Speaker: Prof Guangshan Zhu  
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Griffith University  

Date: Friday 27 April 2012  
Time: 2:00 pm - 3:00 pm  
Venue: Room 0.05, Science 2 building (N34), Griffith University, Nathan Campus

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Title: Targeted Synthesis of Porous Materials for CO2 Capture and Low Energy Separation

Abstract:

Recently, a new family of porous materials, porous organic frameworks (POFs), composed of light elements (C, H, O, N, B, etc) via robust covalent bonds, has led to expeditious advances owing to their high surface areas, high stability and controlled skeletons.[1-2] With the aid of computational design, a new class of POFs, namely porous aromatic frameworks (PAFs), were successfully designed and synthesized in our previous work.[3-9]. Although most of POFs are amorphous, the local skeleton and nanoscale of the products can be controlled by the initial monomers.

Our strategies to assemble PAFs materials include selecting befitting building blocks and employing an effective reaction (Figure 1). Diversiform coupling reactions, such as Ni(cod)2-mediated Yamamoto coupling, Pd-mediated Suzuki coupling, Pd-mediated Sonogashira-Hagihara coupling, ZnCl2 mediated nitrile cyclotrimerization, base-mediated nucleophilic substitution of cyanuric chloride, have been documented to form PAFs materials. PAF-1 derived from tetrakis(4-bromophenyl) methane as a tetrahedral building unit, was acquired via nickel(0)-catalyzed Yamamoto-type Ullmann cross-coupling reaction.[3] PAF-1 exhibits high Langmuir surface area of 7100 m2 g-1. Besides its exceptional surface area, PAF-1 outperforms highly porous MOFs in thermal and hydrothermal stabilities, and demonstrates high uptake capacities for hydrogen and carbon dioxide. Simultaneously, PAF-2 based on a tetraphenylmethane block and a triangular triazine ring been designed and synthesized, with 1109 m2 g-1 Langmuir surface area, and shows selective sorption of benzene.4 Moreover, we also designed and synthesized a series of PAF materials through assembling of the designed build units and employing various synthesis strategies.[5-9] Efforts are also underway for the successfully synthesis of new kind of PAFs materials and their applications in areas of gas storage and separation.
References:

[1] N. B. McKeown, P. M. Budd, Macromolecules., 2010, 43, 5163

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