

Hybridization of Metal–Organic Frameworks and Nanomaterials for Energy Storage and Conversion

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Metal–organic frameworks (MOFs) are typically synthesized into pure and bulk–sized crystals, and thus their usability is limited by the lack of compatibility with advanced technologies. Strategies to intermingle reticular chemistry and nanotechnology will lead to new forms of functional materials and applications. This talk will show how MOFs and nanomaterials can be combined into special constructs and successfully work together for supercapacitors and heterogeneous catalysts.

In the supercapacitors, it will be shown that that nanocrystalline metal–organic frameworks (nMOFs) can be doped with graphene and incorporated into devices to function as supercapacitors. We find that several members of this series give high capacitance; in particular, nMOF–867 which has sp² nitrogen atoms in its organic link exhibits exceptionally high capacitance.

In the heterogeneous catalysis, nanocrystalline MOFs are grown around metal nanoparticles, and their physical and chemical environments control the selectivity and activity of the heterogeneous catalytic reactions triggered by metal nanoparticles.