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Self-assembled Rgo-integrated Cd-mof As High Stability Electrode For Advanced Symmetric And Asymmetric Supercapacitors

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Abstract : The tailoring and controlled fabrication of metal-organic framework (MOF) with diverse conductive materials have garnered significant academic attention, owing to their potential applications in next-generation energy storage devices. Herein, we synthesized the rGO@Cd-MOF composite by a facile solvothermal method and utilized as an electrode in hybrid supercapacitor. FESEM and TEM images verify composite material formation as Cd-MOF crystals are dispersed on the rGO nanosheet. The rGO@Cd-MOF composite electrode showcases outstanding electrochemical performance in a 3-electrode system by achieving the high specific capacity of 634 Cg^{-1} at a current density of 2 Ag^{-1} within the potential range of 0 to 0.6 V. Furthermore, the composite was utilized as an electrode in symmetric and asymmetric supercapacitor devices, however, ASC device achieved impressive energy density of 78.69 $Whkg^{-1}$ at a power density of 1282 Wkg^{-1}, compared to SSC device, which achieved 21.15 $Whkg^{-1}$ at 721 Wkg^{-1}. The ASC device maintained 90 % coulombic efficiency and 94 % capacity after 10k charge-discharge cycles. Thus, for the first time, this study presents the use of rGO@Cd-MOF composite to develop an effective supercapacitor electrode. This proposed layout is also versatile for a flexible symmetric and asymmetric supercapacitor device, providing high energy density and specific capacity values.

Keywords : metal-organic framework, rGO nanosheets, symmetric supercapacitor, asymmetric supercapacitor, energy density, power density
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