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Novel metal-organic framework membranes for separation of Hydrocarbon mixtures

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It is estimated that separation processes account for almost 40% of total energy consumed in petrochemical industry. Membrane technology as an efficiency separation method in many cases can save up to 80% energy compared to conventional technologies such as distillation, adsorption and adsorption, etc. Furthermore, membrane technology has many other advantages such as zero discharge, small footprint, each to scale up, and easy to operate, etc. Hence, it is expected that membrane technology will play a more and more important role in the future. In academic, it is current one of the hottest research topics in chemical Engineering.

Development of novel membrane materials is often a key to develop high performance membranes. For example, membranes made from inorganic porous materials with uniform pore size, such as zeolites, have demonstrated excellent separation performances over conventional polymeric membranes. However, inorganic porous materials are often suffered from their limited topological framework structures and chemical flexibility. Metal organic frameworks (MOFs), as a new class of ordered porous materials with an inorganic-organic hybrid structure, are able to achieve rational designs in both structure and functionalities, and have showed high thermal stability. Hence, it is a very promising type of membrane materials. In this talk we will discuss the synthesis methods for preparation of high quality MOF membranes, and their prospective applications in separation of hydrocarbon mixtures, such as C2/C3, and olefin/paraffin, and isomer mixtures.

Biography:

Professor Lai's research interests mainly focus on synthesis, characterization, and applications of inorganic membranes with ordered porous structures, such as zeolites, mesoporous silica or carbon, metal-organic frameworks, etc. The aim of his research is to understand the membrane formation and separation mechanisms in order to develop novel synthesis strategies to fabricate high performance membrane systems. The applications of these membranes are targeted on gas separations, hydrocarbon mixture separations, membrane reactors, wastewater treatment, and recovery of industrial organic solvents.

Lai is also interested in coupling of inorganic and polymeric materials to develop novel mixed matrix membranes. Another area of his interests is synthesis of porous materials into nanostructures such as core-shell nanostructure and study their potential applications such as drug deliveries and micro-membrane reactors.