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Laser-scribed technique for making high-performance reduced-graphene oxide capacitor

Graphene-based supercapacitors have been fascinated by many researchers since they can provide both high power densities and ultrahigh energy densities and hence high capacitance. Graphene is a material that has high porous surface roughness and because of its superior conductivity making them suitable for ultra-lightweight conducting electrodes for charged-storage device such as batteries and capacitors. In this work, we present a laser-scribed technique for fabricating reduced-graphene oxide (RGO) supercapacitor. The RGO was first coated on Polyethylene terephthalate (PET) substrate by drop casting technique which gives ease of use preparation process on flexible substrate. A rectangular shape electrode pattern was formed by using an in-house laser scriber to turn the RGO film into a conducting electrode. The RGO capacitor was then formed by the two RGO electrodes inserted by a thick phosphoric electrolyte gel. We found capacitance of such RGO device in order of milli-Farad after testing its I-V characteristics and an RC circuit testing. We found their capacitance of two to five mF under a given bias, which are comparable with the recent graphene-oxide supercapacitor and are better than that of the commercial capacitor. The capacitance of such devices was evaluated from the charge-discharged model from I-t measurement under normal light illumination. This research should provide an application technique for extendable charged-energy storage devices for harvesting energy.

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