217.

A COMPARISON OF X-RAY FLUORESCENCE AND WET CHEMICAL ANALYSIS OF AIR FILTERS FROM A SCRAP LEAD SMELTING OPERATION. M. Harper, M. Andrew, NIOSH, Morgantown, WV; T. Hallmark, Mississippi Space Services, John C. Stennis Space Center, MS.

Personal and area air samples were taken at a scrap lead smelter operation at a bullet manufacturer using the 37-mm styrene/acrylonitrile filter cassette, the 37-mm GSP or "cone" sampler, the 25-mm Institute of Occupational Medicine (IOM) inhalable sampler, and the 25-mm Button sampler (developed by the University of Cincinnati). Pure, homopolymer, polyvinylchloride filters were used to capture lead particulate. The filters were pre- and post-weighed, and analyzed for lead content using a portable x-ray fluorescence (XRF) analyzer. The filters were then extracted with dilute nitric acid in a sonic bath and the solutions analyzed by inductively coupled plasma optical emission spectroscopy (ICP-OES). The 25-mm filters were analyzed using a single XRF reading, while three readings on different parts of the filter were taken from the 37-mm filters in accordance with current NIOSH/OSHA methodology. The single reading from the 25-mm filters was adjusted for the nominal area of the filter to obtain the mass loading, while the three readings from the 37-mm filters were inserted into two different algorithms for calculating the mass loadings, one from NIOSH and one from OSHA, and the algorithms were compared. The IOM is the only sampler where material collected in the sampler, but not caught on the filter, is intended to be part of the sampler. Therefore, the cassettes were rinsed separately to determine how this might bias the on-filter analysis, but ICP analysis found only insignificant amounts of lead, in line with other studies. All four samplers gave very good correlations between the two analytical methods above the limit of quantitation of the XRF procedure, although the limit was lower for the 25-mm filters (3 µg) than for the 37-mm filters (10 µg). For both types of 37-mm filter, the OSHA algorithm gave results closer to the ICP values than the NIOSH algorithm.

218.

POTENTIAL WORKPLACE EXPOSURES FROM METAL CASTING PROCESS EMISSIONS. C. Glowacki, J. Stone, Technikon LLC, McClellan, CA.

Workplace exposure to hazardous materials in the metal casting industry has been the topic of many publications and presentations over the last 30 years. Most have focused on physical hazards such as heat and physical stress, inorganic chemicals such as silica, and a limited number of organic compounds. The Casting Emission Reduction Program (CERP), a public/private cooperative research and development program, has identified numerous compounds emitted from a variety of metal casting processes that greatly increase the potential for excessive workplace exposures. Many of these compounds and the method(s) of their formation and release to the environment have not been reported in the literature. The CERP target analyte list contains over 100 specific compounds that are routinely measured to concentrations of 10 to 100 parts per billion. This presentation will detail those organic compounds emitted from major metal casting processes such as core making, mold making, and pouring, cooling, and shakeout activities. The information will be subdivided by the type of metal being cast, the chemistry of the binder system used to prepare the core or mold, and the type of molding or core making process. The specific compounds found in each scenario will be ranked in order of the amount of compound emitted compared to the weight of metal cast, sand used, and/or binder used.

219.

INVESTIGATION OF A VOLATILE PRE-IMPREGNATE FOR USE IN A SELF-VALIDATING DIFFUSIVE SAMPLER. M. Reed, Trident Technical College, Charleston, SC; D. Underhill, C. Feigley, University of South Carolina, Columbia, SC.

The diffusive sampler is a valid air sampling device which can be used to measure airborne contaminants in the workplace. The primary limitation to the diffusive sampler is the uncertainty in the determination of the diffusivity coefficient as the diffusivity coefficient varies with environmental factors that affect complete sample uptake and retention. Accurate determination of the airflow rate cannot always be achieved due to the uncertainty of the diffusivity coefficient affected by these factors. Our objective was to improve the accuracy and assess abuse or misuse of the diffusive sampler by developing a self-validating diffusive sampler that will significantly improve the quality of air sampling data. A volatile pre-impregnate was investigated with adsorptive properties that will result in reverse diffusion under ambient conditions and that has a chemical half-life. The properties of the volatile pre-impregnate include: (1) a sufficiently high vapor pressure such that significant desorption will occur if the sampler is allowed to desorb after the sampling period; (2) easy detection so that only trace levels of the volatile pre-impregnate need to be placed onto the adsorbent; (3) not commonly present in the workplace so that uptake of the volatile pre-impregnate from the atmosphere will not be a confounding factor; (4) chemically stable; (5) readily available; and (6) low in toxicity. Diffusive samplers were exposed to the volatile pre-impregnate in a chamber, allowed to reach equilibrium, exposed to the ambient atmosphere, and desorbed with chlorobenzene. The volatile pre-impregnate was analyzed by gas chromatography with a flame ionization detector and confirmed by gas chromatography with mass spectrometry. There are very few chemical compounds that have the physical and chemical charcteristics suitable for use as a volatile pre-impregnate in a self-validating diffusive sampler. Chloromethane meets the criteria and appears to be the most promising volatile pre-impregnate.

220.

PROBLEMATIC EFFICIENCY OF MDI SAMPLING. L. Saarinen, Finnish Institute of Occupational Health, Helsinki, Finland.

Methylene bisphenyl diisocyanate (MDI) is atomised and evaporated during the exothermic polymerisation process. The data on the relationship between exposure to MDI and the effects it induces are scarce. This may be due to the complex etiology of the effects and/or in the shortcomings of exposure measurements. Sampling methods for MDI were compared in pairs to identify problems.

In the test chamber, the MDI aerosol was produced with a Liu-Lee aerosol generator without a polyol component, and a vapor-aerosol mixture was generated in the polymerisation process. The aerosols were characterized with a scanning electron microscope and a particle size counter. Solvent absorption and variable coated filters were used in the tests. 1-(2-methoxyphenyl)piperatzine (MPP) was the derivative reagent. The filters were coated with 20 or 2 µmol MPP in toluene. The samples were collected under variable airflows and analysed with a high-performance liquid chromatograph.

The collection efficiency for solvent absorption methods was mainly a function of flowrate. The sampling efficiency was poor for particles under 1 µm in size. The loss depended also on the slowness of the reaction rate both in the glassware and on the coated filters. The collection efficiency in the solid-state system of coated filters depended on sampling rate, amount of applied reagent, diffusion, and porosity.

All the tested sampling methods were incomplete, and underestimated the actual concentrations of fast curing MDI present as a mixture of aerosol and vapor. To minimize the underestimation, complementary methods for determining the exposure to MDI are recommended to be used simultaneously. The detection limit of analysis restricts the measurement of very short but high exposure peaks. It was therefore difficult to assess the actual exposure and dosage. Alternating efficiencies under variable sampling conditions impede the establishing of the dose-response relationship.

221.

COMPARISON OF SAMPLERS FOR COLLECTING WOOD-DUST AEROSOL. M. Harper, M. Andrew, NIOSH, Morgantown, WV; Z. Akbar, University of Alabama at Birmingham, Birmingham, AL; B. Muller, Honda Manufacturing of Alabama LLC, Lincoln, AL.

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