Mechanical Engineering Colloquium

Fall 2010 Semester

1pm Wednesday October 13, 2010

Room 224 Mechanical Engineering Center

Dr. Ah-Hyung Alissa Park

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and Associate Director of the Lenfest Center for Sustainable Energy
Columbia University

"Towards Sustainable Energy: Carbon Capture and Storage (CCS)"

Historically, the atmospheric concentration of carbon dioxide fluctuated naturally on the timescales of ice ages. Concerns, however, stem from the recent dramatic increase in the CO_2 concentration, which coincides with global industrial development. This rise is mainly due to the high use of fossil fuels. In order to meet the ever-increasing global energy demands while stabilizing the CO_2 level in the atmosphere, it is widely believed that current carbon emissions must be reduced by at least a factor of three. The containment of carbon dioxide involves CO_2 separation, transportation, and storage. Until now, these technologies have been developed independently of one another, which has resulted in complex and economically challenged large scale designs. CO_2 capture fluids based on the nanoparticle organic hybrid materials (NOHMs) are currently developed and their absorption isotherms are characterized as a function of CO_2 partial pressure and temperature (i.e., combustion and gasification conditions). NOHMs are a new class of organic-inorganic hybrids that consist of a hard nanoparticle core functionalized with a molecular organic (sometimes polymeric) corona. NOHMs are non-volatile and stable over a very wide temperature range, which make them interesting alternatives to various energy and environmental applications. Once captured, CO_2 needs to be stored for permanent disposal. The geological storage of carbon dioxide has been considered to be the most economical method of carbon sequestration, while mineral carbonation is a relatively new and less explored method of sequestering CO_2. The advantage of carbon mineral sequestration is that it is the most permanent and safe method of carbon storage, since the gaseous carbon dioxide is fixed into a solid matrix of Mg-bearing minerals (e.g., serpentine) forming a thermodynamically stable solid product. These carbon sequestration technologies can be integrated into the existing or new energy conversion systems in order to achieve their overall sustainability.

Ah-Hyung (Alissa) Park is the Lenfest Junior Professor in Applied Climate Science of Earth and Environmental Engineering & Chemical Engineering at Columbia University. She is also the Associate Director of the Lenfest Center for Sustainable Energy. Park received her Bachelors and Masters from the University of British Columbia, both in Chemical Engineering and joined Columbia University in the fall of 2007 after completing her Ph.D. in Chemical Engineering at the Ohio State University. Her research interests include carbon capture and storage, sustainable energy conversion systems, particle technology and multiphase flows. Park received a number of professional awards and honors including the NSF CAREER Award in 2009.

For more information, please contact Dr. Ian S. Fischer, 2010 Fall Seminar Coordinator