aihce

CO-SPONSORED BY AIHA® & ACGIH®

AIHce 2015

Abstract Book

May 30 – June 4, 2015

Salt Lake City, UT | Salt Palace Convention Center

www.AIHce2015.org

chromatography with tandem mass spectrometry for thermal desorption and further analysis.

Results: The SPME procedure coupled with GC/MS/MS analysis for the determinations of HHCB and AHTN in the samples of personal care products was established in this study. No carry-over effect was observed from the thermal desorption of the sample. The linear range of all compounds ranged from 0.005 to 0.05 μg ml^{-1}, and the method detection limits were 0.00015 to 0.00075 μg ml^{-1}. Good linearity and precision were presented. More than 100 food detergents samples in Taiwan were determined for the concentrations of HHCB and AHTN. Health risk associated with the possible exposures were also assessed.

Conclusions: The SPME procedure was applied in this study. Advantages over conventional methods, such as solve-free and time-saving, were reached. The sensitivities of the method for different compounds were low enough to determine the concentrations from personal care products.

SR-127-04
Effects of a Series of Ketone Compounds on Liver Microsomal Aniline Hydroxylase Activity in Mice: Implications for Ketone-Drug Interactions in Exposed Workers

W. Luttrell, Oklahoma Christian University, Edmond, OK

Objective: Exposure to toxic chemicals in the workplace or environment can alter the way the body responds to the administration of therapeutic drugs, other xenobiotics, and endogenous materials. Studies have shown that ketones, such as acetone and pinacolone can produce liver microsomal enzyme enhancement. The purpose of this study was to determine the effect of ketone pretreatment on activity of microsomal aniline hydroxylase activity in the liver of mice. In order to determine if the size of the ketone metabolite influences degree of enzyme enhancement, five ketones of increasing size (acetone, 2-butanone, 2-pentanone, 2-hexanone, and pinacolone) were selected for pretreating mice.

Methods: Groups of male CD-1 mice (n = 6) were pretreated subcutaneously with 90% LDLo (lowest published lethal dose) for each compound and then sacrificed 12 hours later. Liver microsomes were isolated and aniline hydroxylase activity was determined spectrophotometrically. The para-hydroxylation of aniline to para-aminophenol was used to assess the cytochrome P-450-dependent mixed-function oxidase system in liver microsomes. In this assay the para-aminophenol metabolite was chemically converted to a phenol-indophenol complex with an absorption maximum at 630 nm. Enzyme activities were expressed as nmol para-aminophenol formed per minute per milligram protein of tissue. Using a substrate concentration of 10 mM aniline HCl, the velocity of the enzyme reaction was determined in each assay, and was reported as the percent of the control enzyme activity. Using SPSS, statistical differences ($p < 0.05$) between the values of percent of control enzyme activity from ketone pretreated and control mice were determined.

Results: Aniline hydroxylase activities were increased following pretreatment with all ketone compounds. There was increasing enzyme activity with increasing size of the ketone compound. Lower concentrations of the ketones were found to be enzyme stimulating in vitro, but higher concentrations of the ketones were found to be enzyme inhibiting in vitro.

Conclusions: Pretreatment with ketone compounds of increasing size resulted in increasing liver aniline hydroxylase activity in mice. This implies that workers exposed to these ketone compounds, as well as other common workplace or environmental compounds that have ketone metabolites, may be at risk for ketone-drug interactions due to enhancement of drug-metabolizing enzymes.

SR-127-05
Modern Design of Colorimetric Sensor Devices for Bisphenol A Dust Measurements

A. Rossner, R. Alkasir, S. Andreescu, Clarkson University, Potsdam, NY

Objective: Objective: The purpose of our work is to evaluate a new design for a portable paper-based sensing device for the colorimetric detection of Bisphenol A (BPA) in household dust. Bisphenol A (BPA) is found in polycarbonate plastic and epoxy resin and is used in variety a of commercial and consumer products. The leaching of BPA consumer products can result in human exposure via inhalation, ingestion, and dermal routes. As a result, humans have been exposed in their home and work environment to BPA. Several studies have reported detectable levels of total urinary BPA in the majority of individuals in a number of populations, in the United States and other locations around the world. To reduce human exposure we need improved sensing devices to allow for quick, effective and inexpensive screening of our living and working environment.

