

Synthesis and Characterization of Fluorine-Free, Hydrophobic and Highly Transparent Coatings

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Abstract : This research work concerns the synthesis of hydrophobic and self-cleaning coatings as an alternative to fluorine-based coatings used on glass. The developed, highly transparent coatings are produced by a chemical route (sol-gel method) using two silica-based precursors, hexamethyldisilazane and tetraethoxysilane (HMDS/TEOS). The addition of zinc oxide nanoparticles (ZnO NPs) within the gel provides a photocatalytic property to the final coating. The prepared gels were deposited on glass slides using different methods. The properties of the coatings were characterized by optical microscopy, scanning electron microscopy, UV-VIS-NIR spectrophotometer, and water contact angle method. The results show that the obtained coatings are homogeneous and have a hydrophobic character. In particular, after thermal treatment, the HMDS/TEOS@ZnO charged gel deposited on glass constitutes a coating capable of degrading methylene blue (MB) under UV irradiation. Optical transmission reaches more than 90% in most of the visible light spectrum. Synthesized coatings have also demonstrated their mechanical durability and self-cleaning ability.

Keywords : coating, durability, hydrophobicity, sol-gel, self-cleaning, transparence

Conference Title : ICMSCN 2020 : International Conference on Materials Sciences, Chemistry and Nanomaterials

Conference Location : Athens, Greece

Conference Dates : April 09-10, 2020