3M

Technical Data Bulletin

OH&ESD

#125

3M™ Diffusion Monitors 3500/3510/3520/3530 Storage and Recovery

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The recovery or desorption coefficient is a measure of the ability of a solvent to elute the compound(s) from the sorbent material for analysis. For many compounds, this coefficient differs from the ideal value of 1.0. The NIOSH and CEN validation protocols recommend that it be greater than 0.75. The amount recovered may be affected by factors such as humidity during sampling, length of storage after sampling, and temperature during storage. This Tech Data Bulletin summarizes a series of experiments that explored the effect of these variables upon recovery for the 3M organic vapor monitors.

Table 1 shows the recovery initially, and after storage at room temperature (RT) and at 4°C (COLD). It was determined that the maximum amount of water that is adsorbed at 80% RH is 40 µl. Therefore, monitors were simultaneously spiked with 40 µl of water and an amount of contaminant equal to what would be collected during an eight hour exposure at one-half the contaminant's exposure limit. Desorption was then performed using carbon disulfide, except for isopropanol which was desorbed using acetonitrile. Most of the compounds do not show significant effects of humidity on recovery with up to 3 weeks of storage at room temperature. However, acetone, diethyl ketone, 2-hexanone, methyl ethyl ketone (MEK), methyl propyl ketone, and vinyl acetate show significant losses.

Table 1: Recovery of Selected Compounds at High Humidity (80% RH)

Compound	Amt Spiked (mg)	Initial	2 Weeks RT	2 Weeks COLD	3 Weeks RT	3 Weeks COLD
Acetone	3.56	0.74	0.51	0.67	0.46	0.66
Carbon Tetrachloride	0.24	1.10	1.10	1.11	1.10	1.11
Chloroform	0.37	0.95	0.94	0.94	0.93	0.94
Diethyl Ketone (3-Pentanone)	5.54	0.97	0.89	—	0.84	—
Ethanol	1.57	0.95	0.93	0.91	0.91	0.91
Hexane	1.32	1.10	1.05	1.07	1.05	1.07
2-Hexanone	0.14	0.95	0.87	0.88	0.82	0.87
Isopropanol	9.42	0.94	0.99	0.89	0.92	0.92
Methyl Ethyl Ketone	5.23	0.87	0.67	0.81	0.62	0.78
Methyl Methacrylate	3.28	0.93	0.99	0.99	1.00	1.00
Methyl Propyl Ketone (2-Pentanone)	5.68	0.92	0.83	—	0.82	—
Methyl tert- Butyl Ether	1.52	1.01	0.97	0.99	0.97	1.00
Methylene Chloride	0.80	0.94	0.94	0.96	0.94	0.96
MIBK	1.60	0.99	0.94	—	0.90	—
Perchloroethylene	1.30	1.04	1.05	1.05	1.03	1.00
Styrene	1.36	0.87	0.84	0.87	0.83	0.86
Toluene	2.60	1.01	1.01	1.03	1.04	1.04
1,1,1-Trichloroethane	13.4	1.02	0.96	0.98	1.00	1.02
Vinyl Acetate	0.28	0.88	0.60	0.79	0.60	0.75

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For acetone, 2-hexanone, MEK, and vinyl acetate, the experiment was repeated without adding the water to compare effects of sampling at high and low humidity. This is shown in Table 2.

Table 2: Recovery of Selected Compounds at Low Humidity (<40% RH)

Compound	Amt Spiked (mg)	Initial	2 Weeks RT	2 Weeks COLD	3 Weeks RT	3 Weeks COLD
Acetone	3.56	0.89	0.81	0.86	0.78	0.89
2-Hexanone	0.14	0.97	0.95	0.95	0.92	0.93
MEK	5.23	0.93	0.92	0.94	0.92	0.94
Vinyl Acetate	0.28	0.97	0.89	0.97	0.86	0.95

We can conclude that ketones and compounds with double bonds may be susceptible to losses during storage when collected at high humidity. Refrigeration can reduce, but not eliminate, the losses in compounds susceptible to degradation by adsorbed water. If MEK, vinyl acetate, or 2-hexanone are monitored at high humidity, samples should be refrigerated if analysis is delayed for 2 to 3 weeks. We highly recommend that acetone samples be refrigerated if collected at high humidity. Aliphatic, aromatic and most halogenated hydrocarbons are not affected by adsorbed water and may be stored for at least three weeks at room temperature.

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