

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

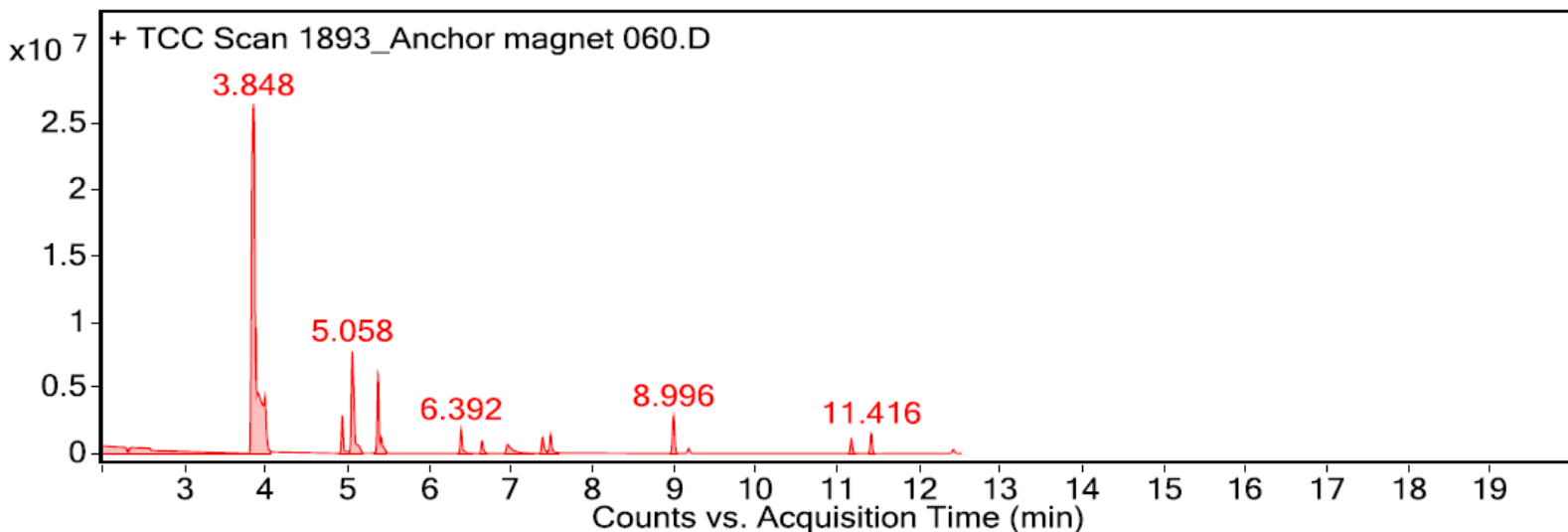
Sample: Anchor Magnet sheet 0.60mm white matte sheet

Oddy test result: Temporary

Date collected: 12/11/2017

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 crotrapped for 2 min at -15°C; GC ramped from 40°C to 225 °C at 10°C/min. Data analyzed in masshunter Qualitative. Samples > 80% match with a NIST library are reported.

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



Library results

RT	Score	Formula	MW	Area	CAS #	Name
3.898	92.7	C7H8	92.1	29136620	108-88-3	Benzene, methyl-
3.993	97.5	C3H8N2O	88.1	2875009	1000452-55-9	Glycinamide, N(2)-methyl-
4.935	99.7	C8H10	106.1	4340251	100-41-4	Ethylbenzene
5.058	98.3	C8H10	106.1	18594598	95-47-6	o-Xylene
5.373	98.5	C8H10	106.1	10474726	95-47-6	o-Xylene
5.411	96.4	C6H10O	98.1	1244449	108-94-1	Cyclohexanone
6.392	98.8	C7H6O	106.0	3228026	100-52-7	Benzaldehyde
6.649	95.4	C8H24O4Si4	296.1	1795629	556-67-2	Cyclotetrasiloxane, octamethyl-
6.962	97.8	C7H8O	108.1	3425218	100-51-6	Benzenemethanol
7.389	98.3	C8H18O	130.1	2728722	104-76-7	1-Hexanol, 2-ethyl-
7.489	97.5	C7H8O	108.1	2537994	100-51-6	Benzyl Alcohol
8.996	93.9	C10H30O5Si5	370.1	5234986	541-02-6	Cyclopentasiloxane, decamethyl-
9.180	97.2	C10H20O2	172.1	666332	103-09-3	Acetic acid, 2-ethylhexyl ester
11.174	94.1	C10H12O2	164.1	1882091	7473-98-5	2-Hydroxy-iso-butyrophenone
11.420	91.6	C12H36O6Si6	444.1	2575800	540-97-6	Cyclohexasiloxane, dodecamethyl-
12.424	93.4	C12H24O3	216.2	578832	77-68-9	Propanoic acid, 2-methyl-, 3-hydroxy-2,2,4-trimethylpentyl ester