INVESTIGATIONS ON THE ADSORPTION, STORAGE STABILITY, AND RECOVERY OF METHYL BROMIDE USING PETROLEUM CHARCOAL AIR SAMPLING TUBES

John M. Ariano

Determination of airborne concentrations of methyl bromide has been a topic addressed by both NIOSH and state agencies. Concern has been expressed about the procedures that have been employed and the apparent limited sample capacity of petroleum based charcoal sampling media and the ability to recover material spiked onto the media. Our goal was to determine the behavior and ability of petroleum charcoal to adsorb and then recover methyl bromide at proposed regulatory levels of 1 ppm or lower where the mass of methyl bromide adsorbed should not approach the capacity of the adsorbent. Studies were conducted down to a lower limit of 50 ppb.

These investigations determined what could realistically be expected in terms of recovery and stability after sampling. In the past, with a number of different researchers, the predominant approach to spiking the sample tubes to determine recovery has been to use a solvent vehicle containing a known amount of methyl bromide. The effect of using a solvent vehicle for introducing the methyl bromide to a point location on the adsorbent and then desorbing does not really mimic the actual process of gaseous methyl bromide adsorption and then subsequent desorption without the effect of the solvent vehicle. In some cases the desorption solvent utilized was the same as the solvent carrier vehicle. A standard operating procedure was written to describe the procedure for reproducibly introducing a known amount of methyl bromide solution to a petroleum charcoal air sampling tube set to determine recoveries and more closely resemble actual field sampling conditions.

Gaseous methyl bromide solutions were introduced to the sampling tube systems and recoveries evaluated after 8 and 12 hour continuous and 24 hour intermittent sampling intervals where ambient air was drawn across the spiked sampling tube sets. Flow rates were adjusted such that the total sampled volume was approximately eleven liters. Additionally, the effects of shipping and handling, and subsequent storage of the spiked sample tubes were evaluated relative to the recovery of the methyl bromide.

The results of the investigations indicated that at levels of current regulatory concern, the air sampling procedure utilizing petroleum charcoal air sampling tubes sets can produce valid and reproducible results. The techniques that were utilized can easily be applied to investigate the performance of the procedure at higher methyl bromide concentrations.