Reduced graphene oxide/polyaniline electrochemical supercapacitors fabricated by laser

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Graphene has attracted increasing attention in recent years due to its excellent mechanical, optical and electrical properties [1]. Its high theoretical specific surface area (SSA = 2630 m^2 g^{-1}) and high electrical conductivity make it an attractive material for many industrial applications [2,3]. Also, it is a flexible transparent material that can be used for solar cells, light emitting diodes (LEDs, OLEDs), touchscreens and LCD displays [4], and in the near future, its flexibility will let to create foldable and wearable devices. In particular, as a consequence of the increasing demand for more efficient, longer-lasting and more compact portable electronic devices, the use of graphene in energy storage devices is one of the most promising applications for this material [5].

We report on the precise fabrication of low cost, high-performance electrochemical supercapacitors with electrodes based in reduced graphene oxide(rGO)/polyaniline nanofiber composite electrode [5]. An infrared laser has been used to reduce the graphene oxide, converting the initial graphene oxide (GO) compact layer into a three dimensional open network of exfoliated graphene flakes (LrGO). This highly conducting porous structure is well suited for electrodepositing pseudocapacitive materials owing to its large surface area. Polyaniline nanofibers have been controllably electrodeposited on the graphene flake network, not only extending further the electrode surface area and providing it with a strong pseudocapacitance but also preventing the restacking of the graphene sheets during the subsequent device processing and charge-discharge cycling [6].
The composite electrode (LrGO-PANI) presents specific capacitance of 442 F g^{-1}, as compared to 81 F g^{-1} of the bare rGO counterpart (Fig 1), and capacitance retention of 93% over 1000 cycles.

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Figure

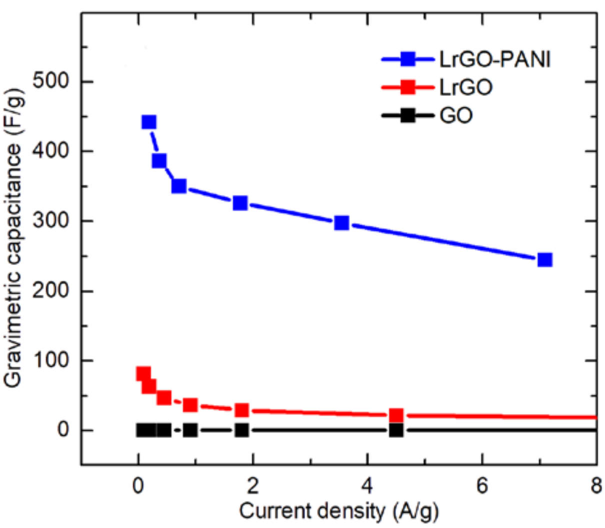

Figure 1: Gravimetric capacitance as a function of the current density for the GO, LrGO, and PANI-LrGO electrodes.