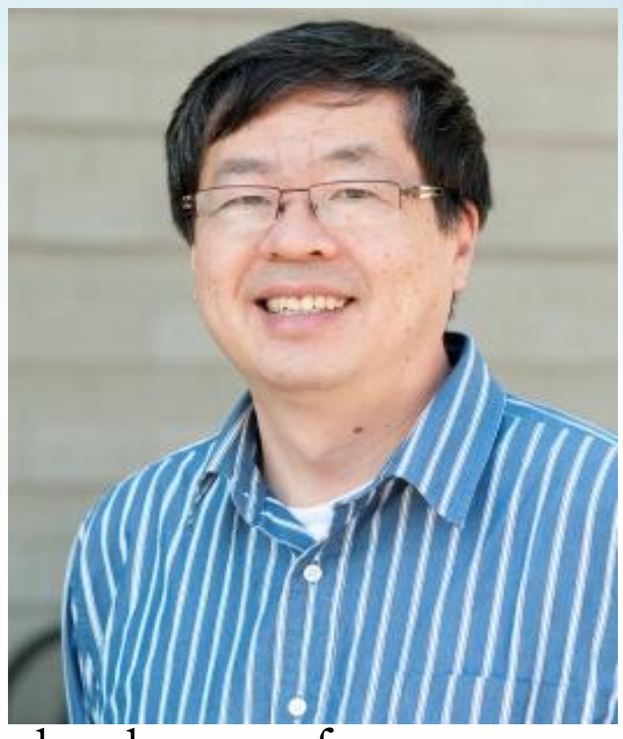
Academic Lecture

State Key Laboratory of Chemical Resource Engineering

Tuning MOF properties for CO_2 adsorption by high external pressure



报告人：Prof. Yining Huang

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时间：2017-08- 31 (周四) 上午10:00-11：30

地点：无机楼107会议室

报告简介： Metal-organic frameworks (MOFs) are a novel class of porous materials, owing to their potential applications in a variety of areas, including gas storage, molecular separations, catalysis, and sensors. Most importantly, their exceptional large surface areas, tunable pore properties and potential for industrial scale production have made MOFs a promising material for clean energy applications, such as CO_2 capture and storage. The chemical and mechanical stabilities of MOFs play a crucial role in their CO_2 storage that requires loading at high pressures. Application of high external pressure (e.g., in gigapascal range) on MOFs can significantly alter the framework structure, pore opening and consequently the adsorption properties. This presentation focuses on the investigation of high-pressure effects on the structures of several representative MOFs and their CO_2 adsorptive properties. In-situ vibrational spectroscopy was used as a primary characterization method, which allows the understanding of local structures, chemical bonding, and thus the nature of guest-host interactions between the adsorbed molecules and the framework. Four types of MOFs with different topologies, structures and porosities have been studied under high pressures, including ZIF-8 (a small pore MOF with an unusual chemical stability under extreme compression); MIL-68 (In) (a flexible MOF featuring two types of channels with distinctly different pore sizes and shapes); CaSDB, SDB = 4, 4′-sulfonyldibenzoate, (a highly robust calcium-based MOF) and SIFSIX-3-Zn (a hybrid MOF with ultra-small pores). We will discuss increased affinity towards CO_2 at high pressures, new adsorption sites identified at elevated pressures, CO_2 adsorption-driven phase transitions.

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