Implementation of superhydrophobic PS electrospun nano/microfibers for corrosion protection of aluminum substrates

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ABSTRACT

In this work, the electrospinning technique is used for the synthesis of micro/nanofibers using a polymeric precursor with hydrophobic (even superhydrophobic) behaviour such as polystyrene (PS). These electrospun fibers are deposited onto aluminum substrates (6061T6). The effect of varying the different electrospinning deposition parameters (mostly applied voltage and flow-rate) will be exhaustively analyzed in order to optimize the resultant electrospun coatings. Several fiber characterization tests have been performed, including Field Emission Scanning Electron Microscopy (FE-SEM), Atomic Force Microscopy (AFM), Termogravimetric analysis (TGA), Optical Microscopy (OM) and Water Contact Angle (WCA) measurements. Furthermore, the anti-corrosion properties of these electrospun coatings can be enhanced by the addition of metal oxide nanoparticles (ZnO) which act as corrosion inhibitors. Finally, electrochemical corrosion tests (Tafel and pitting tests) have been perfomed, showing an improvement in the resultant corrosion resistance of the aluminum alloys coated by the combination of both polymeric film with metal oxide inorganic nanoparticles.

RESULTS AND DISCUSSION

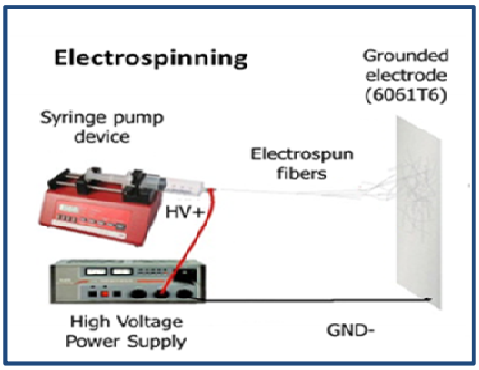

Figure 1: setup experimental for electrospinning process.

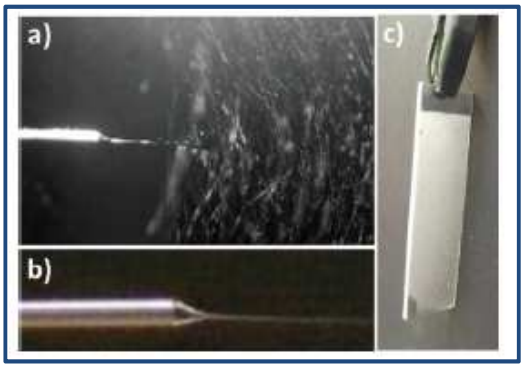

Figure 2: electrospun fibers onto the cathode and aspect of the coating.

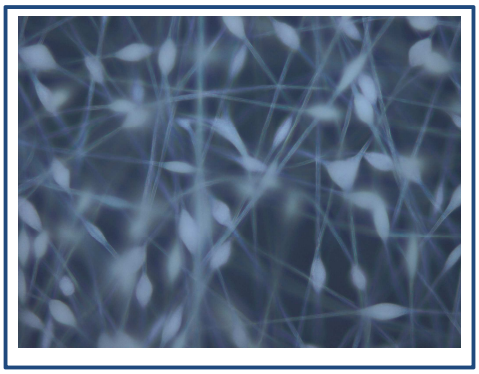

Figure 3: optical microscopy image of the PS electrospun fibers

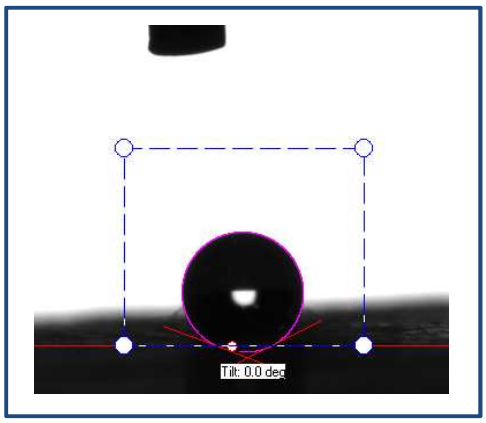

Figure 4: water contact angle (WCA) measurement of the electrospun fibers

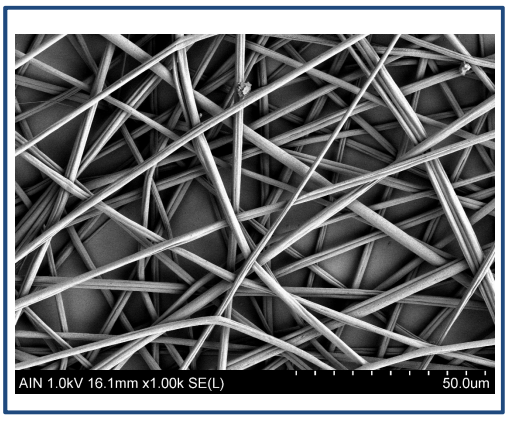

Figure 5: SEM image of the PS electrospun fibers.

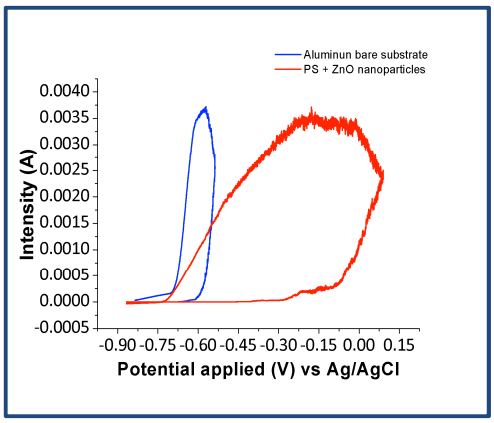

Figure 6: Pitting corrosion tests (reference and electrospun coating)

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