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Nano-Engineering PVD Thin-Film Coating for Photocatalytic Efficiency with High Optical Performances

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Owing to rapid developments in the fields of nanotechnology, energy efficiency, and thin film technology, a more precise knowledge of the surface characteristics and the quality control after processing is a vital challenge. It has been an ambition of both researchers and industries for the past many years to produce self-cleaning surfaces that have a good optical quality and photocatalytic efficiency, particularly with regard to a broader application. It is anticipated that this research will help to realize this aspiration by optimizing coating technologies and materials as well as to introduce standardized methods for surface analysis and the correlated photocatalytic efficiency.

The primary focus of this work is to produce thin films using physical vapor deposition technologies (PVD), which involves the investigation of ion assisted deposition (IAD) and conventional thermal evaporation methods. The discharge current, voltage and gas flow were also varied in the ion-sources to ascertain the optimal parameters. TiO₂ films processed with IAD using the CC-105 plasma source exhibited the highest photodecomposition rate and super-hydrophilicity effect, with the samples as well demonstrating antimicrobial activity towards test microorganisms. The electron-beam vaporization techniques can produce, by selecting appropriate parameters such as substrate temperature or coating rate, dense layers that can effectively improve reproducibility of layer morphology.

As a result of these properties, PVD prepared TiO₂ films are a distinct candidate for use in different applications involving precision optics, such as in spectacles, window glass, laboratory equipment, for example scales, and many more.

Biography

Dr. Redouan Boughaled has completed his PhD from Leibniz University of Hanover, Germany. He developed industrial products and processes in Thin Film Technology at Laser Center of Hanover, Germany. On the last 15 years, he have managed numerous research and industrial projects in Coating Technology, Industrial Chemistry, and in Surface Analysis. He was nominated as an expert for the German Institute for Standardization (DIN) in Berlin, and he is certified quality manager from German Quality Management Association.