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Synthesis of bio-based porous carbon and its application in supercapacitors

Supercapacitors have widespread applications in the field of electrical energy storage devices due to their high power density, fast charge-discharge rate and environmental friendliness1. Nowadays, porous carbon materials, especilly biomass carbons, have been widely used in supercapacitors due to their low cost and sustainability. In this work, we synthesized bio-based porous carbon using cycas leaves as carbon precursor and urea as the nitrogen source; Namely, the dried cycas leaves firstly is burned at 300 oC and then activated by KOH containing urea at 700 oC. Experimental results show that the as-prepared bio-based carbon material displays high specific surface area and suitable pore size for supercapacitor. The supercapacitor performance of as-prepared bio-based carbon material has been investigated in a 2-electode system (see Fig. 1). As shown in Fig. 1a, the CV curves of as-prepared carbon material show an approximate rectangular shape at all voltage scan rates. Its linear GCD curves at all current densities appear an isosceles triange (see Fig. 1b). According to literature established equations2, their specific capacitances are 260 F/g at 0.5 A/g and 203 F/g at 10 A/g (78% of the capacitance retention), respectively. Meanwhile, its energy density for the supercapacitor is about 9.13 W h/kg at a power density of 125 W/kg. In addition, an energy storage device was fabricated (see Fig.1c). Fig. 1c demonstrates that the simple energy storage device can power for a light-emitting diode (LED).

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References

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Figures

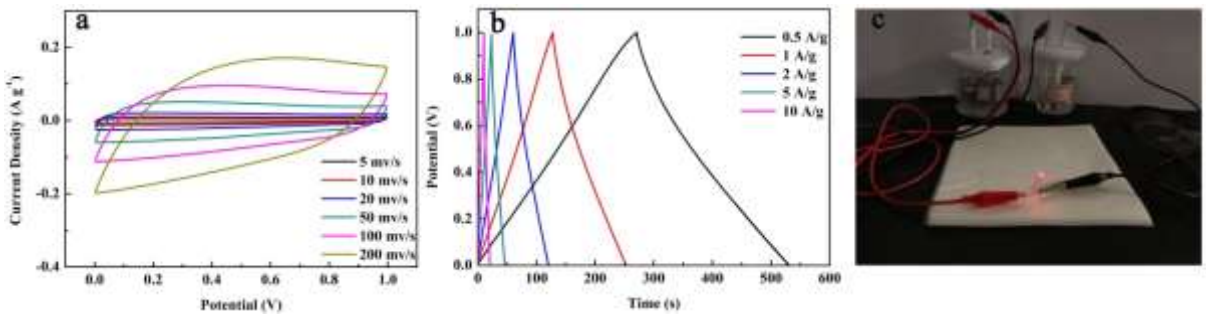

Figure 1: CV curves at various scan rates of 5–200 mV/s; b: GCD curves tested at 0.5 – 10 A/g; c: a energy storage device of supercapacitors made by as-prepared bio-carbon material.