THEME

☒ Thème 1 : Elaboration et mise en forme de matériaux poreux
☐ Thème 2 : Applications des matériaux poreux
☐ Thème 3 : Modélisation et caractérisation de matériaux poreux

Formulation of metal-organic framework inks for the 3D printing of robust microporous solids

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Metal-organic frameworks (MOFs) are a fast-growing class of highly porous materials owing to their exceptional structural diversity. A consequent effort has been deployed during the past few years for rationalizing the preparation of the most promising MOF structures, in view of their applications at larger scale. Still, their shaping represents a major bottleneck due to the difficulty to conciliate high porosity and adequate mechanical resistance to withstand overtime damaging stresses.
3D printing is a promising technology as it allows the fast prototyping of materials at the macroscale.[1] Herein, a 3D printer was modified to prepare a variety of MOF-based solids with controlled morphology from shear-thinning inks containing a cellulose-derived binder. Four benchmark MOFs were tested: HKUST-1, CPL-1, ZIF-8 and UiO-66-NH_2. All solids are mechanically stable up to 0.6 MPa of uniaxial compression and highly porous, with BET specific surface areas lowered by 0 to -25%. Furthermore, these solids were applied to high pressure sorption (CH_4, C_2H_4 and C_2H_6) and presented performances in line with the literature.

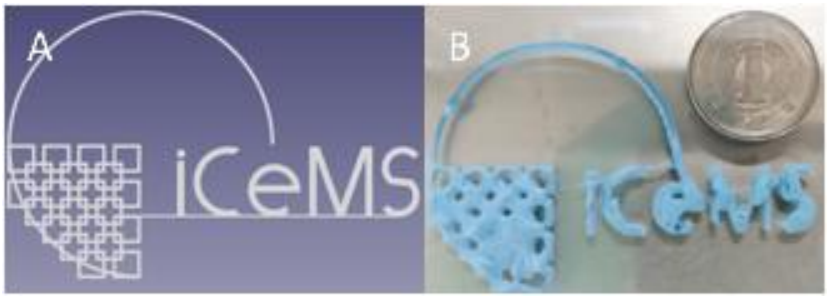

Fig. 1. (A) Model designed using a CAD software; (B) resulting object starting from a MOF-based ink. A one Yen coin is shown for reference (diameter = 20 mm).

Références:

[1] H. Thakkar, S. Eastman, Q. Al-Naddaf, A.A. Rownaghi, F. Rezaei, *ACS Appl. Mater. Interfaces*, **9**, 35908-35916 (2017).