

Synthesis and electrochemical properties of ternary Co-, Cu- and Ni- based metal-organic frameworks electrode for battery supercapacitor hybrid application

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ABSTRACT

Metal-organic frameworks (MOFs) composed by coordination bonds between metal ion with organic linker has a uniform combination of micro and mesoporous structures has been used for several application including battery supercapacitor hybrid. (BSH). In BSH, MOF offer several advantages including high surface area, porous, and structure tunability. This paper reports the synthesis of ternary MOF of copper (Cu), nickel (Ni) and cobalt (Co) with 1,4-benzenedicarboxylic acid. The Co/Cu/Ni-MOF is synthesized using hydrothermal method at 160 °C for 12h and further develop as a BSH electrode. The physicochemical properties of MOF were characterized using FESEM, FTIR, XRD, BET and the electrochemical properties were evaluated using cyclic voltammetry (CV), charge-discharge cycling (CDC) and electrochemical impedance spectroscopy (EIS). Electrochemical analysis indicated that the MOF has high specific capacitance (C_s) of 591 F g⁻¹ at a current density of 1 A g⁻¹ and 519 F g⁻¹ at scan rate of 2 mV s⁻¹, and possess low series resistance (R_s) of 0.44 Ω and equivalent distributed resistance (R_d) of 1.07 Ω.

KEYWORDS

Electrochemical capacitor; Pseudocapacitance; Energy storage; Hydrothermal

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