Methods: Methods: A rapid procedure for dust collection is used with a sensitive method for BPA detection, based on the formation of a greenish color, on the test zone of the sensing device. The color results from the formation of a Schiff base compound, quinine-imine, formed by reaction of chitosan with the enzymatic product of tyrosinase *o*-quinone on paper coated in a layer-by-layer (LbL) assembly approach. The designed system includes a paper-based sensor disk with a diameter of 0.6 cm. as a test zone for BPA detection, and the air-sampling cassette with a diameter of 37 mm as a collection area for household dust. Colorimetric response was concentration dependent with a detection limit of 0.28 μg/g. The color started to appear within the first 60 s and stabilized after 30 min. Replicate samples were run on a Gas Chromatography (GC) as means of validating the colorimetric data. Field sampling was conducted in a series of homes where dust specimens were collected from different homes and a day care center.

Results: Results between the GC and colorimeteric sensor showed a linear regression ($R^2 = 0.9743$) for samples measured by both of the colorimetric and GC methods. In this work, BPA ranged in concentration from 0.05 to 3.87 μg/g in 57 samples of household dust when both methods were used.

Conclusions: While the sample set was relatively small (n=57), the correlation between the colorimetric sensor and GC method was excellent, thus we feel the sensors is promising as a quick, inexpensive means of measuring BPA in settled dust in the home and work environment.

SR-127-06
Adsorption Characterization of Fabricated Single-Walled Carbon Nanotube (SWNT) Buckypapers for Volatile Organic Compound (VOC) Sampling

C. Lungu, J. Oh, University of Alabama- Birmingham, Birmingham, AL; E. Floyd, OUHSC, Oklahoma City, OK

Objective: To compare adsorption efficiency of single-walled carbon nanotube (SWNT) buckypapers obtained through different fabrication methods to be used as volatile organic

compound (VOC) adsorbent.

Methods: Arc discharge SWNTs suspended in surfactants (1% W/V of sodium cholate and sodium dodecyl sulfate) was fabricated into buckypaper. For that, 200 mL (50 mg) of the SWNT solution was suspended (diluted) in 400 mL of acetone for 15 hours, filtered through a polytetrafluoroethylene membrane filter under vacuum. SWNT cake deposited onto the filter was delaminated to obtain a buckypaper (no cleaning process). For cleaning SWNTs, additional steps were involved after SWNT solution was vacuum-filtered. SWNT cake was cleaned with 250 mL of deionized (DI) water and 50 mL of acetone (acetone-cleaned). Alternatively, methanol was used to suspend SWNTs and in the cleaning process as well (methanol-cleaned). The fabricated buckypapers (n=2) were examined for adsorption efficiency in terms of surface area, pore size, and adsorption isotherm. Surface area and pore size were measured using a physisorption analyzer and adsorption isotherms were obtained by repeated indirect injection of liquid toluene into an adsorption chamber until adsorbent was saturated at 23°C.

Results: Buckypapers without cleaning had 43 m^2/g Brunauer, Emmett and Teller (BET) surface area (SA) with 15 nm average pore width while buckypapers cleaned with acetone and methanol exhibited 217 and 348 m^2/g BET surface areas with 9 and 8 nm average pore widths, respectively. The toluene adsorption capacities were 52, 58, and 69 mg (toluene)/g (buckypaper) for not cleaned, acetone-, and methanol-cleaned buckypapers, respectively.

Conclusions: The cleaning process with DI water and solvents (acetone and methanol) increased BET surface area and decreased the average pore size of the buckypapers. Toluene adsorption capacity increased with increasing surface area of buckypaper. Overall, buckyapers cleaned with DI water and methanol were the most adsorptive. The methanol-cleaned buckypapers will be investigated for desorption efficiency using a photothermal desorption technique which desorbs an analyte by irradiating the sorbent with light, eliminating sample preparation time for analysis.

