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## Electrospinning of PVDF-based copolymers

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Electrospinning is a versatile technique for the fabrication of fibers with nano- or microscale size from polymer solution or melt through electrostatic forces. Electrospun membranes are attracting significant attention in plenty of applications, such as tissue engineering, energy conversion, filtration, sensing systems, and protective clothing [1]. Polyvinylidene fluoride (PVDF) is one of the most studied polymers for electrospinning due to its fascinating physico-chemical and electrical properties, such as hydrophobicity, piezoelectric, pyroelectric, and ferroelectric characteristics [2]. Depending on the chain conformation, PVDF shows five distinct crystalline polymorphs, among which the  $\beta$ -form is the most intriguing thanks to its extraordinary piezo, pyro and ferroelectric properties due to the zigzag *all-trans* conformation. Interestingly, electrospinning can induce the  $\beta$ -phase formation during the fabrication process, without need of post processing [3]. Moreover, the nanostructure obtained by electrospinning can further promote the PVDF hydrophobicity. Finally, the introduction of selected comonomers allows to finely tune the final properties of the fluorinated material.

In this work, electrospinning process of PVDF-based copolymers, namely poly(vinylidene fluoride-co-hexafluoropropylene) (PVDF-HFP), poly(vinylidene fluoride-trifluoroethylene-hexafluoropropylene) (PVDF-TrFE-HFP) and poly(vinylidene fluoride-trifluoroethylene-2(trifluoromethyl)acrylic acid) (PVDF-TrFE-MAF), was investigated. The effect of the PVDF comonomer on the fabrication of fibrous membranes and their final properties was studied, and a comparison with flat casted films was assessed. Electrospinning conditions were optimized by varying solution concentration, working distance, applied voltage, and flow rate. Fibrous membranes (Fig. 1a) were

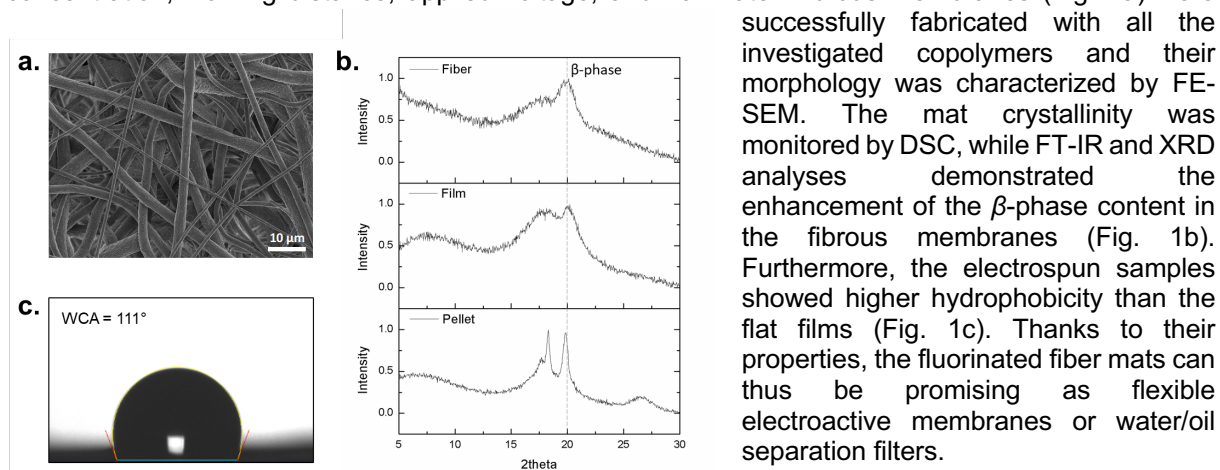


Fig. 1: a. PVDF-HFP electrospun membrane, b. XRD spectra of PVDF-HFP, c. water contact angle of a PVDF-HFP fibrous membrane.

- [1]. Xue, J; Wu, T; Dai, Y; Xia, Y. Electrospinning and Electrospun Nanofibers: Methods, Materials, and Applications. *Chem. Rev.* 2019, 119, 5298–5415.
- [2]. Ameduri, B. From vinylidene fluoride (VDF) to the applications of VDF-containing polymers and copolymers: Recent developments and future trends', *Chemical Reviews* 2009, 109, 6632–6686.
- [3]. Yee, W. Morphology, polymorphism behavior and molecular orientation of electrospun poly(vinylidene fluoride) fibers, *Polymer* 2007, 48, 512–521.