

Metropolitan Museum of Art Gas Chromatography- Mass Spectrometry (GC-MS) Results from Material Analysis

This document includes (1) a mass spectrum and (2) the volatile organic compounds (VOCs) emitted from samples using GC-MS analysis. The data is not interpreted; however, several classes of chemicals are highlighted because they are potential risks for artwork in an enclosed environment. A basic key, provided below, indicates those classes. The amount of each chemical identified has not been determined; similarly, it is not known how much of each chemical is necessary to do damage to art. Finally, peaks may be present that are the result of the sample adsorbing chemicals from the air and reemitting them during testing rather than being inherent to the sample. Research is ongoing to determine specifically which chemicals and amounts are required to negatively affect artifacts.

Highlighted data:

Pink – chemicals currently known to be hazardous to art

Green – amines; can raise the pH, are suspected to react with acids and may form crystals in an enclosed environment

Yellow – chemicals of the following type, which *may* be hazardous to art:

Acids – lower the pH, corrosive to metals, degrade organic materials

Aldehydes – can convert to acids with heat or exposure to UV light

Esters – can hydrolyze into acids with heat and humidity

Sulfur-containing compounds – known to tarnish and corrode some metals

Halogenated compounds – can become reactive with exposure to heat and UV light

Nitrogen-containing, not amine – can react with other off-gassed chemicals

Alkynes – can become reactive when exposed to heat or UV light

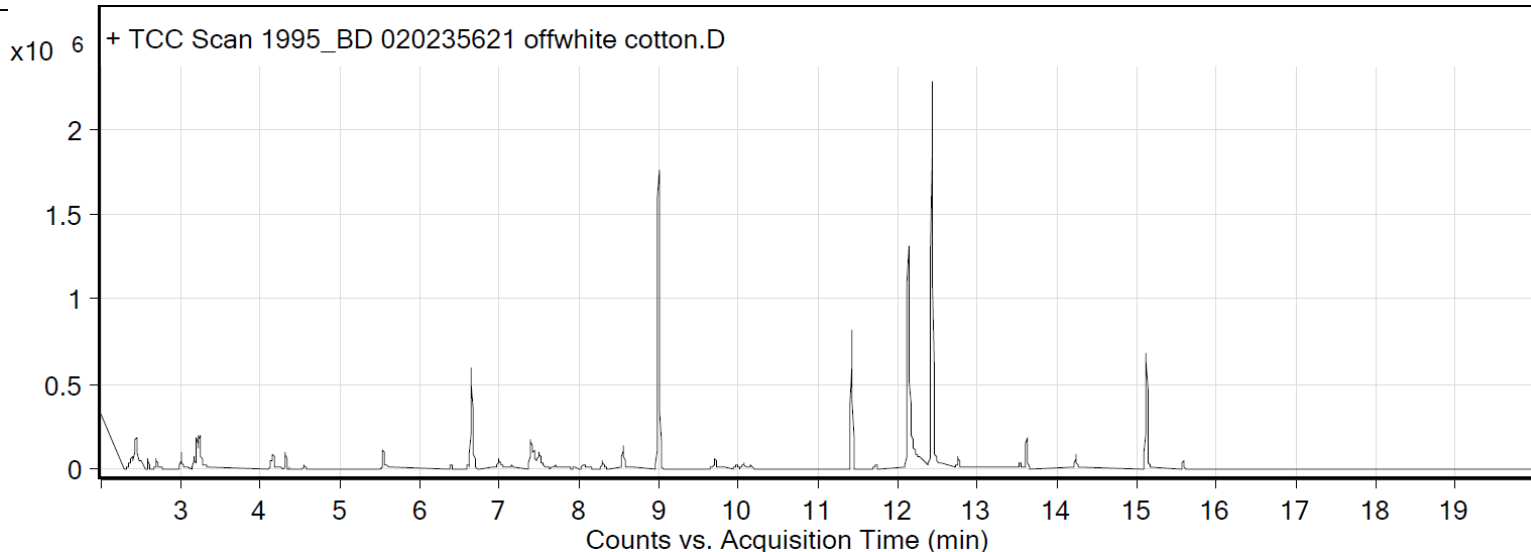
Sample: Baumann Dekor 0202356201 offwhite cotton fabric

