Green Electrospinning. From Waterborne Polymer Dispersions to Functional Nanofibers

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Electrospinning is a well-stablished technology used to create polymer nanofibers. This technology has gained extraordinary relevance in the last years due to its simplicity and low cost, as well as the possibility to effectively scale it up opening perspectives for industrial production. Electrospun nanofibers are very attractive for a broad range of applications such as textiles, filters, tissue engineering, drug delivery, wound healing, sensor, energy storage, catalysis, and many more [1–4].

Although Solution Electrospinning is the most widely used electrospinning method, it presents some limitations for industrial applications. The first limitation is the need of toxic and flammable organic solvents. The second limitation is the maximum critical concentration that can be used in this process (around 10-15 wt % of polymer). Polymer solutions of higher concentrations are not spinnable due to their high viscosity. This concentration limitation decreases the productivity of the electrospinning process importantly. Green Electrospinning is a novel and promising method that consists in the use of an aqueous polymer dispersion (latex) as electrospinning solution with the help of a polymer template. This method overcomes the above mentioned limitation as it allows the use of water as electrospinning medium, even for hydrophobic polymers, and enables to spin solutions of higher polymer concentrations increasing the overall productivity of the process [5,6].

In this work, the effect of latex properties (particle size and PSD, surface functionalization, surfactant type, solids content) that affect the final fiber morphology in green electrospinning will be analyzed. Additionally, fluorescence hybrid organic/inorganic nanofibers will be fabricated for their potential use in sensor applications.

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FIGURES

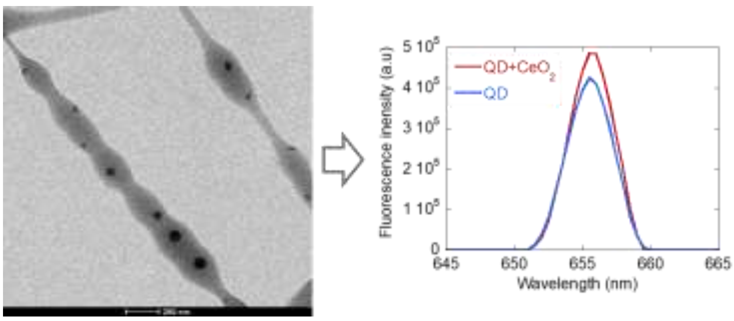

Figure 1: Fluorescent hybrid organic/inorganic nanofibers