IFA
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Deutschen Gesetzlichen Unfallversicherung

MEGA evaluations for the preparation of REACH exposure scenarios for octamethylcyclotetrasiloxane

1 Introduction

The measured data for workplace exposure evaluated in the following have been gathered and documented in accordance with the principles of the measurement system of the German social accident insurance institutions for exposure assessment (MGU[1], formerly BGMG). The quality of the MGU is upheld by a quality management system that in essence satisfies the requirements of DIN EN ISO 9001. The test laboratories are operated in accordance with DIN EN ISO 17025 “General requirements for the competence of testing and calibration laboratories”.

To measure octamethylcyclotetrasiloxane exposure at the workplace, a defined volume of air is sucked by a suitable pump through a tenax stainless steel tube. The volatile organic hazardous substance contained in the air is adsorbed by the Tenax. For analysis, the hazardous substance is evaporated in a thermal desorber and analysed by gas chromatography. After chromatographic separation, analysis is performed simultaneously by a flame ionisation detector (FID) and a mass spectrometer (MS). Qualitative analysis is performed by the MS, and quantitative analysis by the FID. The quantification limit is 3.0 µg/m³ for a test air volume of 2 L. Source: VOC (Volatile Organic Compounds) (ref. no. 8936). In: IFA-Arbeitsmappe Messung von Gefahrstoffen. 45. Lfg. X/2010. Ed.: Deutsche Gesetzliche Unfallversicherung (DGUV), Berlin. Erich Schmidt, Berlin, 2011 – loose-leaf edition.

All the surveyed data in the MGU are brought together in the MEGA exposure database (measured data on exposure to hazardous substances at the workplace). If individual values fall below the measurement method’s analytical quantification limit, half the value is adopted in the evaluation. The MEGA^{Pro} software developed by the IFA (formerly BGIA) makes it possible to statistically analyse the data of the MEGA exposure database on the basis of various selection criteria and evaluation strategies.

For measurements in interiors, measured values for octamethylcyclotetrasiloxane are also available in the MEGA exposure database. These are documented in the report “Innenraumarbeitsplätze – Vorgehensempfehlung für die Ermittlungen zum Arbeitsumfeld” (Ed.: Hauptverband der gewerblichen Berufsgenossenschaften (HVBG), Sankt Augustin, 2005, in German).

[1] Gabriel, S.; Koppisch, D.; Range, D.: The MGU – a monitoring system for the collection and documentation of valid workplace exposure data. Gefahrstoffe – Reinhalt. Luft 70 (2010) No. 1/2, pp. 43-49 http://www.dguv.de/ifa, Webcode m200066

2 Data situation and evaluation strategy

2.1 Overview of the measured values collected in the MGU, data period 2000 to 2010

There is no workplace limit for octamethylcyclotetrasiloxane.
Information on the sampling systems can be found in the IFA work folder (IFA-Arbeitsmappe, in German).

General description	Number of measured values (%)
Total	239
Type of sampling: Stationary	172 (72%)
Type of sampling: Personal	67 (28%)
Sampling time ≥ 0.5 h and exposure time ≥ 6 h (comparable to shift measurements)	188 (78.7%)
Undocumented reference to shift measurements respectively sampling time < 0.5 h or exposure time < 6 h	51 (21.3%)
Number of data < quantification limit (Values < quantification limit were adopted in statistics with half their values)	150 (62.7%)
Examples: Exposure conditions	
Without mechanical ventilation With mechanical ventilation No details	152 53 32
Without local exhaust ventilation With local exhaust ventilation No details	123 33 83
General description of octamethylcyclotetrasiloxane measurements in 54 branches of industry and 64 work areas	

2.2 Criteria for inclusion of measured data in the evaluation

- Measured data relating to exposure
- Sampling time ≥ 1 hour
- Exposure time ≥ 6 hours
- Data sets comprising fewer than ten measured data were disregarded.

2.3 Evaluation strategy

The evaluation was performed on the basis of industry groups (Appendix 1) and work area groups (Appendix 2) and broken down further according to type of sampling (stationary or personal).

3 Abbreviations and indices

The following abbreviations and indices are used in the evaluation tables:

Frequency < values: Number of measured values below the analytical quantification limit

+ The distribution value is below the largest analytical quantification limit in the data set.

$ With reference to the given limit value, the percentage of values below the limit value is given.

! The number of measured values below the analytical quantification limit (a. q.) is greater than the number of measured values represented by this cumulative frequency value. No concentration is therefore given for this cumulative frequency value.

