Enhancing triboelectric performances of electrospun poly(vinylidene fluoride) with graphene oxide sheets

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Poly(vinylidene fluoride) (PVDF) is an easy processable and electroactive polymer, widely investigated for the preparation of electrospun membranes for triboelectric nanogenerators (TENG) [1]. The presence of graphene-oxide (GO) fillers into the PVDF nanofibers has been established to improve the TENG performances of the material since GO acts as charge storage site [2] [3]. In this work, we investigated the effect of graphene-oxide (GO) on the electrospinning process of PVDF-GO composite solutions. In particular, we found that the addition of GO in PVDF solutions, modifies their rheological properties by increasing their viscosity and reducing their elastic behaviour. Consequently, compared to the PVDF solution, the electrospinning process of PVDF-GO composite solution results in more homogenous and thinner nanofibers. Both PVDF and PVDF-GO naofibers showed a fraction of electroactive β-phase of PVDF higher than 80%. Nevertheless, there was no significant effect of GO on the β-phase increase of the polymer chains within the nanofibers.
Therefore, besides acting as the charge storage site, the only other effect of GO that synergistically contributes to the improvement of the TENG performances of PVDF-GO nanofibers compared to PVDF ones is the thinning of the fibers which results in a electrospun membrane with increased specific surface area. This improved the electrical performances of the developed TENG prototype, but further tests are still being performed.

References

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