Professor L.-S. Fan

讲座题目：

Chemical Looping Processes and Applications

讲座时间：2010 年 6 月 9 日（周三） 下午 14:30-16:00
讲座地点：清华大学 化学工程系 工物馆 324-东

主讲人简介：

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范良士教授，美国国家工程学院院士，中国工程院外籍院士，俄亥俄州立大学化工系教授。于 1970 年毕业于台大化工系，随后赴美深造，在西维吉尼亚大学获得化工硕士及博士学位，并在堪萨斯州立大学获得统计学硕士学位。 毕业后于 1978 年受聘俄亥俄州立大学化工系任教，1994-2004 年担任该系系主任。范教授在学术上之成就包括发表 230 篇之期刊论文、三本专书著作。 范教授获得 30 多种国际性及校际性之荣誉与奖项，包括著名的 Malcolm E. Pruitt Award、Alphi Chi Sigma Award、Tomas Baron Award、Fluidized Process Recognition Award、西维吉尼亚大学杰出校友奖。最近又获得俄亥俄州立大学最高荣誉的 Joseph Sullivant 勋章及美国化学会的 Murphree 奖。

讲座简介：

The concept of chemical looping reactions has been widely applied in chemical industries, e.g., the production of hydrogen peroxide (H_2O_2) from hydrogen and oxygen using 9,10-anthraquinone as the looping intermediate. Fundamental research on chemical looping reactions has also been applied to energy systems, e.g., the splitting of water (H_2O) to produce oxygen and hydrogen using ZnO as the looping intermediate. Fossil fuel chemical looping applications had been used commercially with the steam-iron process for coal from the 1900s to the1940s and had been demonstrated at a pilot scale with the carbon dioxide acceptor process in the 1960s and 1970s. There are presently no chemical looping processes using fossil fuels in commercial operation. A key factor that hampered the continued use of these earlier processes for fossil energy operation was the inadequacy of the reactivity and recycleability of the looping particles. This factor led to higher product costs for using the chemical looping processes, compared to the other processes that were petroleum or natural gas based. With CO_2 emission control now being considered as a requirement, interest in chemical looping technology has resurfaced. In particular, chemical looping processes are appealing due to their unique ability to generate a sequestration-ready CO_2 stream while yielding high energy conversion efficiency. Renewed fundamental and applied research since the early 1980s has emphasized improvement over the earlier shortcomings. New techniques have been developed for direct processing of coal or other solid carbonaceous feedstock in chemical looping reactors. Significant progress is underway in particle design, reactor development, and looping system integration, as demonstrated by the operation of several pilot or sub-pilot scale units worldwide, making it possible that chemical looping technology may be commercially viable in the future for processing carbonaceous fuels.

This presentation will describe the fundamental and applied aspects of modern chemical looping technology that utilizes fossil and biomass as feedstock and involve both the metal – metal oxide and metal oxide – metal carbonate as reactive looping systems. The presentation will focus on looping reactor and system engineering and process simulation and applications. Opportunities and challenges for chemical looping process commercialization will also be illustrated.