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Synthesis of cobalt based metal organic framework nanostructures as new electrode materials for high performance supercapacitors

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Today, with unusual global climate change and consumption of fossil fuels along with the decline in fossil fuel, development of sustainable and economical energy has become an important area of interest for both scientific and technological researchers. Recently, the supercapacitor is emerging as a key enabling electrical energy storage technology which offers a low-cost alternative source of energy. Based on the mechanism of charge storage processes, large accessible surface area, considerable electrical conductivity and tailored pore size are required for electrode materials employed for supercapacitors applications. With the investigation the history of different researches, and importance of the metal organic framework (MOF) structure in different fields, especially energy storage systems, it seems that these materials are very good candidates for supercapacitors. So in this research three-dimension metal-organic framework was synthesized via the simple hydrothermal and placed on the collector as an electrode and utilized in supercapacitor system. The electrochemical investigation was carried out and specific capacitance at a scan rate of 5 mV/s was obtained as 1756 F/g. Also, stability investigation of this nanostructure by cyclic voltammetry method at a scan rate of 100 mV/s displayed 85% of initial capacitance value remained after 3000 cycles. Moreover, an asymmetric supercapacitor was assembled using Co-MOF and reduced graphene oxide electrode, the fabricated supercapacitor showed a specific capacitances of 122.6 F g^{-1} at a scan rate of 5 mVs^{-1} and delivered maximum power density of 3625 W/kg. Our studies suggest the Co-MOF as promising electrode materials for supercapacitor applications.

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