

Mechanochemistry: From Scientific Mystery to Scalable Materials Preparation and Recycling Technique

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**Chemistry
Colloquium on
Mechanochemistry**

3:15 p.m.

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Schrenk Hall

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Abstract: The presentation addresses the Mechanochemical approach to the solid-state synthesis technique that enables solvent-free preparation of a great variety of molecular, ionic and hybrid inorganic – organic materials. State of the art in the field of Mechanochemistry is briefly reviewed using authors and other researchers' experimental results as examples, and possible mechanisms of mechanochemical transformations are highlighted. Mechanochemical preparations of novel hybrid and complex materials such as 3D transition metal dichalcogenide heterostructures, high-entropy transition metal dichalcogenides (TMDCs) and rare earth-based metal organic frameworks (MOFs) are discussed, and the recently discovered mechanochemical depolymerization of an addition polymer, polystyrene, to monomeric styrene at room temperature under ambient atmosphere is presented. Transformation of research materials into commercial products and scaling up laboratory protocols will be highlighted using mechanochemical processes as examples.

About the speaker: Dr. Viktor Balema's expertise includes development and scale up of novel electronic, and energy storage materials as well as non-conventional materials preparation techniques. Dr. Balema obtained his MS degree from the Lviv State University and the Institute of Organic Chemistry of the Ukrainian Academy of Science, Kiev, Ukraine, and the PhD degree from the Institute of Organo-Element Compounds of the USSR Academy of Sciences in Moscow. He spent a number of years as Postdoc and Visiting Scientist at the Universities of Karlsruhe and Leipzig, Germany, before moving to Ames Laboratory in the USA. Later, for over a decade, Dr. Balema directed Hard Materials Segment and Materials Science R&D at Sigma-Aldrich Co. Currently he serves as Chief Technology Officer at ProChem Inc., Rockford IL and Adjunct Professor at Clemson University, Clemson, SC. Dr. Balema gave over 30 invited talks on Mechanochemistry at leading research institutions and major scientific conferences around the world. For many years, he has been serving as expert - reviewer for the US Department of Energy, NSF, the U.S. Civilian Research and Development Foundation, the ACS Petroleum Research Fund and a variety of peer reviewed scientific journals, and acted as section chair at annual MRS and ACS conferences.