ROLE OF THE SOLVENT IN ELECTROSPINNING PROCESS OF FIBROUS MATERIALS BASED ON POLYSULFONE

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Modern medicine is challenged with complex problems caused by pathogenic microorganisms and their resistance to conventional antibiotic treatments. From this reason, innovative and sustainable solutions were sought to deal with these serious shortcomings by employing multifunctional materials/surfaces that prevent or reduce the adhesion and colonization of bacteria. In this context, the present work promotes a promising strategic way to design and develop of fibrous micro-/nanostructures based on polysulfone with morphological and surfaces properties tailored in accordance with the purpose of their use. Thus, by combining the properties of the quaternized polysulfone (PSFQ), cellulose acetate phthalate (CAP) and polyvinylidene fluoride (PVDF) and the proper choice of solvents for the electrospinning process of composite solutions, the quality and functionality of the fibrous materials based on PSFQ for the targeted application was guaranteed. Therefore, by controlling the weight ratio of the components in the system, blends with different compositions were obtained in different solvents, i.e., N,N-dimethylformamide (DMF) and N-methyl-2-pyrrolidone (NMP) were obtained, and subsequently electrospun. The morphological changes and characteristics of the nanofibers analyzed using SEM technique highlighted the influence of the polymeric solution properties and solvents nature (Figure 1).

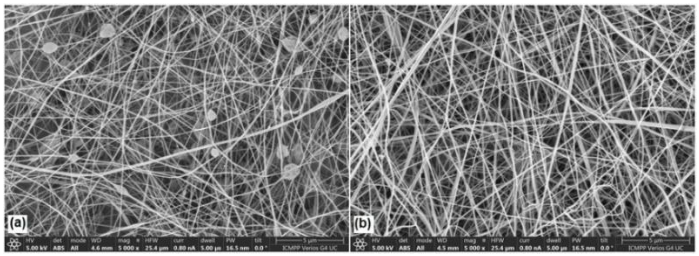

Figure 1. SEM images of PSFQ fibers obtained from solutions of 40% concentration in DMF (a) and NMP (b).

The recorded SEM images demonstrate that electrospinning of pure polymers and their blends solutions with different compositions and concentrations, enables the achievement of the fibers with different morphological characteristics and design, depending on the used solvents. Therefore, the solutions parameters associated with the polymer and solvent properties (concentrations, viscosity, boiling point of the solvents, and the surface tension) and also, the processing parameters related with the operation of the electrospinning apparatus and environmental parameters (temperature, humidity, and local atmospheric conditions) represent the key factors in electrospinning process, directly affecting the structural parameters and morphology of the electrospun fibers.

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