Oddly test result: Temporary

Date collected: 12/8/2017

Technique used: SPME with a PDMS/DVB fiber; Agilent 7890B GC and 5977B MS fitted with a GL Sciences OPTIC-4 multimode inlet and LEAP PAL RTC autosampler; Pre-heated at 60°C for 20 minutes; fiber exposure at 60°C for 20 minutes; sample injected into 220°C inlet and cryo-trapped for 2 min at -15°C; GC ramped from 35°C to 250 °C at 10°C/min. Data analyzed in Masshunter Qualitative Analysis. Deconvoluted data with > 85% match with a NIST 17.0 or Wiley 9 library are reported.

VOCs not highlighted are because they were also observed in blanks: (1) 12.1 min: 2-methyl-, 2,2-dimethyl-1-(2-hydroxy-1-methylethyl) propyl ester propanoic acid; (2) 12.4 min: 2-methyl-, 3-hydroxy-2,2,4-trimethylpentyl ester propanoic acid



RT	Score (Lib)	Area	Name	Formula
2.59	94.4	67389	Silanol, trimethyl-	C3H10OSi
2.69	95.45	98207	Acetic acid	C2H4O2
3.17	93.66	148953	Silanediol, dimethyl-	C2H8O2Si
3.2	93.34	252450	Ethanamine, N,N-diethyl-	C6H15N
3.24	95.32	414055	Triethylamine	C6H15N
4.16	87.94	113030	Hexanal	C6H12O
4.31	93.61	155861	Cyclotrisiloxane, hexamethyl-	C6H18O3Si3
4.55	98.22	44278	2-Furancarboxaldehyde	C5H4O2
5.54	97.93	231501	Ethanol, 2-butoxy-	C6H14O2
6.39	96.76	43780	Benzaldehyde	C7H6O
6.61	96.34	44712	Phenol	C6H6O
6.65	95.23	1110283	Cyclotetrasiloxane, octamethyl-	C8H24O4Si4
7.39	94.21	345909	1-Hexanol, 2-ethyl-	C8H18O
7.43	93.36	98806	dl-Limonene	C10H16
8.29	91.42	93629	Benzenemethanol, .alpha.,.alpha.-dimethyl-	C9H12O
8.55	96.67	248510	Nonanal	C9H18O
9	91.76	3157317	Cyclopentasiloxane, decamethyl-	C10H30O5Si5
9.71	93	128748	Cyclohexanol, 5-methyl-2-(1-methylethyl)-	C10H20O
9.98	94.69	51822	Hexacosane	C26H54
10.07	93.16	51301	Decanal	C10H20O
11.42	91.17	1378276	Cyclohexasiloxane, dodecamethyl-	C12H36O6Si6
12.13	93.19	3209121	Propanoic acid, 2-methyl-, 2,2-dimethyl-1-(2-hydroxy-1-methylethyl)propyl ester	C12H24O3
12.43	93.35	4150747	Propanoic acid, 2-methyl-, 3-hydroxy-2,2,4-trimethylpentyl ester	C12H24O3
12.76	93.27	103330	Dodecane, 2,6,11-trimethyl-	C15H32
14.23	87.47	122890	Hexane, 2,2,3-trimethyl-	C9H20
15.1	91.93	53652	1,2-Benzenedicarboxylic acid, diethyl ester	C12H14O4
15.12	91.67	1166106	PENTAN-1,3-DIOLDIISOBUTYRATE, 2,2,4-TRIMETHYL-	C16H30O4
15.58	91.49	82968	Cyclooctasiloxane, hexadecamethyl-	C16H48O8Si8