A new facile route to flexible and transparent electrodes based on water exfoliated graphene and their triboelectric nanogenerator

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Abstract

Wearable technologies are driving current research efforts to self-powered electronics for which novel high-performance materials such as graphene and low-cost fabrication processes are highly sought. We demonstrate the integration of high-quality graphene films obtained from scalable water processing approaches in emerging applications for flexible and wearable electronics. We developed a novel method for the assembly of shear exfoliated graphene in water, comprising a direct transfer process assisted by isopropyl alcohol evaporation. We demonstrate that graphene films can be easily transferred to any target substrate such as paper, flexible polymeric sheets and fibres, glass and Si substrates. By combining graphene as electrode and polydimethlysiloxane as active layer we demonstrate for the first time a flexible and transparent triboelectric nanogenerator for harvesting energy. Our results constitute a new step towards the realisation of energy harvesting devices that could be integrated with a wide range of wearable and flexible technologies, and opens new possibilities for the use of triboelectric nanogenerators in many applications such as electronic skin and wearable electronics.

Figures

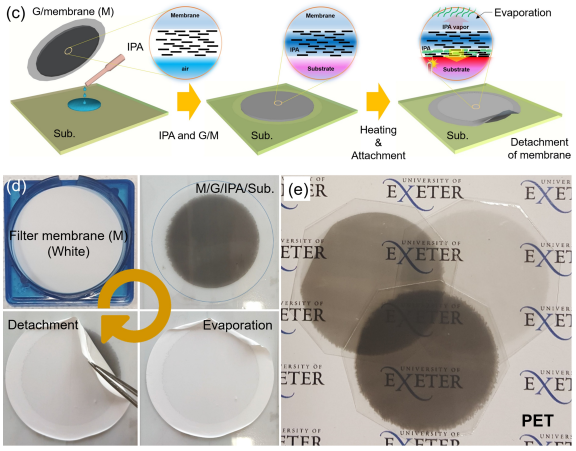

Figure 1: IPA assisted direct transfer (IDT) method for water exfoliated graphene and Transparent graphene electrodes

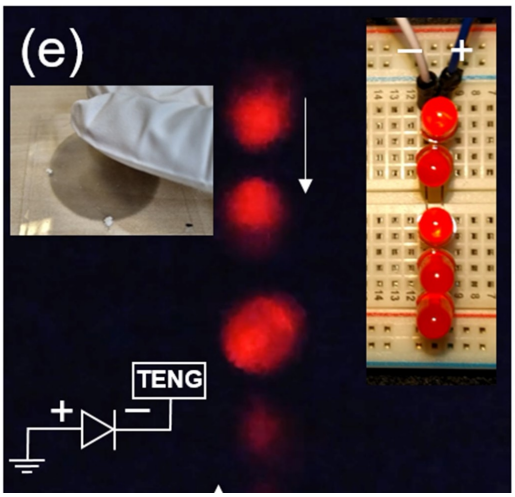

Figure 2: Triboelectric nanogenerator integrated with water exfoliated graphene film