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Superior capacitive performance of reduced graphene hydrogels via dimethyl ketoxime

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Abstract

Three-dimensional (3D) reduced graphene hydrogels (RGHs) have been prepared by using dimethyl ketoxime as reducing agents in aqueous solution of graphene oxide (GO) with ammonia. The structure and surface chemistry were analyzed by scanning electron microscopy, Raman, X-ray diffraction, and X-ray photoelectron spectroscopy. The capacitive performance of the RGHs materials are studied in 6 M KOH electrolyte. Benefitting from the 3D porous structures and heteroatom-doped polar pore surface, the as-prepared RGHs materials exhibit high specific capacitances up to 159.8, 215.1 and 163.4 F g^{-1} at 1 A g^{-1} for RGHs-1, RGHs-2 and RGHs-5, respectively. More importantly, the materials can maintain high capacitances of 95.6, 155.2 and 118.9 F g^{-1} at a very high current density of 20 A g^{-1}, the retention rates are 59.8, 72.2 and 72.8％ for RGHs-1, RGHs-2 and RGHs-5, respectively.