

Poster Presentation

MS74.P25

Mesoporous Metal Phosphites with 3D Crystalline Frameworks

S. Wang¹

¹*National Tsing Hua University, Hsinchu, Taiwan*

The synthesis of crystalline porous solids is of great importance in the area of materials chemistry. Naturally occurring zeolites are mostly crystalline; however, they possess pores/channels that only allow small species smaller than 1 nm in diameter to pass through. One exception is the mineral cacoxenite, containing 36-membered ring (36R) channels that allow guest species of up to 1.41 nm in diameter to pass through. In the past, much effort has been devoted to the development of zeolitic materials. Even though multifaceted design strategies were utilized, the discovery of larger inorganic channels was often accidental. Compared with amorphous mesoporous silicates that contain synthetically tunable pores, zeolitic crystalline structures lack rational synthesis routes. In general, molecular templating leads to crystalline frameworks whereas organized assemblies that are able to produce much larger pores lead to noncrystalline frameworks. Synthetic methods that generate crystallinity from both discrete and organized templates represent a viable design strategy for the development of crystalline porous inorganic frameworks spanning both the micro and the meso regimes. We show by integrating templating mechanisms for both zeolites and mesoporous silica in a single system, the channel size for gallium zincophosphites can be tuned systematically up to 64R and 72R. With apertures of 3.5 nm, the new compounds represent the first non-disordered structures for mesoporous solids. Through the use of long straight-chain alkyl monoamines as templates, three common building blocks are induced that repeatedly self assemble into two isotopic porous frameworks with the ability to increasingly enlarge channel size. The rational design of crystalline porous metal oxides is achieved for the first time. A general formula was derived to predict new members with even larger channels along with their individual space group symmetry.

[1] Lin, H. Y.; Chin, C. Y.; Huang, H. L.; Huang, W. Y.; Sie, M. J.; Huang, L. H.; Lee, Y. H.; Lin, C. H.; Lii, K. H.; Bu, X.; Wang, S. L. *Science*, 2013, 339, 811-813, [2] Lai, Y. L.; Lii, K. H. and Wang, S. L. *J. Am. Chem. Soc.* 2007, 129, 5350-5351, [3] Lin, C. H.; Wang, S. L.; Lii, K. H. *J. Am. Chem. Soc.* 2001, 123, 4649-4650.

Keywords: Mesoporous structure, Metal phosphite, Crystalline framework