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Ultra-trace Analysis of Airborne Molecular Contaminants in Cleanroom Atmosphere Constructed in National Institute for Environmental Studies (NIES)

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Introduction:

The control of contamination levels in environmental air is most important for the experiment of endocrine disrupters. As alkyl phthalates such as di-(2-ethylhexyl) phthalate could, especially, exist in all the analytical environment, the contamination control of alkyl phthalates is essential for the evaluation of alkyl phthalates. The concentration levels of alkyl phthalates and the other airborne molecular contaminants (AMCs) in the newly built cleanroom in National Institute of Environmental Studies (NIES) were determined and evaluated.

Experimental

The alkyl phthalates in the air were collected with quartz filter and solid phase extraction disk (Empore^{TM} disk). The analytes were extracted by organic solvent and determined by gas chromatography-mass spectrometry (GC-MS). On the other hand, total volatile organic compounds (VOCs) were collected with Tenax ^{TM} GR adsorbent and determined by GC-MS following thermal desorption.

Results and discussion

Eight compounds of alkyl phthalates, alkyl phosphates, low molecular weight cyclosiloxanes (LMCSs) and total VOCs in cleanroom and outdoor air were determined. The results of alkyl phthalates and total VOCs are shown in Table 1. The concentration levels of 1AMCs in new cleanroom air were lower than those in cleanrooms used for semiconductor industry. Especially, the concentration of DOP was one tenth order lower than that of semiconductor cleanrooms.

Table 1. The concentrations of phthalates and total VOCs in cleanroom and outdoor air

Unit: $\mu g/m^3$

	Outdoor air	Cleanroom air	Recovery of spiked d-phthalates (%)
Di-n-butyl phthalate (DBP)	0.02	<0.01	66
Di-2-ethylhexyl phthalate (DOP)	0.05	<0.02	95
Diethyl phthalate (DEP)	<0.002	<0.002	94
Dipropyl phthalate	<0.002	<0.002	73
Dipentyl phthalate	<0.002	<0.002	75
Dihexyl phthalate	<0.002	<0.002	109
Butyl-benzyl phthalate	<0.01	<0.01	89
Dicyclohexyl phthalate	<0.002	<0.002	84
Total VOCs	46	1.0	-

Note :Analysis Values of VOC are shown it as toluene conversion values.