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

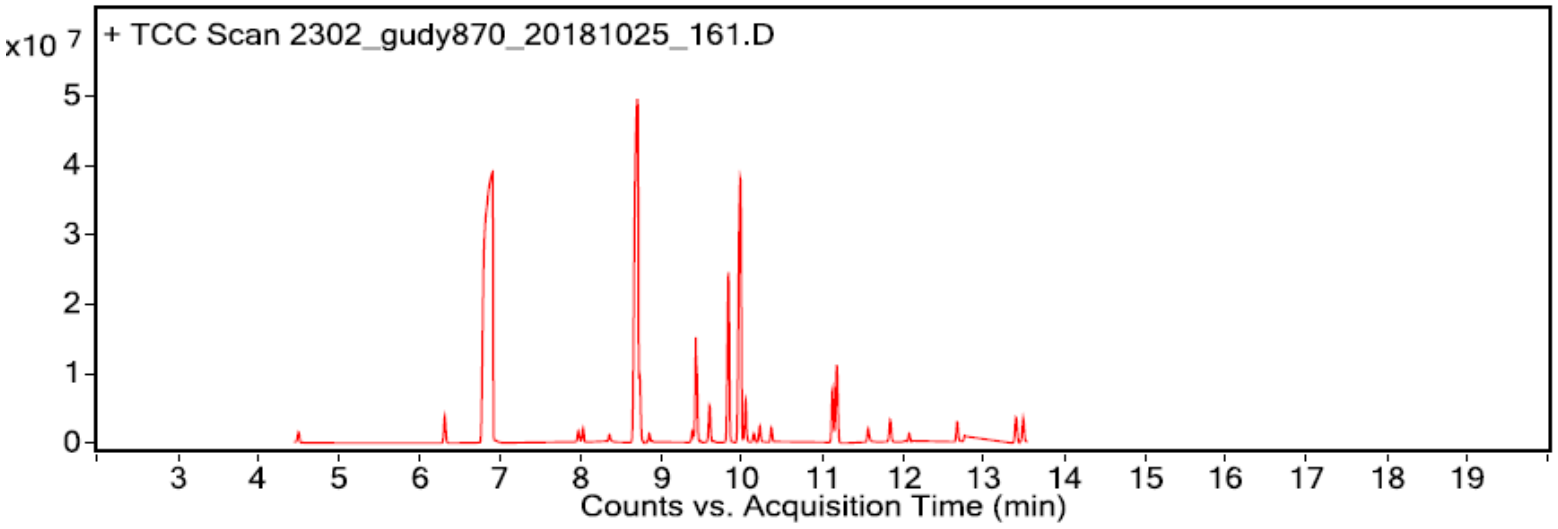
Alkynes – can become reactive when exposed to heat or UV light

Sample: Gudy 870 transparent double side pressure-sensitive adhesive

Date collected: 10/24/2018

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 auto-sampler; Pre-heated at 60°C for 20 minutes; fiber exposure at 60°C for 20 minutes; sample injected into 220°C inlet and cryotrapped for 2 min at -15°C; GC ramped from 40°C to 225 °C at 10°C/min. Data analyzed using the Masshunter Qualitative program. Samples > 80% match with a NIST 17.0 library are reported.

VOCs not highlighted are because they were also observed in blanks: (1) 11.6 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



Library results

RT	Score	Formula	MW	Area	CAS #	Name
4.500	92.7	C8H24O2Si3	236.1	2932091	107-51-7	Trisiloxane, octamethyl-
6.310	95.8	C8H24O4Si4	296.1	6338799	556-67-2	Cyclotetrasiloxane, octamethyl-
6.900	85.1	C8H16	112.1	201644614	999018-64-2	octene
7.970	97.0	C9H18O	142.1	2576910	124-19-6	Nonanal
8.030	93.6	C11H26OSi	202.2	2218171	18023-53-5	2-Ethylhexanol, TMS derivative
8.360	85.6	C12H22O3	214.2	2294008	1000382-54-0	Carbonic acid, octyl prop-1-en-2-yl ester
8.700	95.0	C10H20O2	172.1	148125635	103-09-3	Acetic acid, 2-ethylhexyl ester
8.730	94.3	C10H30O5Si5	370.1	19785277	541-02-6	Cyclopentasiloxane, decamethyl-
8.850	87.2	C12H22O3	214.2	2044729	1000382-54-0	Carbonic acid, octyl prop-1-en-2-yl ester
9.390	85.7	C12H26	170.2	2426612	112-40-3	Dodecane
9.440	91.6	C12H26O	186.2	18251464	62625-25-6	1-Butoxy-2-ethylhexane
9.600	95.7	C10H20O	156.2	8930928	21862-63-5	Cyclohexanol, 4-(1,1-dimethylethyl)-, trans-
9.830	96.1	C11H20O2	184.1	42498013	103-11-7	2-Ethylhexyl acrylate
9.980	91.6	C11H22O2	186.2	85754312	999145-46-3	2-Ethyl-1-hexyl propionate
10.150	82.4	C12H22O	182.2	2074621	32064-71-4	3-Octen-2-one, 3-butyl-
11.130	93.5	C12H24O2	200.2	12907972	25415-84-3	n-Butyric acid 2-ethylhexyl ester
11.180	96.2	C12H36O6Si6	444.1	20745695	540-97-6	Cyclohexasiloxane, dodecamethyl-
11.570	90.5	C12H24O3	216.2	3756653	74367-33-2	Propanoic acid, 2-methyl-, 2,2-dimethyl-1-(2-hydroxy-1-methylethyl)propyl ester
11.840	93.1	C12H24O3	216.2	5996990	74367-34-3	Propanoic acid, 2-methyl-, 3-hydroxy-2,4,4-trimethylpentyl ester
13.400	80.6	C14H42O7Si7	518.1	6961491	107-50-6	Cycloheptasiloxane, tetradecamethyl-
13.490	93.6	C16H34O	242.3	5669778	10143-60-9	bis(2-Ethylhexyl) ether