Development of electrospun nanofibers membranes with magnetic properties

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Electrospinning is a technique suitable for obtaining polymeric fibers with diameters in the nanometer and micrometer range from a polymeric solution thanks to the electrostatic force created between two electrodes, i.e. the tip of the capillary syringe, where the drop of the polymeric solution is formed, and the grounded collector, where the fiber membrane is deposited [1]. Thus, it can be considered as a versatile technique for high porosity and high surface-to-volume ratio membranes production, which can be used in a wide range of applications such as nanocatalyst, protective coatings, membranes, filtration and wound dresingn, among others [2].

On the othe hand, magnetic properties of magnetic nanomaterials make them good candidates for being used in different research areas and multidisciplinar studies. Among them, magnetite nanoparticles (Fe_3O_4) are the most widely studied one due to their properties. The incorporation of these nanoparticles into polymeric structures, allowes the obtaining of lightweight, flexible and magnetic polymeric nanofiber membranes, which are known to be very promising materials in numerous application fields.

In this study, Fe_3O_4 nanoparticles prepared by the co-precipitation method from an aqueous Fe^{3+}/Fe^{2+} solution (3:2 molar ratio) using ammonium hydroxide in excess, were coated with oleic acid, and used to provide magnetic properties to electrospun polyurethane nanofiber membranes (Figure 1). The content of Fe_3O_4 nanoparticles was varied to modulate the magnetic properties of the membranes.

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References

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Figures

Figure 1: Sequence of digital images of the magnetic reponse of an electrospun membrane with Fe_3O_4 nanoparticles.