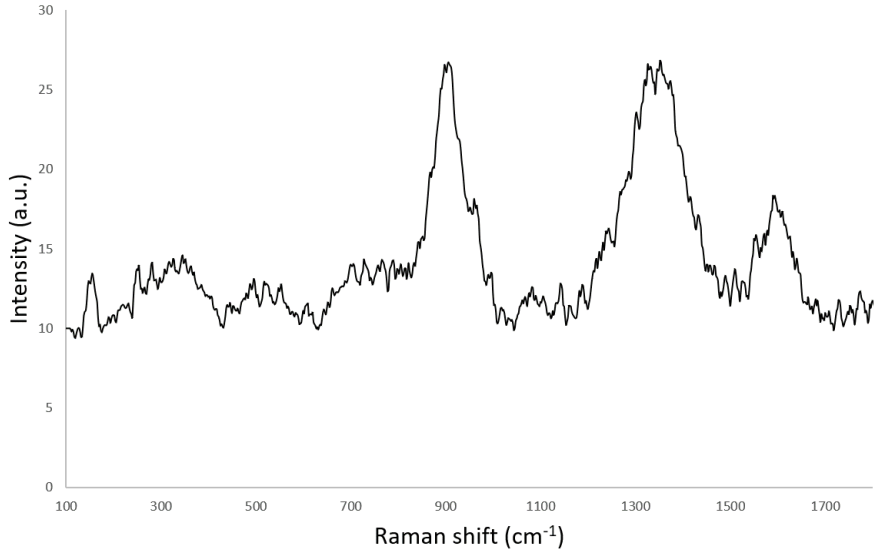

Figure S352. *Raman spectrum of carbon pigment*

Parameters used to obtain this spectrum are as follows: 785 nm, 200 mW, 10 second integration, 3 average, 2 boxcar, auto-baseline on. Major peaks occur at 908 cm^{-1}, 1352 cm^{-1}, and 1594 cm^{-1}.

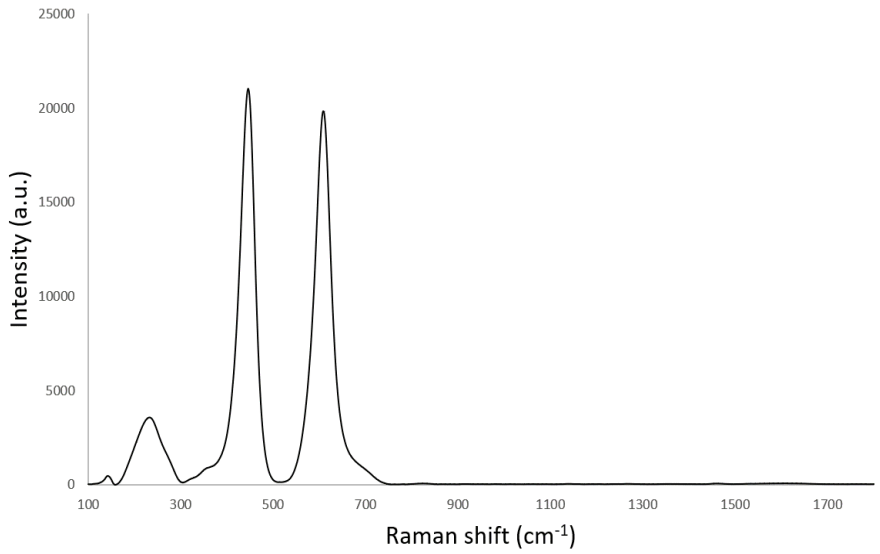

Figure S353. *Raman spectrum of titanium dioxide (Pigment White 6)*

Parameters used to obtain this spectrum are as follows: 785 nm, 200 mW, 10 second integration, 3 average, 2 boxcar, auto-baseline on. Major peaks occur at 610 cm^{-1}, 448 cm^{-1}, and 238 cm^{-1}.

12. Standard NMR spectra

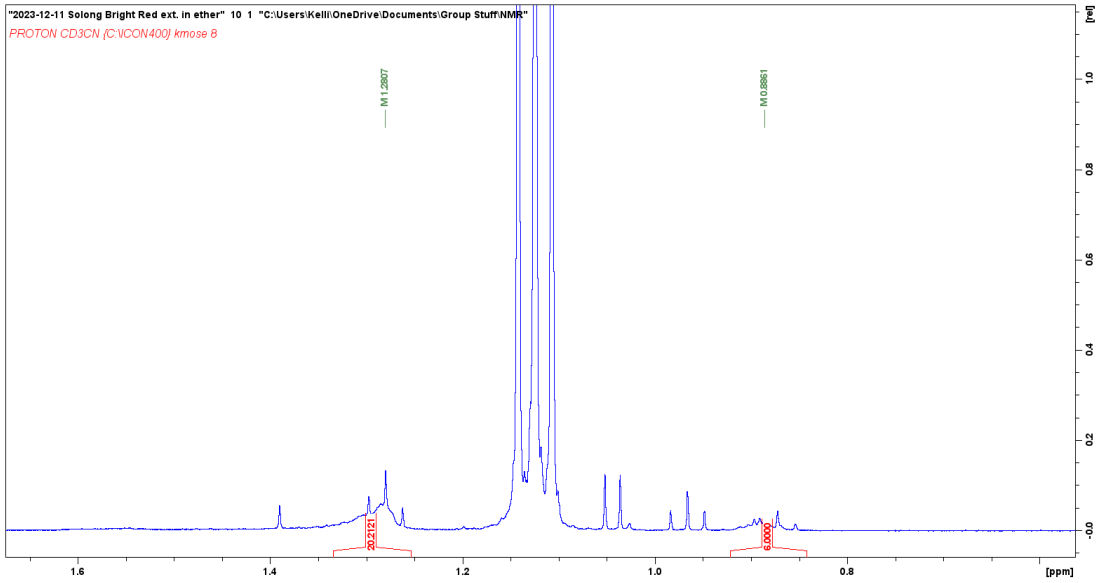

Figure S354. *^{1}H NMR spectrum of Solong Bright Red pot residue extracted in diethyl ether in acetonitrile-d3*

Integration of peaks at δ0.8861 ppm and δ1.2807 ppm, suspected to be a long-chain hydrocarbon, show a ratio of 6:20. This is typical of dodecane, having two CH_3 groups and 10 CH_2 groups for a total of 26 hydrogens.

References

1. SOPRANO. SOP Spectral Library. https://soprano.kikirpa.be/index.php?lib=sop