FORM-STABLE AND SOLVENT-RESISTANT PEO-BASED ELECTROSPUN MATS BY PHOTO-INDUCED CROSSLINKING

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Electrospinning is a versatile technique to produce fine polymer fibers through electrostatic forces from a large set of polymers. Polyethylene oxide (PEO), with remarkable characteristics such as biocompatibility, stability and inertness, has a long history in electrospinning field as a carrier/template polymer for non-electrospinnable polymers. However, this polymer suffers from shape instability as it is soluble in water and most of the common solvents. In the form of electrospun membrane, PEO cannot retain the fibrous morphology after contact with its solvents, and also when the membrane is heated above PEO melting temperature, the morphology is lost. In this regard, chemical crosslinking can be applied to address these stability issues [1].

In this study, PEO fibrous mats were fabricated through electrospinning and subsequent photo-crosslinking (Figure 1a). Electrospun membranes with different composition ratio of PEO and an acrylic crosslinker were prepared and subjected to the UV-irradiation. The UV dose was optimized by performing photo-DSC and FT-IR kinetics studies. The fibrous membranes exhibited high insoluble fraction and fibrous morphology retention after solvent treatment (Figure 1b) [2]. Additionally, the electrospun membranes could endure a large number of thermal cycles above the PEO melting point (Figure 1c) and exhibited constant fusion/crystallinity enthalpy over the heating cycles. The prepared PEO-based electrospun membranes are thus promising for application in numerous fields such as biomedical fields, water treatment and in thermal energy storage.

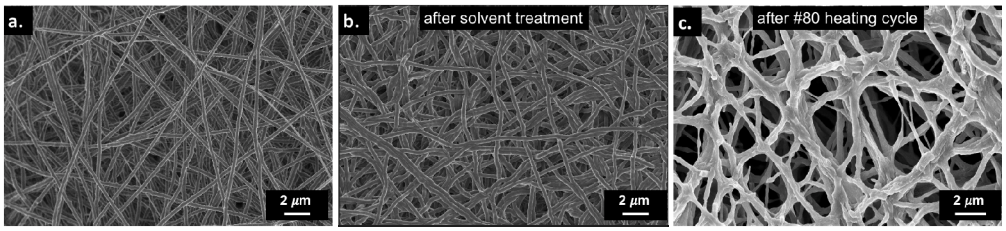

Figure 1 FESEM images of **a.** crosslinked electrospun PEO membrane, **b.** after immersion in water, and **c.** after 80 heating/cooling cycles above PEO melting temperature.

[1] Zhou, C., Wang, Q., Wu, Q. (2012). *Carbohydrate Polymers*, 87, 1779–1786.

[2] Kianfar, P., Vitale, A., Dalle Vacche, S., & Bongiovanni, R. (2021) *Journal of Materials Science*, *56*(2), 1879-1896.