Fast and Scalable Hydrodynamic Synthesis of Defect-Free Graphene/MnO_2 Nanocomposites

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The integration of metal oxide and carbon material provides a great potential for the high energy and power density of supercapacitor, but the scale-up of fabrication process of such composite materials still remains a challenge. We report a fast, scalable, and one-pot hydrodynamic synthesis for the preparation of ion conductive and defect-free graphene from graphite and MnO_2/graphene nanocomposites. The use of this hydrodynamic method using Taylor–Couette flow allows us to efficiently shear-exfoliate graphite into large quantities of high-quality graphene sheets. Deposition of MnO_2 on graphene followed in a fluidic reactor in 10 min. The prepared MnO_2/graphene nanocomposite shows an outstanding electrochemical performance, such as a high specific capacitance of 679 F/g at 25 mV/s, and a high rate capability of 74.7% retention at an extremely high rate of 1000 mV/s.