On the production of fluorescent ultrathin fibers from the “green” electrospinning of poly (vinyl alcohol)/water-soluble graphene quantum dots

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In this investigation, we propose “green” routes for the production of fluorescent ultrathin fibers from the electrospinning of poly (vinyl alcohol) (PVA)/graphene quantum dots (GQDs) aqueous solutions. The preparation of water-soluble GQDs was explored from two adapted methodologies, as follows: *i*) conversion of citric acid under microwave heating (4 min), followed by magnetic stirring in NaOH solution (*method 1*); *ii*) conversion of citric acid via carbonization (30 min) in air, followed by magnetic stirring in NaOH solution (*method 2*). Before any experiment, all GQDs solutions were neutralized using HCl (0.2 M). Firstly, a series of electrospinning experiments was performed for neat PVA solutions, until optimized conditions were reached, as follows: concentrations at 4-8 wt% in deionized water; 15-20 kV as positive voltages; 10 cm as needle-collector distance. PVA/GQDs solutions were directly prepared by dissolving the polymer in the as-prepared water-soluble GQDs. In both routes of GQDs production, the final solutions emitted cyan fluorescence (460 nm) when irradiated with UV light (365 nm). Although this is still an ongoing study, our results have demonstrated that GQDs produced via *method 1* led to PVA/GQDs solutions with better spinnability. Moreover, the use of PVA at 4 wt% led to electrospun fibrous mats with better homogeneity and less defects when GQDs produced by *method 1* were used instead the ones prepared by *method 2*. Furthermore, considering GQDS from *method 1*, increasing the PVA concentration from 4 to 8 wt% led to highly fluorescent defect-free fibrous mats. These results pointed out the clear dependence of the solution spinnability with the polymer concentration. This in-progress work has demonstrated the feasibility of producing fluorescent electrospun membranes from PVA/water-soluble GQDs solutions. In addition, these “green” fibrous mats may find suitable applications in a wide range of fields, such as tissue engineering, biosensing and drug delivery.