SR-127-07
Isocyanates: Assessing Field Extraction

D. LaGarde, OSHA, Sandy, UT

Objective: OSHA has operated a National Emphasis Program (NEP) for Isocyanates that began June 2013. The NEP requires OSHA Compliance Officers (CSHOs) to perform a field extraction of air samples and then ship the extracted samples to Salt Lake Technical Center (SLTC) for analysis. Field extraction has been proposed to more effectively derivatize large isocyanate particles, providing higher and more accurate analytical results. Prior to the NEP, OSHA samples were laboratory extracted.

Methods: In an effort to determine the impact of field extraction on compliance work, SLTC staff has been evaluating different aspects of field extraction versus non-field extraction techniques. SLTC performed a stability study to evaluate the necessity of special handling, over-night shipping, and/or cold storage of the field-extracted samples prior to analysis. Sample results were analyzed over the course of the NEP, and statistically evaluated the data against OSHA's historical sample results. SLTC has coordinated side-by-side samples of non-field extracted and field extracted samples for isocyanates in different occupational processes. To assess the impact of field extraction on sample integrity and sample quality, spiked filters were sent to the field and extracted alongside field samples to assess the impact of field extraction on sample integrity and sample quality.

Results: Sample stability results demonstrated field-extracted samples (glass fiber filters in 3-mL extraction solution), and non-field extracted (dry filters) samples were equivalently stable: recoveries of 100% were obtained for both types of samples after 22-days, at ambient temperature. It has been suggested that field extraction will produce higher results. Sample result data for field extracted samples, show no observed trend in increased sample concentrations over previous years. Results from side-by-side field samples fail to reveal statistical difference between the two sample extraction methods. Quality control spiked samples are used to assess the Sampling and Analytical Error (SAE), a measure of uncertainty in analytical quantitative results. CSHO field extracted isocyanate samples has increased the SAE by over 5%. In addition, a significant percentage of field-extracted samples arriving at SLTC show signs of sample leakage.

Conclusions: Studies performed to date, within the OSHA monitoring program for isocyanate sampling and analysis; show no compelling advantage of field extraction over laboratory extraction.

SR-127-08
Determinations of Bisphenol A in Household Dusts by Microwave-Assisted Solid-Phase Microextraction

C. Chang, C. Chang, S. Tsai, Department of Public Health & Institute of Environmental Health, College of Public Health, National Taiwan University, Taipei, Taiwan

Objective: Indoor dust has been known as a sink for many semi-volatile organic compounds, such as bisphenol A (BPA). Since indoor environment can protect dust from sunlight, rain and biological degradation, pollutants then could be persistent and accumulated in the residential environment. Up to now, the analysis of BPA in dust is solvent and time consuming. Therefore, the purpose of this research was to develop a method for the determinations of BPA in dusts simultaneously by using microwave assisted headspace solid-phase microextraction (MAE-HS-SPME).

Methods: In this study, commercial vacuum cleaner was used to collect household dusts while particles with diameter smaller than 150μm were filtered out by stainless mesh. After cleaning by the Soxhlet extraction, the sample with known amounts of BPA spiked was then put in a vial for the MAE-HS-SPME extraction followed by the analysis with gas chromatograph and mass spectrometer (GC/MS). Several parameters affecting the SPME extraction efficiency were optimized.

Results: The results showed that the desorption efficiency was 100% when the desorption time was 5 min under 250°C. The best suitable fiber coating was 65μm Polyethylene Glycol (PEG) and the optimum condition of MAE-HS-SPME for extraction of BPA in dust was 20 minutes at 80°C by the addition of 1 mL water. The linear range for the analysis was 1.25 ~ 125 ng/g dust (r=0.99).

Conclusions: Compared with tradition extraction methods, the MAE-HS-SPME provides a time saving, easy for operation and solvent-free procedure.