# abstract book

## Society of Environmental Toxicology and Chemistry North America 33rd Annual Meeting

Catching the Next Wave: Advancing Science Through
Innovation and Collaboration

Long Beach Convention & Entertainment Center, Long Beach, California
11–15 November 2012

requires extreme caution and special venting facilities that are not widely available. Here we evaluate a multi-step wet digestion, using a combination of $HNO_3$, HCl, BrCl, and $H_2O_2$, as an alternative to $HClO_4$. The challenge of using $HNO_3$, which has alower oxidative power compared with $HClO_4$, is achieving complete digestion of organic complexes. To overcome this, samples were heated in concentrated $HNO_3$ in closed Teflon vials that provided minimal headspace, and were followed by treatment with other oxidizers. We evaluated the effectiveness of our method to digest different tissue matrices by using a variety of certified reference materials (CRM): DORM-2, DOLT-3, NIST 2976, TORT-2, and PACS-2. Our method requires very small sample masses (10-50 mg) and digestates are mixed with concentrated HCl to reduce the selenium to $Se^{IV}$, the most favorable valence for hydride generation. Due to the difficulty of finding an internal standard that mimics both the hydride generation reaction and the various matrix suppression effects, a standard Se solution of 5 ppb was measured every 5 to 6 samples to correct for signal drift. The signal drift was corrected based on the sample run time and the corresponding value for the 5 ppb standard using a polynomial equation and the signal value for the same standard from the calibration curve calculated using the calibration coefficient. The measured concentrations of Se in CRMs agreed well with certified values after the drift correction. The method detection limit (MDL) was 0.21 ppb and 0.08 µg/g. This method corrects for the low bias (8-10%) observed in the literature using a $HNO_3 + H_2O_2$ digestion and allows for consistent recoveries achievable in most laboratory settings.

**WP269 Photocatalytic activity of magnetically recyclable Fe3O4/TiO2 in the color removal of a triphenyl methane dye: A preliminary investigation** U. Nascimento, Institute of Chemistry of Sao Carlos (USP) / Chemistry and Molecular Physics Department; L. Varanda, E. Bessa, Institute of Chemistry of São Carlos; R.N. Padovan, University of Sao Paulo / Instituto de Quimica de Sao Carlos / Departamento de Quimica e Fisica Molecular. The application of semiconductors for treating polluted waters and wastewaters is a promising environmental remediation technology, especially for organic pollutants. Among several oxide semiconductor photocatalysts, $TiO_2$ is the most suitable material for a widespread environmental application, due to its biological and chemical inertness, strong oxidizing power, cost effectiveness, and stability regarding photo and chemical corrosion. However, $TiO_2$ also has some disadvantages, such as: it is UV-excited and it is usually necessary an additional step (e.g. filtration or centrifugation) for recycling purposes. In trying to solve those drawbacks, we fabricated a magnetic photocatalyst $Fe_3O_4/TiO_2$ core/shell submicroparticles with high surface area and good photocatalytic activity. We used Acid Blue 9 (C.I. 42090) dye color removal for investigating the photocatalytic activity, pH and catalyst dosage effects through a $2^2$ factorial design. Statistical analyses were performed in order to assess the significance of the parameters used. We obtained magnetically recyclable $Fe_3O_4/TiO_2$ core/shell submicroparticles with specific surface area of 80 $m^2/g$. The magnetic photocatalyst presented a red shift in the absorbance spectrum. Both parameters (pH and catalyst dosage) were statistically significant. It is possible to reach a complete color removal of the dye solution with smaller pH values and higher catalyst dosages. In these preliminary study, the greatest color removal (83%) was achieved with pH 3.0, 1.0 g $L^{-1}$ of photocatalyst, and 1 h of reaction. The photocatalyst could be easily removed from suspension by a simple magnet.

**WP270 The Determination of Heavy metals in Soils, Plants and Hand-dug Wells from an Electronic Waste Disposal site in Lagos, Nigeria** A.O Bankole, J.M. Godoy, Pontificia Universidade Católica do Rio de Janeiro,Brasil / Department of Chemistry; D.V. Perez, Embrapa Soils, Rio de Janeiro, RJ, Brazil; O. Osibanjo, University of Ibadan, Ibadan, Oyo State, Nigeria. / Department of Chemistry,. The disposal of e-waste is a global environmental issue, as these wastes contain a wide array of toxic substances among which are heavy metals. This study examined heavy metal contamination of soil, hand dug wells, plant roots, shoots, leaves and flowers from an e-waste disposal area in Alaba International Market, Lagos, Nigeria. Surface and core soil samples were collected, wet digested using the EPA 3051A method. The ICP-OES and FAAS spectrophotometric techniques were used for analysis of heavy metals. Soils were physically characterized for pH, organic matter and mechanical properties. The experimental study was conducted using the BCR 141r standard reference material characterised for aqua regia available recoverable trace elements and NIST 1547 peach leaves which all gave good recoveries for all element studied. The levels of Pb, Zn, Ni, Cu, Cd and Cr in mg/kg ranged from 16.670-6520.683, 61.290-3451.089, 2.944-716.391, 14.289-11966.698, 1.167-138.250 and 4.738- 116.680 respectively. The study also recorded high concentrations of heavy metals in plants and groundwater above the maximum allowable level by WHO/FAO. Results from the study established heavy metal soil contamination, heavy metal groundwater contamination and heavy metal bioaccumulation in plants which far exceeds other concentrations recorded in previous studies in other market region. A more detailed study is underway to study the metal speciation in order to understand the environmental behaviour of these potentially toxic elements.It is concluded that indiscriminate dumping and burning of e-waste is a principal source of heavy metal contamination.

