ABSTRACT

Validation of a Technique for the Assessment of
Occupational Exposure to Methanol Vapor. (August 1993)
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Studies of the performance of a technique for the assessment of occupational exposure to methanol vapor were completed. This air sampling technique utilized carbon molecular sieve contained in a stainless steel tube for the collection of methanol vapor from controlled test atmospheres. The test atmospheres were generated by means of a dynamic, all-glass system which utilized a syringe drive to introduce methanol into an air stream of known temperature and humidity. The sampling period for all samples was 120 minutes. The test atmosphere was drawn through the tube by means of a battery-powered air sampling pump which could be fitted with various flow-limiting orifices. In preliminary studies at test conditions of 95% RH at 35° C, and 400 ppm methanol, a sampling flow rate of 20 mL/min (established by means of limiting orifices) was the maximum flow which did not produce more than 5% breakthrough; this sampling flow rate was used in all subsequent parts of the research. The collection tubes were desorbed with 250° C nitrogen in a programmed thermal desorber, and the amount of desorbed methanol vapor was determined through gas chromatography-flame ionization detection. The analytical instrumentation was calibrated by direct injection of methanol into the inlet of the programmed thermal desorber. Next studies were conducted to assess the performance of the technique

under conditions of varying temperature, humidity, and methanol concentration. These investigations demonstrated that the methanol concentration, partial pressure of water vapor, and the interaction of temperature with partial pressure of water vapor had a significant effect upon the recovery, while breakthrough was significantly affected by the partial pressure of water vapor and the interaction of temperature with the partial pressure of water vapor. In general, the data suggest that the sampling flow rate should be increased to 50-100 mL/min if the anticipated methanol concentration is less than 50 ppm and that breakthrough occurred only under conditions of high heat and humidity when the methanol concentration was 800 ppm. The effect of storage time and storage temperature upon recovery at methanol loadings of 50, 100, and 200 ppm showed that the collected samples could be kept at 4°C for ten days prior to analysis with no significant loss of methanol; however, the interaction of storage time with storage temperature did have a significant effect upon recovery, producing unacceptable sample losses when the collected samples were stored at combinations of high temperature/long-term storage prior to analysis. An additional study showed that the transcontinental air shipment of the collected samples, prior to analysis, had no significant, detrimental effect upon the recovery of methanol. The reported technique has several advantages over the standard technique for assessment of occupational exposure to methanol vapor, including reuseable sampling tubes and reduced sample manipulation. It also requires less skill than the standard air sampling technique for methanol.