UNIVERSITY OF CALIFORNIA
UC RIVERSIDE | Materials Science and Engineering

FALL 2019 COLLOQUIUM SPEAKER

Electron Microscopy: Analysis of Materials and Reactions at Nanoscale

The development of the first electron microscope by Max Knoll and Ernst Ruska in Germany in 1931 has introduced a principally new method for imaging and analysis. Since then the continuing advances in electron microscopy (EM) have greatly contributed to expanding our understanding of microstructures of materials and recently in the development of nanotechnology. After brief introduction to the principles of EM the capabilities of the method will be demonstrated by discussing studies of three types of materials widely differing in terms of their origin, structure, composition, and applications.

The first example focuses on the development of mosaic domain microstructure in zeolite material, a member of the so-called molecular sieves that are used commercially on a large scale in many chemical processes, mostly as catalysts or adsorbents. A non-traditional dissolution treatment method is applied to understand crystal growth mechanism, which is critical to controlling zeolite properties tailored towards their ever increasing applications.

The second example is a study of geological materials, where the power of electron microscopy in revealing mountain building mechanism is demonstrated. The deep origin of the Alpe Arami garnet lherzolite massif in the Swiss Alps was established by studying anti-phase domain structures in pyroxene minerals.

The third example deals with twinning microstructures as result of ferroelastic phase transformation in rear-earth oxide material. The superelastic response to mechanical deformation is facilitated by twin domain shear and mobility of twin boundaries.

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Dr. Krassimir Bozhilov is currently Director of the Central Facility for Advanced Microscopy and Microanalysis at UC Riverside, he is also Adjunct Professor at the Materials Science and Engineering Program. With over 30 years of experience in application of EM and microanalysis his research is focused on characterizing crystalline materials at microscopic level, understanding their real structure, properties, and behavior as direct consequence of the conditions of crystal growth and phase transformation. His research interests can be divided into three main fields: (i) crystal defects and behavior of minerals; (ii) properties and crystal growth of zeolites; (iii) structural and compositional characterization of nanocrystalline phases.

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