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

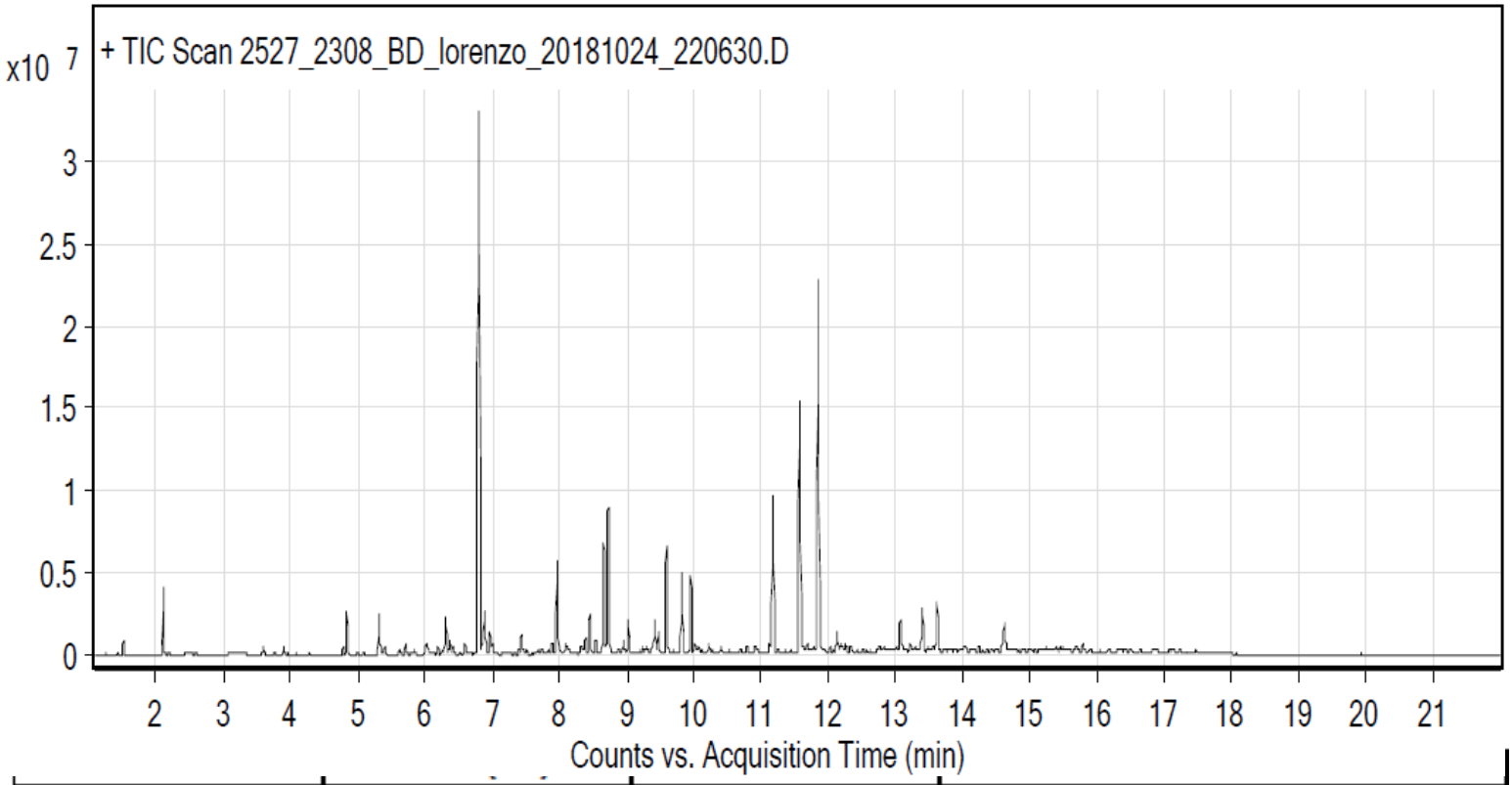
Sulfur-containing compounds – known to tarnish and corrode some metals

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 Lorenzo fabric
Date collected: 10/24/2018
Oddy test result: temporary
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 35°C to 225 °C at 7.5°C/min. Data analyzed in Masshunter Qualitative. Samples > 90% match with a NIST 17.0 library are reported. VOCs not highlighted are because they were also observed in blanks: (1) 11.5 min: 2-methyl-, 2,2-dimethyl-1-(2-hydroxyl-1-methylethyl) propyl ester propanoic acid; (2) 11.8 min: 2-methyl-, 3-hydroxyl-2,4,4-trimethylpentyl ester propanoic acid



3.89	91.43	793225	2-Pentanone, 4-hydroxy-4-methyl-
4.83	96.96	3611705	Ethanol, 2-butoxy-
5.31	94.76	3508446	Ethanol, 2-(2-methoxyethoxy)-
5.39	92.24	752015	2-Propanol, 1-butoxy-
5.7	97.38	1002178	Benzaldehyde
6.03	92.85	1120074	2-Vinylfuran
6.37	91.95	1015885	Octanal
6.41	91.48	784773	dipropylene glycol monomethyl ether isomer, STRUCTURE UNKNOWN
6.58	91	1263282	dipropylene glycol monomethyl ether isomer, STRUCTURE UNKNOWN
6.8	95.54	68772734	1-Hexanol, 2-ethyl-
6.88	90.04	2777888	Benzyl Alcohol
6.89	93.58	1737696	(S)-3-Ethyl-4-methylpentanol
6.96	95.98	2507188	2-Pyrrolidinone, 1-methyl-
7	91.75	786227	(S)-(+)-5-Methyl-1-heptanol
7.43	95.64	1805449	1-Octanol
7.96	96.51	8624321	Nonanal
8.39	90.56	1717160	1-Nonanol
8.45	95.7	3371840	Pentanedioic acid, dimethyl ester
8.54	94.67	1149336	(S)-(+)-6-Methyl-1-octanol
8.66	95.58	9809374	Acetic acid, 2-ethylhexyl ester
8.72	90.15	12722536	Cyclopentasiloxane, decamethyl-
8.95	95.67	1133150	1-Nonanol

9.02	97.15	3152698	Cyclohexanol, 5-methyl-2-(1-methylethyl)-
9.23	90.12	517176	Ethanol, 2-(2-butoxyethoxy)-
9.42	94.93	3459436	Cyclohexanol, 4-(1,1-dimethylethyl)-, cis-
9.47	95.02	2058204	Decanal
9.59	95.38	10048940	Cyclohexanol, 4-(1,1-dimethylethyl)-, trans-
9.82	94.78	7388201	2-Ethylhexyl acrylate
9.95	91.67	6782927	2-Ethyl-1-hexyl propionate
10.22	93.32	818541	meso-2,3-Diethyl-2,3-dimethylsuccinic acid dinitrile
10.79	98.94	536057	Dodecane, 2-methyl-
11.17	91.16	14654539	Cyclohexasiloxane, dodecamethyl-
11.57	91.17	26310241	Propanoic acid, 2-methyl-, 2,2-dimethyl-1-(2-hydroxy-1-methylethyl)propyl ester
11.85	93.55	40290759	Propanoic acid, 2-methyl-, 3-hydroxy-2,4,4-trimethylpentyl ester
12.13	95.02	1769784	Undecane, 4,7-dimethyl-
13.62	95.98	3954722	Phenol, 2,6-bis(1,1-dimethylethyl)-4-methyl-