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Extended Abstract

Novel Coatings for Superhydrophobic/ Superamphiphobic Surfaces with Tunable Morphology of Nanoparticles †

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Functional surfaces with special wettability properties are currently receiving a lot of attention due to their numerous potential applications, from water–oil separation strategies to self-cleaning and anti-icing or anti-corrosion coatings [1]. Both superhydrophobic and superomniphobic properties are based on the principle of roughness enhanced wettability. Among the methods proposed to fabricate coating materials with superhydrophobicity or superamphiphobicity, the most facile and easy scalable involves the embedding of nanoparticles (NPs) in filmogenic matrix with suitable chemical properties. In the present work, the influence of the morphology of nanopowders used to achieve the roughness of the coating was investigated. Functional materials have been prepared through the embedding of ZnO nanoparticles in organo-modified (Ormosil) silica matrix. Zinc oxide nanopowders with various sizes of nanocrystallites and different shapes (quasi- spherical, elipsoidal, rose-like, chrysanthemum-like 3D aggregates) were used to obtain nano- and micro-structure of the coating materials. ZnO nanoparticles were synthesized by using a simple ecofriendly hydrothermal synthesis in high-temperature/high-pressure conditions. Zinc precursor, composition of the solvent, concentration of the structuring agent added are parameters that allow fine tuning of size and morphology of the product.The nanoparticles obtained were characterized using various techniques such as dynamic light scattering, XRD, scanning electron microscopy (SEM). The functional materials were prepared by using the entrapment of ZnO nanoparticles in silica matrix obtained through sol–gel method. A model hydrophobic silica matrix was used prepared from a mixture of tetraethyl ortosilicate (TEOS) and organo-modified silane derivatives (octadecyl OTES and perfluorodecyltrichlorosilane, PFDTS) in various molar ratios, in order to obtain a filmogenic, transparent, and resistant coating. The wetting properties were investigated by using the contact angle method and the results have been discussed with the focus point on the morphological variation of the coatings assessed by SEM images.Superhydrophobic and superamphiphobic materials have been prepared using 3D nano and micro-structures formed by

using different ZnO nanoparticles with special morphologies. The NPs concentration and dispersing method is found to be critical to achieve "super" wetting properties.

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