* Measured values below the analytical quantification limit of the measuring method concerned are adopted in the evaluation with half the analytical quantification limit value.

Appendix 1

Statistic evaluations for industry groups

Octamethylcyclotetrasiloxane. sampling time ≥ 0.5 h and exposure time ≥ 6 h
Industry groups, general

D.No. = Data set number/ Designation Branch of industry	Number of measured data	Number of firms	Frequency < number of values %	Number of AIIs*	Largest quantification limit in mg/m³	≤ limit value % $	Concentrations in mg/m³		
							50 percen-tile *	90 percen-tile *	95 percen-tile *
D.No. 20 Octamethylcyclotetrasiloxane Total	188	69	117 62.2	17	0.03		! a. q.	0.075	0.129
D.No. 144 Octamethylcyclotetrasiloxane Plastics, processing; Manufacture and processing of rubber products	18	3	8 44.4	2	0.03		+ 0.015	0.101	0.133
D.No. 145 Octamethylcyclotetrasiloxane Manufacture of machinery and vehi-cles	19	8	5 26.3	4	0.005		0.017	0.172	0.193
D.No. 146 Octamethylcyclotetrasiloxane Repair shop (service shop), general	14	1	10 71.4	1	0.005		! a. q.	0.009	0.009
D.No. 147 Octamethylcyclotetrasiloxane Wholesale trade with fuels, technical oils and fats; Wholesale trade with iron and metal haberdashery, textiles; Wholesale trade with fine mechanical products and medical commodities	33	15	20 60.6	1	0.005		! a. q.	0.128	0.135
D.No. 148 Octamethylcyclotetrasiloxane Transport, shipping, transport compa-nies and similar	23	4	13 56.5	2	0.005		! a. q.	0.009	0.01
D.No. 149 Octamethylcyclotetrasiloxane Research, Health services	16	5	14 87.5	4	0.005		! a. q.	0.0339	0.0848

* AII = social accident insurance institution

Industry groups: Stationary measurements

D.No. = Data set number/ Designation Branch of industry	Number of measured data	Number of firms	Frequency < number of values %	Number of AIIs*	Largest quantification limit in mg/m³	≤ limit value % $	Concentrations in mg/m³		
							50 percen-tile *	90 percen-tile *	95 percen-tile *
D.No. 174 Octamethylcyclotetrasiloxane Total	142	58	98 69	16	0.03		! a. q.	0.0394	0.0709
D.No. 150 Octamethylcyclotetrasiloxane Plastics, processing; Manufacture and processing of rubber products	17	3	8 47.1	2	0.03		+ 0.015	0.0894	0.135
D.No. 151 Octamethylcyclotetrasiloxane Manufacture of machinery and vehicles	12	6	5 41.7	4	0.005		+ 0.005	0.148	0.202
D.No. 152 Octamethylcyclotetrasiloxane Repair shop (service shop), general	14	1	10 71.4	1	0.005		! a. q.	0.0086	0.009
D.No. 153 Octamethylcyclotetrasiloxane Wholesale trade with fuels, technical oils and fats; Wholesale trade with iron and metal haberdashery, textiles; Wholesale trade with fine mechanical products and medical commodities	24	13	18 75	1	0.005		! a. q.	0.014	0.0196
D.No. 154 Octamethylcyclotetrasiloxane Transport, shipping, transport compa-nies and similar	12	4	9 75	2	0.005		! a. q.	+ 0.005	0.0054
D.No. 155 Octamethylcyclotetrasiloxane Research, Health services	16	5	14 87.5	4	0.005		! a. q.	0.0339	0.0848

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Industry groups: Personal measurements

D.No. = Data set number/ Designation Branch of industry	Number of measured data	Number of firms	Frequency < number of values %	Number of AIIs*	Largest quantification limit in mg/m³	≤ limit value % $	Concentrations in mg/m³		
							50 percen-tile *	90 percen-tile *	95 percen-tile *
D.No. 175 Octamethylcyclotetrasiloxane Total	46	17	19 41.3	4	0.006		0.008	0.135	0.161
D.No. 156 Octamethylcyclotetrasiloxane Plastics, processing; Manufacture and processing of rubber products	1	1	0	1					
D.No. 157 Octamethylcyclotetrasiloxane Manufacture of machinery and vehi-cles	7	2	0	1					
D.No. 158 Octamethylcyclotetrasiloxane Repair shop (service shop), general	0	0	0	0					
D.No. 159 Octamethylcyclotetrasiloxane Wholesale trade with fuels, technical oils and fats; Wholesale trade with iron and metal haberdashery, textiles; Wholesale trade with fine mechanical products and medical commodities	9	4	2 22.2	1	0.005				
D.No. 160 Octamethylcyclotetrasiloxane Transport, shipping, transport compa-nies and similar	11	1	4 36.4	1	0.005		+ 0.005	0.0099	0.0118
D.No. 161 Octamethylcyclotetrasiloxane Research, Health services	0	0	0	0					

