SEMTE seminar

Advanced Molecular Separations for Energy and Environmental Technologies

School for Engineering of Matter, Transport and Energy

abstract

Energy, environment, and sustainability are recognized as critical issues that must be solved for human habitat in the future. Although diverse efforts need to be devoted, the development of new materials and systems capable of high-performance molecular separation can contribute significantly to solving these problems. My research has been focused on energy-efficient separation processes, such as adsorptive and membrane separations, used in many energy and environmental technologies. In this talk, my recent work on high-performance adsorbents for application in post-combustion carbon dioxide capture will be presented firstly. Then, gas separation membranes containing nanoporous materials that I have studied since my Ph.D. study at Georgia Tech, will be introduced. To synthesize high-performance carbon dioxide separation membranes containing metal-organic frameworks, two different strategies, improving molecular sieving effect or carbon dioxide sorption property, have been utilized. For composite membranes containing zeolites, novel methodologies developed to enhance zeolite/polymer interfacial morphology and thus improve gas separation performance will be presented. Lastly, my future research envisioned as "advanced molecular separations for energy and environmental technologies" will be presented. Based on my expertise on materials chemistry and engineering processes, the new materials and separation processes will be developed to address many current issues in energy and environmental technologies. Initial researches proposed include "facilitated transport membranes with engineered metal-organic frameworks" and "engineered nanoporous films for advanced adsorption system".

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biosketch

Tae-Hyun Bae received his B.S. (1999), M.S. (2001), and Ph.D. (2006) degrees from the school of biological resources and materials engineering at Seoul National University after studying polymeric membranes and their processes for water treatments. He earned his second Ph.D. (2010) in chemical engineering at Georgia Institute of Technology under the supervision of Prof. Christopher W. Jones and Prof. Sankar Nair. His research at Georgia Tech was focused on engineering nanoporous materials for applications in gas separation membranes. Currently, he is a postdoctoral fellow in Jeffrey Long's research group at UC Berkeley, where he is working on CO_2 capture with metal-organic frameworks and other porous materials.

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January 31, 2013 at 10:00am in GWC 487