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COMPARING THE ADSORPTION CHARACTERISTICS OF A NEW COMPOSITE MATERIAL WITH GRANULAR ACTIVATED CARBON. C. Lungu, J. Park, University of Minnesota, Minneapolis, MN.

Granular activated carbon (GAC) has been the industry standard for many years as adsorbent in respirator cartridges. However, GAC presents a series of drawbacks for use in industrial hygiene: it has relatively low adsorption capacity, poor selectivity, high pressure drop, and requires containment, making the respirators expensive. Activated carbon fibers exhibit significantly better adsorption characteristics, but they are expensive and nondurable. In recent years a new family of adsorbent materials has been developed using glass fibers coated with phenolic resin which was activated. These new composite materials, Fibrous Porous Materials (FPM) are much less expensive than activated carbon fibers and have a higher mechanical resistance. However, their adsorption characteristics have not yet been tested for respiratory protection use. In this study, the dynamic adsorption of FPM was compared with that of GAC for three compounds: toluene, acetone, and sulfur dioxide. The adsorption isotherms of the three compounds were obtained from the breakthrough curves generated by continuous injection of the contaminants at controlled rates into the airflow passing through fixed beds of GAC and FPM. The adsorbent was placed into a copper cylinder immersed in a temperature controlled water bath. A gas chromatograph, or in the case of sulfur dioxide, an infrared gas analyzer, monitored the effluent concentration. For the entire range of toluene-challenging concentrations (25 to 200 ppm) the adsorption capacity was 85 to 129% higher using GAC compared with FPM. For acetone too, the GAC adsorption capacity was higher compared with FPM for all challenging concentrations (31 to 68%). Sulfur dioxide was also more strongly adsorbed by GAC compared to FPM; however, for this compound the shape of the breakthrough curve was almost identical, indicating similar kinetics. Although the FPM did not show improved performance compared to GAC, its adsorption characteristics should be further studied.

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USING MARSSIMS TO INTERPRET ELEVATED BERYLLIUM SURFACE CONTAMINATION. R. Brounstein, Bechtel-SAICComp LLC, Las Vegas, NV.

During the late 1960s, a number of experiments were conducted at the Nevada Test Site's Area 25 that resulted in a dispersion of beryllium alloy. Approximately 3.5 miles away is the Yucca Mountain Project's Sample Management Facility (SMF) where various types of soil and core samples are analyzed and stored. Throughout 2002 and 2003, an assessment was conducted at the SMF to determine the extent of beryllium contamination. While airborne samples resulted in nondetect measurements, surface swipes indicated detectable beryllium at levels greater than the release criteria of 0.2 micrograms per 100 centimeters squared, established by the Department of Energy per 10 CFR 850, "The Chronic Beryllium Disease Protection Program." It has been hypothesized that these elevated levels are due to the natural beryllium content of the regional soils (up to 3 parts per million) and that many of the swipes picked up large quantities of material due to large soil deposition via the operations conducted at the SMF (ex. wet saw cutting) as opposed to legacy issues.

Using the Multi-Agency Radioactive Survey and Site Investigation Manual (MARSSIM) techniques, further investigations were conducted, based on a 95/95% confidence limit, to determine whether the beryllium detected in surface samples is due to natural soil conditions or prior legacy issues. As a result, MARSSIM assessment methodologies proved to be a valuable tool to determine whether 10 CFR 850 requirements were applicable.

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SIMULATION OF RETROSPECTIVE AND PROSPECTIVE CHEMICAL EXPOSURE SCENARIOS USING SULFUR HEXAFLUORIDE (SF_6). R. Moore, C. Simmons, Boelter & Yates Inc., Park Ridge, IL.

There often is a need to estimate chemical exposures which may have occurred in the past. It is not always possible to recreate these scenarios using the actual chemicals of interest due to safety and liability concerns. There are other situations where it is desirable to predict employee exposures during new process development. This presentation contains case studies, where sulfur hexafluoride (SF_6) was used as a surrogate to simulate both past and future chemical-related exposure scenarios involving gases and vapors. In the first case discussed, an elevator graffiti cleaning operation on the ground floor of a high-rise condominium was simulated using SF_6 to determine worst-case chemical levels which may have occurred as a result of this operation in a unit located on the 13th floor. The owner of the unit had made allegations that chemicals from this operation had migrated into the unit and caused irreversible damage to health. In the second case discussed, a rubber membrane roof installation operation was simulated. Sulfur hexafluoride was used as a surrogate to estimate possible worst-case chemical levels in occupied areas of the building. Certain occupants of the building had made allegations that chemicals from an operation of this nature on one particular day had entered their workplace and caused irreversible damage to their health. Both of these simulations assumed all of the solvent chemicals involved in the operations had evaporated. The third case presents how SF6 simulations are used in the semiconductor industry to predict possible worst-case employee exposures during equipment failures involving piping and processes that utilize pressurized gases and vapor-laden gas streams.

