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Surface modified ZIF-67 and NH2-MIL(101)Fe Metal Organic Frameworks for Photocatalysis and Supercapacitor Applications

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Metal Organic Frameworks (MOFs) are highly ordered 3-dimensionally arranged crystalline hybrid materials containing both an inorganic and an organic component. Their base structure is comprised of metal ions or clusters (inorganic) that are connected by electron-donating “linker” groups (organic) to create a networked structure with periodically arranged rigid/semi-rigid pores. As a result of their porosity, flexibility and ability to be functionalized they find use in applications such as gas storage, separations, sensing, and catalysis.
We report here an investigation on the impact of temperature on the growth of bench-top synthesized Cobalt-based Zeolite Imidazolate Frameworks (ZIF-67). ZIF-67 annealed sequentially under inert atmosphere and air at 600℃ and 350 ℃, was also prepared and a comparative photocatalytic profile for degradation of methylene blue is reported. Alongside these, we report an environmentally friendly and energy-efficient method for preparing NH2-MIL (101) Fe MOFs. Traditional methods of synthesizing NH2-MIL (101) Fe involve solvothermal synthesis in N,N-Dimethylformamide (DMF) at 150 ℃, for 1-2 days. The environmental trail left as a result of washing of DMF using methanol is usually huge. We report the use of a more environmentally friendly, energy saving bench top synthesis of NH2-MIL (101) Fe using ethanol at 60 ℃. NH2-MIL (101) Fe doped with Cobalt alongside the pristine MOF, were pyrolyzed at 500 ℃, 2h and employed for supercapacitor applications using cyclic voltammetry, charge-discharge cycling and electrochemical impedance spectroscopy. The impact of Co-impregnation on the capacitive properties of the pyrolyzed NH2-MIL (101) Fe MOF is discussed.

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