SMU Department of Mechanical Engineering

SEMINAR

"Rational Design of Nanomaterials for Energy Storage Applications"

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Abstract: Nanomaterials are the building blocks of diverse nanotechnology applications, and the size and shape dependant material properties are the key enabling factor of the emerging nanotechnology revolution. Throughout the human history, different technology applications require different material properties which are solved by developing different materials for suitable applications. What is qualitatively different in nanotechnology is the fact that material properties changes in 1-10nm scale so that different technology applications are possible using the same material with different size and shape. Over the last 2 decades we have seen a rapid growth in diverse nanomaterial synthesis capability with increasing control in size and shape. Diverse nanomaterials are shown to have unusual material properties which are different from their bulk counterpart. Even though nanomaterial synthesis technology is rapidly developing, the rational basis guiding such fabrication is in an early stage of development. In order to bring the nanotechnology frontier to the next level toward a mature engineering technology, it is essential to design the nanomaterial components as well as integrated nanostructures and systems. Due to the intrinsic complexity of the nanomaterials, it is important to apply a systematic multiscale simulation method to design any nanomaterials with predictive power. As a representative example, we will discuss the use of rational design of nanoparticles in commercial development of Diesel oxidation catalyst (DOC) starting from conceptual design in 2003 to full commercial scale qualification and production in 2009-2010. We will apply the developed rational design approach to the energy storage applications with high energy and power density material development.

Bio: *Prof. Kyeongjae Cho* is an associate professor of materials science & engineering and physics at the University of Texas at Dallas. He is also a WCU visiting professor at Seoul National University. Prior to joining UT Dallas in 2006 he was an assistant professor of mechanical engineering at Stanford University with a joint appointment in materials science and engineering (1997-2006). Dr. Cho has received his Ph.D. in Physics at MIT in 1994, and he has worked as research associates at MIT and Harvard University during 1994-1997. He is a co-founder and member of the advisory board of Nanostellar Inc., which specializes in developing nanoscaled catalytic materials for diesel emissions control. He has published 107 archival journal papers, and 24 conference proceedings papers. He also holds five U.S. patents. He has supervised 16 Ph.D. students and 15 postdoctoral associates and received two dozen research funding awards.