Analysis report

MiPlaza

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Materials Analysis

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Subject
Outgassing test of table top materials (40 and 100 °C)

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Experimental

Outgassing experiments can be performed by placing a small amount of sample in a desorption oven. When this oven is heated volatile organic compounds are released and collected in a cryo-trap for refocusing. After finishing the collection process, the cryo-trap is heated very quickly and the trapped analytes are injected onto the gas chromatography column. After separation, the analytes are detected and identified using a mass spectrometer. A calibration mixture is used to calculate an average sensitivity, because it is not possible to calibrate for each individual component. Because the sensitivity of the mass spectrometer is quite equal for most components, a reliable estimation is received for the sensitivity of the detector for the individual analytes detected. Depending on the properties of the compounds sampled, trapping or releasing can be less than 100%.

Results

Pieces of tabletop material were analysed using GC-MS (top layer and the whole stack), the manufacturer sawed the samples into pieces of 1.2*2.5*8 cm each, to fit the sampling chamber.
The analysis results are listed in the table below. All chromatograms can be found in the appendix.
Because outgassing of organic compounds is expected to be very low, longer sampling times were used to increase sensitivity and obtain results that are more reliable.

Table 1: Summary of results

#	samplename	TOC (molecules/cm2/s)	TOCnv (molecules/cm2/s)	TOCv (molecules/cm2/s)	non volatiles (%)	Refractory (molecules/cm2/s)
	Top layer					
1	40 °C - 0-20 min.	7.8E+09	7.8E+09	n.d.	100.0	n.d.
2	40 °C - 20-40 min.	3.3E+09	3.2E+09	1.6E+08	95.1	n.d.
	Average:	5.6E+09	5.5E+09	8.2E+07	97.5	-
3	100 °C - 40-60 min.	2.9E+11	2.9E+11	2.4E+09	99.2	n.d.
4	100 °C - 60-100 min.	1.4E+11	1.4E+11	1.3E+09	99.1	n.d.
	Average:	2.2E+11	2.1E+11	1.9E+09	99.1	-
	Stack					
5	40 °C - 0-20 min.	4.5E+08	4.5E+08	n.d.	100.0	n.d.
6	40 °C - 20-40 min.	3.4E+08	3.4E+08	n.d.	100.0	n.d.
	Average:	3.9E+08	3.9E+08	-	100.0	-
7	100 °C - 40-60 min.	3.3E+10	2.8E+10	4.3E+09	87.0	n.d.
8	100 °C - 60-100 min.	2.9E+10	2.6E+10	2.5E+09	91.5	n.d.
	Average:	3.1E+10	2.7E+10	3.4E+09	89.2	-

#	samplename	TOC (pmol/cm2/min.)	TOCnv (pmol/cm2/min.)	TOCv (pmol/cm2/min.)	non volatiles (%)	Refractory (pmol/cm2/min.)
	Top layer					
1	40 °C - 0-20 min.	7.8E-01	7.8E-01	n.d.	100.0	n.d.
2	40 °C - 20-40 min.	3.3E-01	3.2E-01	1.6E-02	95.1	n.d.
	Average:	5.6E-01	5.5E-01	8.2E-03	97.5	-
3	100 °C - 40-60 min.	2.9E+01	2.9E+01	2.4E-01	99.2	n.d.
4	100 °C - 60-100 min.	1.4E+01	1.4E+01	1.3E-01	99.1	n.d.
	Average:	2.2E+01	2.1E+01	1.9E-01	99.1	-
	Stack					
5	40 °C - 0-20 min.	4.5E-02	4.5E-02	n.d.	100.0	n.d.
6	40 °C - 20-40 min.	3.4E-02	3.4E-02	n.d.	100.0	n.d.
	Average:	3.9E-02	3.9E-02	-	100.0	-
7	100 °C - 40-60 min.	3.3E+00	2.8E+00	4.3E-01	87.0	n.d.
8	100 °C - 60-100 min.	2.9E+00	2.6E+00	2.5E-01	91.5	n.d.
	Average:	3.1E+00	2.7E+00	3.4E-01	89.2	-

*TOCv = compounds having a boiling point <150°C and a molecular weight <120 g/mol
TOCnv = compounds having a boiling point ≥150°C or a molecular weight ≥120 g/mol
n.d. = not detected

Conclusion:
At a temperature of 40 °C the top layer of the tabletop material, as well as the entire stack of material release a small amount of organic compound. Comparing the two samples shows a higher outgassing rate for the top layer. For both samples, the majority of the compounds released consists of phenol.
When heated to 100 °C, the outgassing of organic compounds increases significantly for both samples; the compounds released are mainly non-volatile and quite identical for both samples. The majority of the organic compounds released, consist of phenol, other compounds detected consist of solvents, alkanes and esters.
No refractory compounds were detected at both temperatures.
The outgassing results are quite similar to the results discussed in report 2008.4884, the main difference is the absence of silicon containing refractory compounds.

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Appendix 1: Chromatograms.