Graphene wrapped MnO2 nanostructures for desalination via capacitive deionization

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Abstract

Graphene is an optimal electrode in the capacitive deionization (CDI) units if the specific capacitance could be improved. In this study, novel strategy for rapid transformation of graphite into graphene-intercalated with nanostructure MnO_2 with morphology control is introduced by one-pot reaction, low-time consuming and eco-environmentally method. Conversion of graphite into the graphene structure was suggested through vigorous oxidation using ammonium peroxysulphate and hydrogen peroxide in the presence of manganese sulfate followed by a reduction step using piperidine under a microwave irradiation. It was explained that the formation of MnO_2 nanostructures during the exfoliation process has a great impact to separate the graphene sheets as the metallic nanostructures wedged among the sheets. Interestingly, morphology control could be performed: MnO_2 nanorod and MnO_2 nanoparticles @graphene could be prepared. As an electrode in the CDI unit, the synthesized MnO_2-nanorods @graphene showed the excellent results in the specific capacitance (292 F/g), distinct electrosorp- tive capacity (5.0 mg/g), good salt removal efficiency (93%) and distinguished recyclability.

References

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