**WP271 Tributyltin and Its Derivatives in Water and Sediment Samples of National Inland Waterway Authority Harbour of Warri, Nigeria** E.T Ogbomida, National Centre for Energy and Environment / Ecotoxicology and Environmental Forensics; L.I. Ezemonye, University of Benin / Zoology Dept; A.A. Enuneku, I. Tongo, University of Benin / Animal and Environmental Biology. Tributyltin (TBT) is an organotin toxic compound commonly used as an antifouling agent in marine paint biocide formulation. Due to its wide industrial application and its consequent discharge into the environment, TBT pollution has been recognized as a major environmental problem at global scale. Recently, TBT has been considered to be the most toxic substance ever deliberately introduced into the environment and has been known to be extremely poisonous to mollusc fishery resources. Contamination of tributyltin (TBT) and its derivatives dibutyltin (DBT) and monobutyltin (MBT) in surface water and sediment samples of National Inland Waterway Authority (NIWA) Harbour in Warri, Nigeria was assessed by quantitative determination of tributyltin and its derivatives using gas chromatography coupled with flame ionization detector (GC-FID) with detection limit of 0.001µg/l after derivatization with Grignard reagent pentyl magnesium chloride. The concentrations of TBT in surface water samples ranged from 0.01µg/l to 0.05µg/l, while its derivative DBT and MBT ranged from 0.01µg/l to 0.03µg/l and 0.01µg/l to 0.02µg/l. In sediment samples TBT ranged from 0.03µg/g to 0.05µg/g while its derivatives DBT and MBT ranged from 0.01µg/g to 0.03µg/g and 0.01µg/g to 0.04µg/g. The total butyltin concentration ranged from 0.04µg/l to 0.09µg/l. TBT was generally dominant in all the samples, suggesting fresh inputs of tributyltin compounds and/or less degradation of TBT. The Butyltin degradation index (BDI) for the National Inland Waterway Authority (NIWA) Harbour in water ranged from 0.6 to 6 and in sediment 0 – 1.5 indicating a lot of fresh input of butyltins into the harbour and a lower degradation rate. The observed mean concentrations TBT in surface water and sediment samples exceeded the ecotoxicological benchmark of 0.01µg/l recommended by USEPA and are severe enough to cause harmful effects on the harbour flora and fauna. This survey provides first information and documentation of tributyltin compound and its derivatives contamination in National Inland Waterway Authority (NIWA) Harbour and suggests further environmental monitoring of other Nigeria harbours. Therefore, there is a need to regulate the use of butyltins as biocides in marine antifouling paints.

**WP272 Whole-sediment AVS-SEM Analytical Reference Standard – A Synthetic Alternative** A.M Gonzalez, Envonyx Environmental Technologies / Environmental Services, Independent Research & Development / Environmental Services. Acid-volatile sulfide (AVS) and simultaneously extractable metals (SEM) have proven to be robust concepts for explaining and predicting the responses of aquatic organisms after exposure to sediment contaminated by certain transition metals. In the presence of excess reduced sulfur species, the cumulative chemical activity (and by association, the toxicity) of transition metals in pore water is suppressed by metal-sulfide equilibria. Accurately judging a metal-contaminated sediment sample as hazardous or innocuous to aquatic organisms depends in large part on analytical precision and bias. The quality of environmental data is validated using quality assurance procedures (e.g., running reference standards) in parallel with the primary analyses. One factor potentially affecting the accuracy of some analysis (e.g., AVS and SEM) is matrix interference effects. The ideal reference standard for AVS-SEM analysis would be a temporally stable material with precisely known concentrations (of AVS and associated metal[s]) that responds consistently and predictably to analytical procedures, and that replicates the matrix background of natural sediment samples. Regrettably, the species that comprise AVS in natural sediment are only stable under a narrow set of conditions, and can be altered by changes in