Seminar

Topic：Towards Sustainable Energy: Carbon Capture, Utilization and Storage (CCUS)

Speaker：Prof. Ah-Hyung Alissa Park

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Date & Time：**15:00 (pm) Nov, 11, 2011（Friday）**

Venue：**Multifunction Hall, IPE Mansion**

Abstract

Historically, the atmospheric concentration of CO_2 fluctuated naturally on the timescales of ice ages. Concerns, however, stem from the recent dramatic increase in 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 CO_2 involves three operations: separation, transportation, and storage. Until now, these technologies have been developed independent of one another, which has resulted in complex and economically challenging large-scale designs. The future direction of carbon management technologies now focuses on the integration of CO_2 capture and storage schemes as well as CO_2 utilization. In this seminar, two novel carbon capture, utilization and storage (CCUS) technologies will be introduced. 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 that possesses high degree of tunability. NOHMs are non-volatile and stable over a very wide temperature range, which make them interesting materials for 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 CO_2 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.