* AII = social accident insurance institution

Industry groups: Measurements with local exhaust ventilation

D.No. = Data set number/ Designation Branch of industry	Number of measured data	Number of firms	Frequency < number of values %	Number of AIIs*	Largest quantification limit in mg/m³	≤ limit value % $	Concentrations in mg/m³		
							50 percentile *	90 percentile *	95 percentile *
D.No. 177 Octamethylcyclotetrasiloxane Total	17	10	12 70.6	8	0.03		! a. q.	0.0934	0.131
D.No. 168 Octamethylcyclotetrasiloxane Plastics, processing; Manufacture and processing of rubber products	3	2	2 66.7	2	0.03				
D.No. 169 Octamethylcyclotetrasiloxane Manufacture of machinery and vehicles	2	1	2 100	1	0.005				
D.No. 170 Octamethylcyclotetrasiloxane Repair shop (service shop), general	0	0	0	0					
D.No. 171 Octamethylcyclotetrasiloxane Wholesale trade with fuels, technical oils and fats; Wholesale trade with iron and metal haberdashery, textiles; Wholesale trade with fine mechanical products and medical commodities	1	1	0	1					
D.No. 172 Octamethylcyclotetrasiloxane Transport, shipping, transport companies and similar	0	0	0	0					
D.No. 173 Octamethylcyclotetrasiloxane Research, Health services	3	2	3 100	2	0.005				

* AII = social accident insurance institution

Industry groups: Measurements without local exhaust ventilation

D.No. = Data set number/ Designation Branch of industry	Number of measured data	Number of firms	Frequency < number of values %	Number of AIIs*	Largest quantification limit in mg/m³	≤ limit value % $	Concentrations in mg/m³		
							50 percen-tile *	90 percen-tile *	95 percen-tile *
D.No. 176 Octamethylcyclotetrasiloxane Total	102	39	71 69.6	11	0.005		! a. q.	0.0546	0.083
D.No. 162 Octamethylcyclotetrasiloxane Plastics, processing; Manufacture and processing of rubber products	0	0	0	0					
D.No. 163 Octamethylcyclotetrasiloxane Manufacture of machinery and vehi-cles	5	3	2 40	3	0.005				
D.No. 164 Octamethylcyclotetrasiloxane Repair shop (service shop), general	0	0	0	0					
D.No. 165 Octamethylcyclotetrasiloxane Wholesale trade with fuels, technical oils and fats; Wholesale trade with iron and metal haberdashery, textiles; Wholesale trade with fine mechanical products and medical commodities	27	10	17 63	1	0.005		! a. q.	0.127	0.131
D.No. 166 Octamethylcyclotetrasiloxane Transport, shipping, transport compa-nies and similar	23	4	13 56.5	2	0.005		! a. q.	0.0087	0.00985
D.No. 167 Octamethylcyclotetrasiloxane Research, Health services	13	5	11 84.6	4	0.005		! a. q.	0.0575	0.0877

* AII = social accident insurance institution

Appendix 2

Statistical evaluations for work area groups

Octamethylcyclotetrasiloxane, sampling time ≥ 0.5 h and exposure time ≥ 6 h
Work area groups: General

D.No. = Data set number/ Designation Work area	Number of measured data	Number of firms	Frequency < number of values %	Number of AIIs*	Largest quantification limit in mg/m³	≤ limit value % $	Concentrations in mg/m³		
							50 percen-tile *	90 percen-tile *	95 percen-tile *
D.No. 178 Octamethylcyclotetrasiloxane Storing, Sorting	60	25	37 61.7	5	0.005		! a. q.	0.021	0.127
D.No. 179 Octamethylcyclotetrasiloxane Pressing, Extruder, Rolling	16	6	5 31.3	2	0.006		0.01	0.178	0.202
D.No. 180 Octamethylcyclotetrasiloxane Processing, Sanding	13	5	3 23.1	3	0.005		0.017	0.119	0.141
D.No. 181 Octamethylcyclotetrasiloxane Test facilities, Quality inspection	29	9	20 69	6	0.006		! a. q.	0.013	0.0278
D.No. 182 Octamethylcyclotetrasiloxane Laboratory	12	4	12 100	3	0.005		! a. q.	! a. q.	! a. q.

