Controlled synthesis of imine-linked 2D COFs from particles to gel

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Résumé :

Covalent Organic Frameworks (COFs) are an emerging class of porous crystalline materials. Synthesized from organic building block made of light atoms (C, N, O, B, H), COFs display an increasing interest for the scientific community thanks to their permanent porosity, their crystallinity and their chemical tunability. Thus, several applications are considered from molecular separation[1,2] and sensors[3,4] to drug delivery[5,6] and catalysis. However, COFs are crosslinked materials and so, often isolated as insoluble powder or polycrystalline films making their processability a challenge[7].
Herein, we report the capacity to control the material formation from the nanoscale to the macroscopic scale. At the nanoscale, by irradiating with a specific wavelength, the solution of building blocks during the synthesis we are able to tune the final size of the Imine-linked COF particles (from 140 nm to 46 nm) while preserving the crystallinity. At the macroscale, by controlling the formation of hydrogen bonds *via* the introduction of hydroxy groups on the building blocks, we developed a series of colloidal gels and cryogels/aerogels. Controlling the morphology and organization at different scales of COF-based materials represents a major advance in the field and pave the way for real-world applications.

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