Tuesday Evening Poster Sessions

Actinides and Rare Earths Focus Topic
Room: Central Hall - Session AC-TuP

Actinide and Rare Earth Poster Session

AC-TuP2 Sputter-Deposited Layers for Solid Phase Microextraction, ***Tuhin Roychowdhury***, *D. Patel, M.R. Linford*, Brigham Young University

Solid phase microextraction (SPME) is an effective analyte sampling method. It works by placing a coated fiber above a sample (headspace mode) or immersing it in a liquid sample such that molecules (analytes) of interest can be selectively captured and concentrated. The extracted species are then released into a chromatograph for separation, identification, and quantification. It is a 'green' method as no additional solvent is required in this process. Recently, we have developed a new class of SPME fibers that offer extraordinary capacity, sensitivity, and speed. They are prepared by sputtering a material under conditions that lead to a robust nanoporous coating on the fiber. In particular, silicon sputtering generates a porous surface that can be additionally oxidized, leading to a high density of silanol groups than can be subsequently silanized or used in other depositions. The surfaces and materials generated for SPME in this project have been characterized by X-ray photoelectron spectroscopy (XPS), scanning electron microscopy (SEM), spectroscopic ellipsometry (SE), time-of-flight secondary ion mass spectrometry (ToF-SIMS), and wetting. They confirm the synthesis of highly porous, hydrophobic materials. The performance of our 2 micron sputtered coatings has been compared to that of thicker (7 micron) commercial coating. Our fiber consistently outperforms the commercial fiber, showing significantly higher capacity, for example, for high molecular weight polycyclic aromatic hydrocarbons (PAHs). PAHs are a significant environmental pollutant. (They are produced from industrial wastes, incomplete combustion of fossil fuels, and natural emissions, and are detrimental to human health and the environment due to their carcinogenicity.) Hence, there is a need to identify these toxic pollutants. Real world samples, e.g., hops have also been analyzed. Different sputter coating thicknesses have been prepared and evaluated.

AC-TuP3 Mechanical Behavior Improvement of Coated Epoxy Resins Exposed To Environmental Effects, ***Dorina Mihut***, *A. Afshar, S. Hill*, Mercer University, *G. Negrea*, Technical University Cluj Napoca, Romania, *R. Alyamani, A. Aldhubaie*, Mercer University

Abstract:

Epoxy resins based materials are widely used as a matrix component for marine, aviation, transportation and civil infrastructures as they are light weight and are offering high strength and stiffness-to-weight ratio as well as good corrosion resistance. However, during their usage these materials are exposed to exterior environmental effects which can significantly degrade their mechanical properties and preclude their prolonged use. The present research investigates the influence of metallic and ceramic coatings in order to enhance the mechanical behavior of the epoxy resin based substrate materials to a combination of exterior factors: ultraviolet (UV) radiation, moisture and erosion. The metallic and ceramic coatings were deposited using high vacuum DC magnetron sputtering equipment. The pristine and coated polymer based samples were further exposed to continuous and cyclic UV radiation and moisture (ASTM G 154 standard). The samples' morphology was characterized using optical microscopy and X-ray diffraction analysis was used for determining the chemical composition of the coatings. The mechanical properties of all samples were tested using the standardized three points bending test and their erosion behavior was also tested using an erosion tester.

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