Topical Symposia
Room Golden State Ballroom - Session TS2P-ThP

Sustainable Surface Solutions, Materials, Processes and Applications - TS2 Poster Session

TS2P-ThP-1 The Study of Different Crystalline Moissanite: Nucleation and Growth of Nanoparticle Gold Coatings, ***Tsung-Jen Wu***, *S. Song, W. Chen,* Institute of Geosciences, National Taiwan University, Taiwan; *W. Lin,* Department of Materials and Mineral Resources Engineering, National Taipei University of Technology, Taiwan

The localized surface plasmon resonance effect (LSPR) of gold nanoparticles (Au NPs) causes color diversity at the nanoscale, which is often applied to form color of material appearance. Particles below 10 nm of Au NPs show pink-red on coating surface. Results from the analyses of spherical aberration-corrected transmission electron microscopy (AC-TEM) with electron energy loss spectroscopy (EELS) methods, the pattern of nucleation and growth of Au NPs coatings on moissanite (silicon carbide, SiC) with different crystalline are highly variable.

When the Au NPs coating is grown on the amorphous interface layer produced by the CVD method, it is suitable for growth but not nucleation. Under the TEM observations show that the atomic structure is disordered, and only a few inconspicuous lattice fringes form the quasi-granular shapes. On the contrary, the Au NPs coating is directly grown on the moissanite matrix of 4C-SiC or 6C-SiC structures, which is more suitable for nucleation than growth. Therefore, images of TEM with EELS show that the Au-crystal has a pronounced particle shape in the coating surface. The lattice fringes of nanoparticles are prominent and unevenly distributed in coating layers.

Color coating of moissanite needs to be stable and not easy to peel off for different usages. Therefore, the Au NPs coating on the amorphous SiC interface is less prone to exfoliation due to the different surface energy. That is why it is the most suitable way for color coating.

TS2P-ThP-2 Multilayered Structure of PE-Based Polymer Film Composites, ***Marcin Bilewicz***, Silesan University of Technology, Poland

Polymer processing of films becomes widely developed recent years and evolved in different directions to obtain more complex structures includingmono- and multilayer films and films filled with different fillers like micro- and nano-sized particles. Achievements in polymer chemistry and polymer processing through more advanced technologies equipped with precise sensors and computer controlled brings possibility to obtain more advanced structures of polymer composites. Multilayered films are used recently for many applications like packaging, materials with special barrier properties or with resistance for specific liquids or radiation, e.g. UV. The investigation aims to obtain the composite in form of 3-layer polymer film (fig. 1). Structure of the composite contains polymer based layers. To obtain the film was used blow molding technology on 20 meter high machine with advanced, rotating basket, gravimetric dosing and precise sensors. Tensile strength of 3-layer layer films can be even doubled comparing to single layer film. Additionally material composition and arrangement can brings additional improvement of properties.

TS2P-ThP-3 Understanding the Mechanical Behavior of Nanoporous Si by Molecular Dynamics Simulations, *B. Crutchfield,* ***Robert Fleming***, Arkansas State University, USA

Nanoporous materials are of great interest for developing low-density, high-strength materials for a variety of applications, such as zeolites, light-weight structural elements, and scaffolds for biomaterials. These materials are often created from a ceramic or oxide matrix, with porosity generated by sacrificial polymer inclusions that are burned out during thermal processing. As a result, there is much interest in fine-tuning the structure of nanoporous materials and understanding how the mechanical properties are influenced by the porosity volume fraction. In this project, molecular dynamics (MD) simulations have been performed to better understand how porosity affects the stress-strain behavior of nanoporous crystalline silicon (c-Si) as function of crystalline orientation, as well as amorphous silicon (a-Si). From these simulations, the elastic modulus and strength-to-weight figure of merit were determined as a function of porosity and applied strain rate. These results give insights into the mechanical behavior of porous Si-based materials, and can be used to improve the understanding of structure-property-processing relationships for nanoporous materials.

Author Index

Bold page numbers indicate presenter