

Spatially Controlled Hybridization of Porous Metal–Organic Crystals

(¹*School of Engineering, The University of Tokyo*, ²*RIKEN Center for Emergent Matter Science, JST-PRESTO*) ○Kunyi Leng,^{1,2} Takuzo Aida^{1,2}, Hiroshi Sato^{2,3}

Keywords: Metal–Organic Framework; Crystal Engineering; Hybrid Materials; Photochemistry; Porous Materials

Hybrid materials with two or more distinct chemical components integrated into a single platform hold enriched diversity, versatility, and functionality, in comparison with conventional unitary materials.¹ Metal-organic frameworks (MOFs), as crystalline porous materials, have attracted extensive attention. Their physicochemical properties are highly dependent on the composition and architectures. Although the hybridization of multiple MOF crystals has emerged as a powerful tool for modifying porous properties,² it remains challenging but very attractive to develop a strategy for spatially controlled arrangement and hybridization of different types of MOF crystals.

Recently, we reported a photochemically crushable and regenerative MOF (**MOF**₁) using a dithienylethene-based ligand (**L**₁, Fig. 1a).³ **MOF**₁ crystals can be dissolved in a solvent by UV light and subsequently regenerated by visible light. This unique property inspired us to come up with a photochemical surgery approach to realize hybrid MOF crystals by the destruction of a targeted portion of MOF crystals by UV light and then selectively crystallizing new MOF crystals at the destroyed location (Fig. 1b). **MOF**₂ crystal composed of another photoreactive ligand (**L**₂, Fig. 1a) was successfully hybridized with the **MOF**₁ crystal. We also report on the hybridization of MOF crystals with different types of ligands as well as with MOF crystals composed of different metal ions.

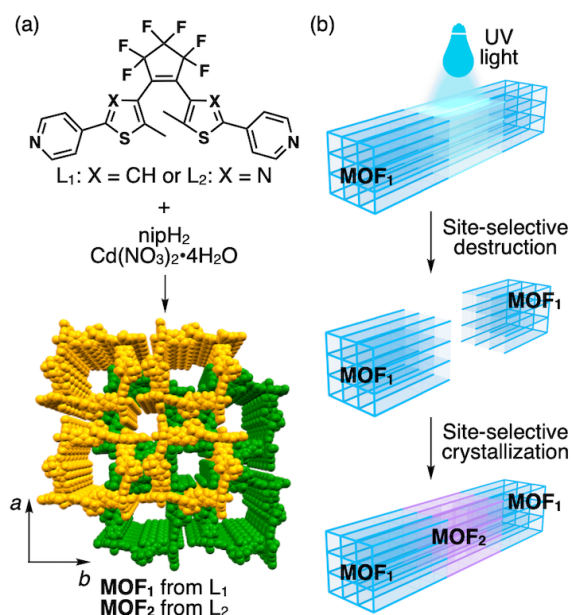


Fig. 1 (a) Structures of photoreactive ligands (**L**₁ and **L**₂), **MOF**₁, and **MOF**₂. nipH₂: 5-nitroisophthalic acid. (b) Photochemical surgery for hybridization of multiple MOF crystals.

1) E. Katz, I. Willner, *Angew. Chem. Int. Ed.* **2004**, 43, 6042. 2) L. Feng, K.Y. Liang, J. Powell, H.C. Zhou, *Matter* **2019**, 1, 801. 3) H. Sato, T. Matsui, Z.Y. Chen, J. Pirillo, Y. Hijikata, T. Aida, *J. Am. Chem. Soc.* **2020**, 142, 14069.