Poster Presentation

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Hierarchically structured materials from nano cellulose - HKUST-1 MOF composites

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Cellulose is the most abundant naturally occurring polymer on the Earth. The mechanical properties of nano cellulose is similar to Kevlar and stronger than steel. The superior qualities of nano cellulose like mechanical robustness and self-association [1] make nano cellulose promising candidates for the fabrication of nanocomposites. Among nano cellulose composites, nano cellulose based metal organic framework composites showcase special attention. MOFs have high surface area, tunable pore size with desirable functionalities. HKUST-1 (Cu_3 $(BTC)_2$. $2H_2O$) forms an ideal functional material in the synthesis of nano cellulose based composite due to its greater stability and easily tunable porosity. There are various methods to prepare nano cellulose like acid hydrolysis, TEMPO mediated oxidation, ultra-sonication etc. We prepared nano cellulose fibres from micro sized cellulose by TEMPO mediated oxidation [2] (TEMPO/ NaBr/ NaOCl system) followed by mechanical treatment. The carboxyl content of nano cellulose is measured using titration method. HKUST-1 crystals are synthesised in situ in nano cellulose medium. Nano cellulose forms a template for the synthesis of HKUST-1 crystals [3]. The copper ions attached to the carboxyl groups of nano cellulose play the role of nucleation centres for the hierarchical growth of the HKUST-1 crystals. The covalent bonding between the copper ion and the carboxyl groups of cellulose nanofibers proved the successful fabrication of the nano composite. We studied the nucleation and crystal growth of HKUST-1 at different pH and temperature conditions. The hybrid composites thus synthesised are characterised by PXRD, FT-IR, TGA, DSC, SEM, TEM, Raman spectroscopic techniques and gas adsorption measurements. As future work, we intend to tune the porosity of HKUST-1 and the size of nano cellulose to fabricate more feasible composites. These nano cellulose - HKUST-1 composites can have potential applications in gas separation and storage.

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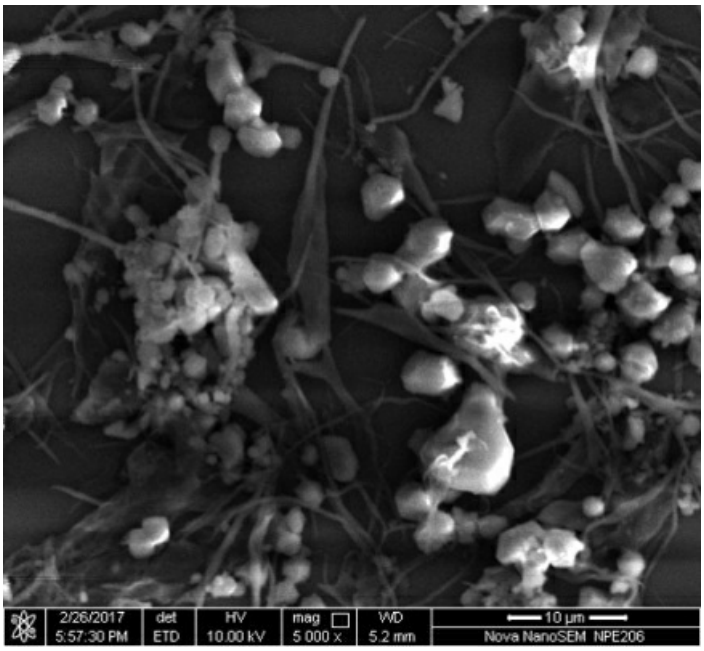

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