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Flexible planar asymmetric supercapacitor using synthesized few-layer graphene and activated carbon from biomass for wearable energy storage

ABSTRACT. We have fabricated a flexible planar asymmetric supercapacitor demonstrating high energy storage capability that can be utilized to power various flexible and wearable electronic devices. A locally available cheap source of biomass—banana peel—was used for synthesising carbonaceous materials—few-layer graphene and activated carbon—for the device. Few-layer graphene was synthesized by heating banana peel at high temperature under an inert atmosphere followed by crushing with mortar and pestle. Activated carbon was synthesized by heating banana peel impregnated with KOH at high temperature. The device was fabricated using a low-cost screen printing technique to create the current collector followed by deposition of active electrode materials and sandwiching filter paper soaked in gel electrolyte in between the electrodes. Devices showed high areal capacitance of 88 mF/cm^2 at 10 mV/s scan rate; and were satisfactory under multiple electronic cycling (100 cycles) and bending conditions. The devices can be economically fabricated on a large scale and used for developing emerging flexible electronics.

Keywords: high areal capacitance, screen printing

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