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DEVELOPMENT OF A TAPE-STRIPPING METHOD TO QUANTIFY DERMAL EXPOSURE TO HEXAMETHYLENE DIISOCYANATE. K. Fent, K. Jayaraj, A. Gold, L. Ball, L. Nylander-French, University of North Carolina, Chapel Hill, NC.

Significant worker skin contact with hexamethylene diisocyanate (HDI) occurs during the application and manufacture of surface-coatings, foams, resins, and plastics. Respiratory sensitization and occupational asthma have long been associated with airborne isocyanate exposure, but a similar association with dermal exposure to isocyanates has largely been left unexplored, mainly due to nonexistent quantitative sampling methods. We have developed a noninvasive tape-stripping technique for sampling layers of the epidermis for determination of chemical concentrations in the skin. Quantification of HDI on tape-strip samples following derivatization reaction with 1-(2-methoxyphenyl)-piperazine was performed using liquid chromatography and mass spectrometry with electrospray ionization in positive ion mode. The derivative was synthesized independently and shown to be pure by proton NMR and melting point analysis. The ion at m/z 553.4, corresponding to the protonated molecular ion, was used for quantitation. This method was tested by applying HDI-containing products to tape-strip samples, performing derivatization and quantitative analysis, and determining the yield, which ranged from 87 to 93%. The limit of detection for this method is 0.05 ρmol/μL, while the limit of quantification is 0.5 ρmol/μL. This method is highly sensitive and specific and suitable for quantification of dermal exposure to HDI in occupational settings. This method will be used to measure dermal exposure to HDI in conjunction with inhalation and biological monitoring during spray-painting operations in order to investigate the contribution of dermal exposure to total body dose.

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EVALUATION OF EXPOSURE TO CARBON MONOXIDE DURING FOREST PRESCRIBED BURN ACTIVITIES. K. Dunn, I. Devaux, A. Stock, J. Mott, CDC/NCEH, Atlanta, GA; L. Naeher, University of Georgia, Athens, GA.

As part of a 2004 study of smoke exposure and respiratory function in a cohort of forest fire fighters in the southeastern United States, we collected personal monitoring exposure data for $PM_{2.5}$ and carbon monoxide (CO). CO sampling was performed using real-time Draeger

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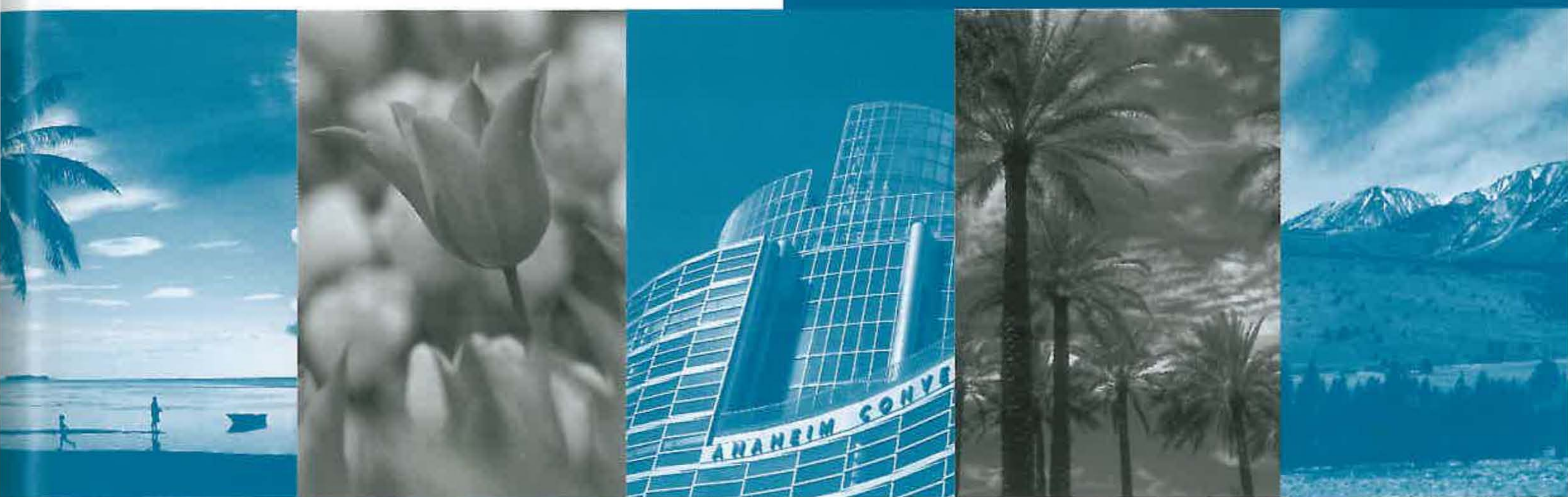

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