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ADVANCED CHARACTERIZATION OF INTERFACES AND THIN FILMS

Insights on Structure–Property Correlations by Advanced Characterization Techniques

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Controlling materials properties through atomic structure tuning is one of the most attractive challenges in materials science. This functional tunability can be achieved in the materials by a modification of the underlying surface and interface chemistry. Surfaces and interfaces are highly influential because of their effect on synthesis-property correlations in nanomaterials, thin films, and coatings. In other words, the interfaces play an important part in guiding the atomic ordering and determining the functional properties in materials. To develop a fundamental understanding of the underlying mechanisms, advanced characterization methods need to be adopted, which are the focus of this themed topic.

This topic covers the studies on the advanced characterization of materials interfaces at multiple length scales in metal, alloys, ceramics, and two-dimensional materials using various experimental as well as theoretical techniques. It also emphasizes the role of interfaces on manipulation of synthesis parameters to attain different morphologies of nanostructured materials. The studies included in the current issue involve the experimental results obtained by nanomechanical Raman spectroscopy, x-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), atomic force microscopy (AFM), and photoluminescence, etc. On the other hand, it also includes research work focused on molecular dynamics simulations as phenomenologic modeling approaches.

In this editorial, we highlight experimental and theoretical advancements in various research works published in this issue. In the research works by S. Gupta et al. and A. Bhaumik et al., we discuss the synthesis and characterization of the recently discovered quenched Q-carbon phase and direct conversion of amorphous carbon to single crystalline diamond. The work also emphasizes the critical role of the substrate and sp^3/sp^2 composition in the amorphous film on the morphologic changes occurring in pulsed laser annealing-induced Q-carbon and nanodiamonds. Y. Zhang et al. report insights into the in situ measurement of stress distribution during elevated temperature deformations in In-617 using nanomechanical Raman spectroscopy. The research team of A. Pandey utilized Raman and UV–Vis spectroscopy techniques to understand the absorbent nature of 3D graphene oxide for methylene blue. In another work, H. Kim et al. present the mechanism of interface cracking and its effect on the electrical performance of solar cells. On the simulation front, S. Song et al. demonstrate the molecular dynamics studies on the swelling nature of Montmorillonite under interlayer cation hydration. Overall, this topic of Advanced Characterization of Interfaces and Thin Films discusses the research works implementing a broad spectrum of advanced characterization methods with emphasis on interface chemistry and its relation to material performance.

The following articles are published under the topic "Advanced Characterization of Interfaces and Thin Films" in the April 2018 issue (vol. 70, no. 4) of *JOM* and can be accessed via the *JOM* page at http://link.springer.com/journal/11837/70/4/page/1.

- "Structural Evolution of Q-Carbon and Nanodiamonds" by Siddharth Gupta, Anagh Bhaumik, Ritesh Sachan, and Jagdish Narayan.
- "Synthesis and Characterization of Quenched and Crystalline Phases: Q-carbon, Q-BN, Diamond and Phase-pure c-BN" by Anagh Bhaumik and Jagdish Narayan.
- "Visualizing Stress and Temperature Distribution During Elevated Temperature Deformation

Ritesh Sachan and Vikas Tomar are the *JOM* advisors for the Thin Films and Interfaces Committee of the TMS Functional Materials Division, and guest editors for the topic "Advanced Characterization of Interfaces and Thin Films, in this issue."

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of IN-617 Using Nanomechanical Raman Spectroscopy" by Yang Zhang, Hao Wang, and Vikas Tomar.
- "3D Oxidized Graphene Frameworks: An Efficient Adsorbent for Methylene Blue" by Abhishek Pandey, Madhurima Deb, Shreya Tiwari, Pranav Bhagwan Pawar, Sumit Saxena, and Shobha Shukla.
- "The Effect of Interface Cracks on the Electrical Performance of Solar Cells" by Hansung Kim, MD Towfiq Tofail, and Ciby John.
- "Molecular Dynamics Study of Crystalline Swelling of Montmorillonite as Affected by Interlayer Cation Hydration" by Hongliang Li, Shaoxian Song, Xianshu Dong, Fanfei Min, Yunliang Zhao, Chenliang Peng, and Yuri Nahmad.