Synthesis of nickel cobalt manganese metal organic framework@high quality graphene composites as novel electrode materials for high performance supercapacitors

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Due to the importance of developing energy storage devices, various materials are reported day by day as electrode material. One of the most interesting and promising type of which is metal–organic framework (MOF) materials. In this study, a nanocomposite of glucose (G), high quality graphene (HQG), and NiCoMn-MOF which is called G-HQG@NiCoMn-MOF nanocomposite has been successfully used to prepare an efficient electrode for supercapacitor (SC) applications. A high specific capacity of 1263.6C g−1 at a current density of 1 A g−1 and 89.2% capacity retention after 5000 consecutive charge/discharge cycles at 7 A g−1, indicate excellent performance of G-HQG@NiCoMn-MOF electrode as an appropriate material to prepare the working electrode for use in SCs. Also, the as-prepared G-HQG@NiCoMn-MOF//AC asymmetric SC has a high specific energy of 69.9 Wh kg−1 at a specific power of 1217.9 W kg−1. This device could provide excellent rate capability by recovering 74.1% of its initial capacitance at a current density of 10 A g−1 and brilliant cycle life by recovering 85.2% of its initial capacitance after 5000 consecutive cycles at a current density of 7 A g−1. On this, turning on 9 LED bulbs for more than 14 min showed that the assembled devices have extraordinary performance.

Keywords: Metal–organic frameworks (MOFs), Nanocomposites, High quality grapheme, Asymmetric supercapacitors