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Surface functionalization with atmospheric pressure DBD

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Intense research efforts have been recently made to develop a large variety of deposition processes for the direct and remote DBD deposition of thin films from monomers in gas, vapor and aerosol form. In this contribution, the preparation of organic-inorganic nanocomposite coatings by DBD fed with helium and the aerosol of a dispersion of ZnO nanoparticles in hydrocarbon solvent will be described. The nanocomposite coatings show multifunctional behavior and specifically combine the photocatalytic properties of ZnO with superhydrophobicity. The DBD jet co-deposition of acrylic acid and ethylene to obtain stable coatings containing carboxylic functionalities will be also presented. Results from X-ray photoelectron spectroscopy (XPS) in conjunction with chemical derivatization, and scanning electron microscopy demonstrate the chemical and morphological stability of these coatings upon immersion in water. Finally our recent work on the plasma-enhanced chemical vapor deposition of fluoropolymers on complex three-dimensional (3D) porous substrates, such as polyurethane foams, will be shown. During the deposition, the DBD is ignited inside the porous 3D network of the foams and allows obtaining a uniform coating within their interior.