Stepwise Synthesis of Robust Metal-Organic Frameworks via Post-Synthetic Metathesis and Oxidation of Metal Nodes

Scientific Achievement

Robust MOFs with improved stability were synthesized using post-synthetic metathesis and followed with the oxidation of metal nodes (PSMO).

Significance and Impact

It provides a new route to synthesize the robust MOFs with high valence metal ions.

Research Details

– Robust MOFs constructed with high valence metal ions, such as Fe$^{3+}$, Cr$^{3+}$ and Ti$^{4+}$, are difficult to crystallize, due to the kinetic inertness of the metal-ligand bonds.
– Using Mg-MOF as template, we first exchanged the metal nodes with Fe$^{2+}$ and Cr$^{2+}$ ions to form the intermediate Fe(II) and Cr(II)-MOFs.
– After air oxidation of metal nodes, PCN-426-Fe(III) and PCN-426-Cr(III) were obtained in a single-crystal to single crystal transformation.

Tian-Fu Liu, Lanfang Zou, Dawei Feng, Ying-Pin Chen, Stephen Fordham, Xuan Wang, Yangyang Liu, and Hong-Cai Zhou. J. Am. Chem. Soc. 2014, 136, 7813–7816. Work was performed at Texas A&M university.