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Manganese-enriched electrochemistry of $LiFePO_4$/RGO nanohybrid for aqueous energy storage

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ABSTRACT:

Manganese-doped lithium iron phosphate (LFMP) integrated with reduced graphene oxide (RGO) has been prepared via microwave-assisted synthesis and investigated as lithium-ion energy storage system in aqueous Li_2SO_4 electrolyte. The doping of the LFP was achieved with a low-cost commercial electrolytic manganese oxide (EMD) precursor using a microwave-assisted solvothermal technique. When compared to the undoped counterpart (LFP/RGO), obtained under similar experimental conditions, the LFMP/RGO nanohybrid showed an improved electrochemical performance. The LFMP/RGO gave a maximum areal capacitance of ca. 39.48 mF cm^{-2}, power density of 70.3 mW cm^{-2} and energy density of 8 mWh cm^{-2}compared to the values for the pristine complex (LFP/RGO); ca. 16.85 mF cm^{-2}, 54.4 mW cm^{-2} and 4.8 mWh cm^{-2}. In addition, when the two types of electrochemical storage systems were subjected to voltage-holding (floating) experiment for 50 h, LFMP/RGO maintained 98% capacitance retention while LFP/G maintained 94% capacitance retention. The findings in this work prove that Mn-doping is capable of enhancing the electrochemical performance of the LFP material for energy storage.