ETHZ SEMINAR SCHEDULE

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Wednesday, April 16
Seminar (01:30 PM ~) – Aerosol-based processing to fabricate nanoscale hybrid materials and their applications. D-MAVT, ETHZ

BIOSKETCH:
Jeong Hoon Byeon earned a PhD (MS combined) in Mechanical Engineering from Yonsei University (South Korea) in 2008 under the guidance of Dr. Jungho Hwang (Editor of Aerosol and Air Quality Research) and Dr. Mansoo Choi (Editor-in-Chief of Journal of Aerosol Science). After graduation, he worked three years as a senior engineer developing printed electronics in the LCD R&D Center of Samsung Electronics Company in South Korea. Since 2011, Dr. Byeon has been a postdoctoral research associate in the Department of Chemistry at Purdue University, working for Jeffrey T. Roberts (Frederick L. Hovde Dean). Dr. Byeon has published 62 research articles in international journals, 36 presentations in international conference proceedings, earned 3 academic awards, and obtained 2 U.S. and 19 Korean patents for his original devices. His previous research has included aerosol nanoparticles, nonthermal plasmas, and contamination control. And his current research focuses on aerosol-based processing to fabricate nanoscale hybrid materials, which is a hot new research area in materials processing technology. His other interests include anisotropic metallic nanostructures, thin films, and micro/nanopatterns.

ABSTRACT:
As new applications for nanomaterials continue to develop, many proponents are now positioning nanotechnologies at the forefront of environmental efforts to create a greener, more sustainable future. The usual route to hybrid/functionali"d nanomaterials is wet chemistry. In contrast to classical wet chemical methods, however, aerosol-based processing involves far fewer preparation steps. It also produces materials continuously, allowing for a straightforward collection of materials and the generation of low waste. However, conventional aerosol-based synthesis of nanomaterials typically requires high temperatures, and thus can only be used to fabricate inorganic nanomaterials. Consequently, it is not a viable strategy for synthesizing hybrid nanomaterials without post-functionalization steps. Clearly, a method is needed that operates entirely at low processing temperatures, thereby allowing the introduction of heat-sensitive organic molecules to an inorganic network at the nanoscale.
Recently, the syntheses of hybrid nanomaterials can now be performed in a low-temperature aerosol-based reaction developed by Dr. Byeon, which allows freshly produced metallic nanoparticles to be embedded in another matrix “on the fly” by merging them appropriately in a single-pass ambient gas stream. In this presentation, Dr. Byeon will not only explain this process, but he will also elaborate on this aerosol-based strategy with details about an “aerosol into liquid” configuration for synthesizing anisotropic metallic nanostructures and a “catalytic surface activation” of substrates using metal nanoparticles synthesized in the aerosol-state for electroless deposition. These aerosol-based methods are now being developed for biomedical, energy, environmental, and micro/nanoelectronic applications as part of Dr. Byeon’s continuing research in aerosol-based materials processing.

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