

Title **Self-Organization of Biomimetic Nanoparticles**

Speaker Prof. Nicholas Kotov
 Department of Chemical Engineering
 University of Michigan
 USA



Date & Time Thursday, August 2, 2018 4:00 p.m.
Place Inamori Hall, Inamori Bldg., Ito campus,
 Kyushu University

Abstract

Inorganic nanoparticles (NPs) have the ability to self-organize into variety of structures with sophisticated and dynamic geometries. Analysis of experimental data for different types of NPs indicates a general trend of self-assembly under a wider range of conditions and having broader structural variability than self-assembling units from organic matter. Remarkably, the internal organization of self-assembled NP systems rival in complexity to those found in biology which reflects the biomimetic behavior of nanoscale inorganic matter. In this talk, the following questions will be addressed:

- (a) What are the differences and similarities of NP self-organization compared with similar phenomena involving organic and biological building blocks?
- (b) What are the forces and related theoretical assumptions essential for NP interactions?
- (c) What is the significance of NP self-assembly for understanding emergence of life?
- (d) What are the technological opportunities of NP self-organization?

Self-organization of chiral nanostructures will illustrate the importance of subtle anisotropic effects stemming from collective behavior of NPs and non-additivity of their interactions. The fundamental significance of studies in this area from this and other groups will be discussed in relation to the origin of homochirality on Earth and spontaneous compartmentalization (protocells). The practicality of self-organization of nanoparticles will be discussed in relation to charge storage technologies, DNA/protein biosensing, chiral catalysis, and combating antibiotic resistant bacteria and other infections including rapidly mutating viruses.

About the Speaker

Prof. Nicholas A. Kotov is working on scientific foundations and technical realizations of biomimetic nanostructures. Conceptual examples of scientific advances in biomimetic nanostructures associated with his works include pioneering studies on graphene- and clay-based layered biomimetic nanocomposites, self-organization of nanoparticles, chiral nanomaterials and omni-dispersible colloids. His contribution to technology of biomimetic nanostructures include ultrastrong nacre-mimetic materials, nanocomposite neuroprosthetic implants, 3D tissue replicas for drug-testing, chiral biosensors, and cartilage-like electrolytes for safe batteries. Prof. Kotov is a founder of several start-up companies that commercialized biomimetic nanomaterials for biomedical, military, energy, and automotive technologies.

Host: Professor Shigenori Fujikawa

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Contact: Research Support and International Affairs division
 International Institute for Carbon-Neutral Energy Research
 Tel:092-802-6934 Email:wpikenkyu@jimmu.kyushu-u.ac.jp

