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Self-standing nanoporous zeolite/cellulose deposits prepared with ultrafiltration for energy storage applications

Metal-organic frameworks (MOFs) are a class of crystalline solids containing metal ions and organic ligands. Owing to their high porosity and tuneable selectivity, they have been intensively researched for their application in gas separation, filtration, catalysis, sensing and energy storage [1]. However, MOFs are typically produced in forms of powders, which require further processing before being applied on a larger, industrial scale. In the field of liquid separation, synthesis or deposition of MOFs on polymeric membranes has been regarded as a viable solution, however further research is needed to evaluate the microstructure-function relationship of these hybrid materials. The use of biopolymers-based membranes for supporting MOFs constitutes an attractive fabrication route, owing to their intrinsic physiochemical properties, sustainability and biocompatibility [2]. The present work focuses on the use of a hydrophobic MOF (ZIF-8), which exhibits energy storage capability through cycles of liquid intrusion/extrusion [3]. The ZIF-8 powder was mixed with crystalline nanocellulose (CNC) and used to fabricate a hybrid deposit by means of ultrafiltration. The flow behaviour of the ZIF-8/CNC suspensions was probed using oscillatory rheology. The effect of the composition of the feed solution on the deposit formation has been also investigated, and the deposit was characterized with optical and electron microscopy, and ultra-small angle X-ray scattering. Results show that low amounts of CNC enable formation of a homogeneous and resistant ZIF-8/CNC composite material which maintains its performance as an energy storage system, with intruding pressures up to 250 bar.

[1] Lai, Z. Development of ZIF-8 Membranes: Opportunities and Challenges for Commercial Applications. Curr. Opin. Chem. Eng. 2018, 20, 78–85. https://doi.org/10.1016/j.coche.2018.03.002.
[2] El Hankari, S.; Bousmina, M.; El Kadib, A. Biopolymer@Metal-Organic Framework Hybrid Materials: A Critical Survey. Prog. Mater. Sci. 2019, 106 (May), 100579. https://doi.org/10.1016/j.pmatsci.2019.100579.
[3] Michelin-Jamois, M.; Picard, C.; Vigier, G.; Charlaix, E. Giant Osmotic Pressure in the Forced Wetting of Hydrophobic Nanopores. Phys. Rev. Lett. 2015, 115 (3), 1–4. https://doi.org/10.1103/PhysRevLett.115.036101.

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