MS30-05 | Highly Versatile Metal-Organic Frameworks

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The relationship between crystallization conditions, crystal structure and properties is a pivotal point in modern chemistry both for the investigation of fundamental aspects and for material design. The interest spans from the macro- to the nanoscale, and across the gamut of natural, laboratory-made, organic and inorganic systems.

In our study, we investigate the factors affecting the size and morphology of self-assembled metal-organic frameworks (MOFs). In general, micro-nano crystals grown by modulator-free synthesis are polydispersed in size, exhibit non-homogeneous shape or simple polyhedral morphologies, usually reflecting the underlying geometry of the crystallographic structure. We developed an approach that results in the formation of monodispersed crystals with a large variability of morphologies, while keeping the crystallographic structure nearly identical. No templates or modulators are used. The crystals generated include rare polyhedral shapes, hollow structures and unique morphologies not classifiable according to conventional rules. Interestingly, we prepared morphologically highly complex crystals from achiral components that exhibits single crystallinity and chirality at both the molecular structure and crystal morphology. The work provides new fundamental insights in the growth of uniform and chiral crystals, opening up opportunities for their use as 3D objects for nanotechnological applications.