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Triboelectric composites obtained by electrospinning of PVdF/GO nanofibers

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Abstract

Poly(vinylidene fluoride) (PVdF) has been widely studied and utilized for industrial manufacturing for its unique triboelectric and piezoelectric properties [1]. In the past few years, great attention has been paid to the investigation of its crystalline morphology. In particular, the β and γ phases are preferred to the α phase for their higher electrical properties [2]. Electrospinning is an efficient technique to produce nanofiber-composed polymeric mats with enhanced β and γ phases content (> 75%). In this work we studied how Graphene Oxide (GO) addition influences the electrospinning process and the morphology of the produced PVdF/GO mats. FTIR, XRD and SEM analysis show that the addition of less than 1% of GO leads to a reduction of the nanofiber diameter [fig 1a) and 1b)] and to a further increase of the piezoelectric β phase at the expense of the poorly triboelectric α phase [fig 1c)]. Rheological measures revealed that this effect is due to the higher viscosity and plasticity of the PVdF/GO solution respect to the pure PVdF one. Tuning the GO amount and the electrospinning voltage allowed to maximize the triboelectric phases content. The samples produced this way were tested on a self-made triboelectric generator and produced voltage outputs more than 10 times higher respect to the PVdF produces by blade casting.

References

[1] Martins, P. et al., *Prog. Polym. Sci. 39,* 4 (2014) 683-706
[2] Cai, X. et al., *RSC adv. 7,* 25 (2017) 15382-15389

Figures

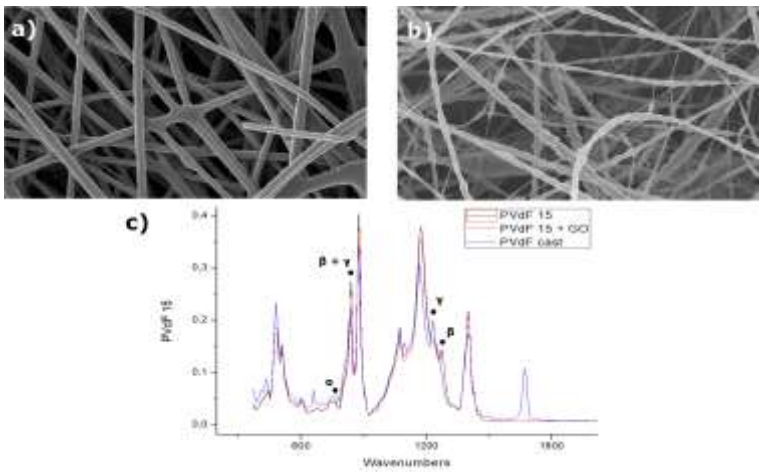

Figure 1: SEM images of pure PVdF (a) and PVdF/GO (b) nanofibers. FTIR spectra of cast PVdF, electrospun PVdF and electrospun PVdF/GO (c)