An In Situ One-Pot Synthetic Approach towards Multivariate Zirconium MOFs

Scientific Achievement
Porphyrinic ligands are incorporated into UiO-66 through a one-pot, thermodynamically controlled synthesis from mixed ligands [ditopic 1,4-benzene-dicarboxylate (BDC²⁻) or its derivatives and tetratopic tetrakis(4-carboxyphenyl)porphyrin (TCPP⁴⁻)].

Significance and Impact
This strategy provides a facile route to introduce multiple functionalities into stable Zr-MOFs for an extensive variety of potential applications.

Research Details
– Tetratopic TCPP ligands were successfully integrated into UiO-66 while preserving the crystal structure, morphology, and stability of UiO-66.
– EDX-mappings demonstrated an even distribution of all the elements, especially Ni and Zr, in the framework.
– The amount of integrated TCPP can be gradually tuned by varying the ratio of mixed ligands used in the synthesis.

Upper: Schematic illustration of UiO-66 incorporated with TCPP.
Lower: Photographs of X⊂UiO-66 (X = NiTCPP, FeTCPCCI, MnTCPCCI, CuTCP, H₂TCP, ZnTCP, and CoTCP from left to right).


Work was performed at Texas A&M University and Guilin University of Electronic Technology.