MATERIOMICS

Session co-chairs: Joyce Wong, Boston University, and Thomas Scheibel, Universität Bayreuth

Materiomics is a relatively new concept: the initial use of the term "materiomics" was in a 2004 *Materials Research Society Proceedings* paper by Akita et al. where it was used to describe the design of alloys using combinatorial methods. In 2008, Markus Buehler (first speaker) introduced a generalized materiomics concept in a series of papers that describe the holistic study of materials using a systems perspective. This generalized view of materiomics refers to the study of the processes, structures, and properties of materials from a fundamental, systematic perspective. Moreover, multiple length scales (from nano to macro) are incorporated in the synthesis, processing, and function of materials and structures. This integrated view of these interactions at all length scales is referred to as a material's 'materiome'. Materiomics provides a comprehensive strategy towards materials design of both biological and synthetic materials and now finds applications in numerous areas of materials science.

Our first speaker, Dr. Markus Buehler, will provide an overview of materiomics and its overall impact in both biological and nonbiological systems. He has published numerous articles on this topic, including reviews, perspectives and reports of applications in multidisciplinary studies. He will give specific examples of the integration of this approach in materials design and performance.

Our second speaker, Dr. Tobias Kraus, will discuss mesoscale crystals, clusters, and self-assembled monolayers.

Our third speaker, Dr. Robin Seidel, will discuss biomimetic examples from the plant world and their application to materials design. For example, he will describe his current research focus on bio-inspired impact and puncture resistant materials and bio-inspired surfaces. He will also give an overview of how the plant world can inspire new materials design.

Our fourth speaker, Dr. Renata Pasqualini, will discuss a novel nanosystem comprised of phage and colloidal gold nanoparticles that offers a multifunctional-targeted delivery platform for a variety of diagnostic and imaging agents. The in vivo phage display targeting system that she co-developed has led to the identification of peptide moieties that actively target vascular receptors that are organ- and tumor-specific, which has led to a new field of vascular-targeted pharmacology. She will describe their recent experiences in first-in-human clinical trials in targeting prostate cancer and obesity. She will also discuss generally the development of ligand-directed agents for application in the treatment of cancer patients and human disease.