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Behavioral study of devices fabricated by graphene oxide and potassium permanganate composite

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Abstract

Graphene oxide is an oxidized form of graphene and an electrical insulator. Graphene oxide can be used in the fabrication of electronic devices with variable resistance and capacitance (memristor and capacitive memory) and micro-supercapacitors in a metal/insulator/metal structure, where the state of the device changes based on the growth of graphene dendrites due to the reduction of the graphene oxide layer in the presence of moisture and applied electric field. The dendrites growth process is an irreversible electrochemical process that depends on many parameters such as the applied electric field and the environmental humidity. By controlling its reduction, suitable and stable devices can be fabricated as ionic devices like supercapacitors. In this research, potassium permanganate, which is an oxidizing agent, was used to control the rate of the graphene oxide reduction process. Depending on the amount of potassium permanganate and the amount of the applied electric field in the environmental conditions, three different behaviors are observed in the voltammetric responseof the samples. Such behaviors can be used in the fabrication of memristors, ionic devices (devices in which the ionic process is dominant), and micro-supercapacitors. In this research, the obtained results are discussed and the performance of the devices is studied.

Keywords: Graphene oxide, Potassium permanganese, Memristor, Micro-supercapacitor.Electrochemical reduction

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