Abstract

Metal-organic frameworks (MOFs) have gained significant attention as potential electrode materials for supercapattery devices, which combine the advantages of both batteries and supercapacitors in a single system. In this study, three bimetallic Mn and Ni MOFs were synthesized through a hydrothermal method using trimesic acid as organic linkers. The varying amounts of Mn (25%, 50%, and 75%) in these Mn/Ni-MOF samples were named S25, S50, and S75, respectively, and their performance and specific surface areas were evaluated. Interestingly, the results indicated that the sample with 75% Manganese content (S75) exhibited the highest specific capacitance (Cs), with a value of 312 Fg^{-1} at a current density of 1 Ag^{-1} and 253 Fg^{-1} at a scan rate of 40 mV/s. This suggests that higher manganese content led to improved electrochemical performance.To analyze the electrochemical performance, a three-electrode configuration was employed, and a more detailed investigation was conducted to establish correlations between the electrochemical characteristics and the physico-chemical properties of these MOFs. The key findings suggest that the bimetallic Mn/NiMOFs, particularly sample S75, have the potential to be effective electrode materials for supercapattery devices, offering a balance between energy storage and rapid energy release, which is characteristic of both batteries and supercapacitors.