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Self-assembly of metal-organic polyhedra into supramolecular porous polymers

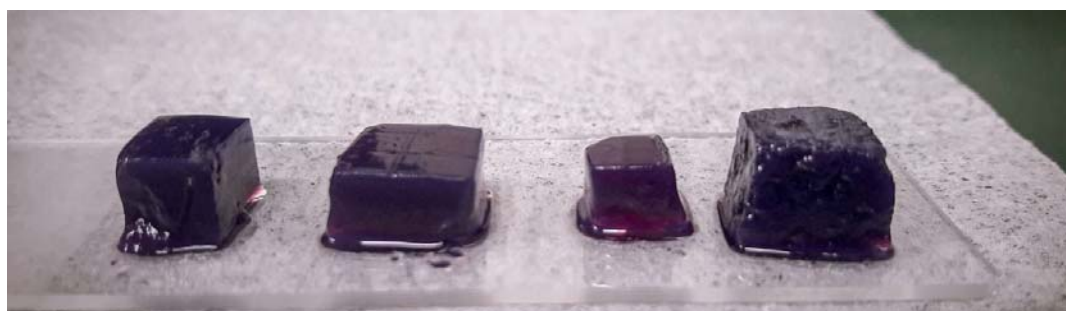
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Designed porosity in coordination materials often relies on highly ordered crystalline networks, which provide stability upon solvent removal. However, the requirement for crystallinity often impedes control of higher degrees of morphological versatility, or materials processing. Herein, we describe a supramolecular approach to the synthesis of amorphous polymer materials with controlled microporosity.^[1] The strategy entails the use of robust metal-organic polyhedra (MOPs)^[2,3] as porous monomers in the supramolecular polymerization reaction. Detailed analysis of the reaction mechanism of the MOPs with imidazole-based linkers revealed the polymerization to consist of three separate stages: nucleation, elongation, and cross-linking. By controlling the self-assembly pathways, we successfully tuned the resulting macroscopic form of the polymers, from spherical colloidal particles to colloidal gels with hierarchical porosity (Figure). The resulting materials display distinct microporous properties arising from the internal cavity of the MOPs. This synthetic approach could lead to the fabrication of soft, flexible materials with permanent porosity.



References:

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