* AII = social accident insurance institution

Work area groups: Stationary measurements

D.No. = Data set number/ Designation Work area	Number of measured data	Number of firms	Frequency < number of values %	Number of AIIs*	Largest quantification limit in mg/m³	≤ limit value % $	Concentrations in mg/m³		
							50 percen-tile *	90 percen-tile *	95 percen-tile *
D.No. 183 Octamethylcyclotetrasiloxane Storing, Sorting	35	22	27 77.1	5	0.005		! a. q.	0.008	0.019
D.No. 184 Octamethylcyclotetrasiloxane Pressing, Extruder, Rolling	14	5	5 35.7	2	0.006		0.009	0.126	0.194
D.No. 185 Octamethylcyclotetrasiloxane Processing, Sanding	7	3	1 14.3	2	0.005				
D.No. 186 Octamethylcyclotetrasiloxane Test facilities, Quality inspection	27	8	18 66.7	5	0.005		! a. q.	0.0162	0.028
D.No. 187 Octamethylcyclotetrasiloxane Laboratory	12	4	12 100	3	0.005		! a. q.	! a. q.	! a. q.

* AII = social accident insurance institution

Work area groups: Personal measurements

D.No. = Data set number/ Designation Work area	Number of measured data	Number of firms	Frequency < number of values %	Number of AIIs*	Largest quantification limit in mg/m³	≤ limit value % $	Concentrations in mg/m³		
							50 percen-tile *	90 percen-tile *	95 percen-tile *
D.No. 188 Octamethylcyclotetrasiloxane Storing, Sorting	25	6	10 40	1	0.005		0.006	0.128	0.131
D.No. 189 Octamethylcyclotetrasiloxane Pressing, Extruder, Rolling	2	2	0	1					
D.No. 190 Octamethylcyclotetrasiloxane Processing, Sanding	6	3	2 33.3	2	0.005				
D.No. 191 Octamethylcyclotetrasiloxane Test facilities, Quality inspection	2	1	2 100	1	0.006				
D.No. 192 Octamethylcyclotetrasiloxane Laboratory	0	0	0	0					

* AII = social accident insurance institution

Work area groups: Measurements without local exhaust ventilation

D.No. = Data set number/ Designation Work area	Number of measured data	Number of firms	Frequency < number of values %	Number of AIIs*	Largest quantification limit in mg/m³	≤ limit value % $	Concentrations in mg/m³		
							50 percen-tile *	90 percen-tile *	95 percen-tile *
D.No. 193 Octamethylcyclotetrasiloxane Storing, Sorting	52	19	31 59.6	4	0.005		! a. q.	0.056	0.127
D.No. 194 Octamethylcyclotetrasiloxane Pressing, Extruder, Rolling	6	2	4 66.7	1	0.005				
D.No. 195 Octamethylcyclotetrasiloxane Processing, Sanding	3	2	3 100	2	0.005				
D.No. 196 Octamethylcyclotetrasiloxane Test facilities, Quality inspection	10	5	6 60	3	0.005		! a. q.	0.029	0.055
D.No. 197 Octamethylcyclotetrasiloxane Laboratory	7	3	7 100	2	0.005				

* AII = social accident insurance institution

Work area groups: Measurements with local exhaust ventilation

D.No. = Data set number/ Designation Work area	Number of measured data	Number of firms	Frequency < number of values %	Number of AIIs*	Largest quantification limit in mg/m³	≤ limit value % $	Concentrations in mg/m³		
							50 percen-tile *	90 percen-tile *	95 percen-tile *
D.No. 198 Octamethylcyclotetrasiloxane Storing, Sorting	0	0	0	0					
D.No. 199 Octamethylcyclotetrasiloxane Pressing, Extruder, Rolling	1	1	0	1					
D.No. 200 Octamethylcyclotetrasiloxane Processing, Sanding	1	1	0	1					
D.No. 201 Octamethylcyclotetrasiloxane Test facilities, Quality inspection	2	1	2 100	1	0.005				
D.No. 202 Octamethylcyclotetrasiloxane Laboratory	3	2	3 100	2	0.005				

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