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A NANO GRAVIMETRIC APPROACH TO STUDY THE PHOTOCATALYTIC ACTIVITY OF NANO TITANIA THIN FILMS

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Self-cleaning photocatalytic nanocoatings have garnered considerable attention due to recent global public health crises, such as the COVID-19 pandemic. Nevertheless, most of the evaluations validating the efficacy of such coatings have focused on solid-liquid interfaces. There is a scarcity of real-time, *in situ* information that sheds light on the photocatalytic degradation occurring on titania thin films at the solid-air interface. In this particular investigation, a titania nanocoating was fabricated on a gold surface of a quartz crystal microbalance (QCM) sensor using a spin coating technique. To serve as a representative organic molecule, methyl orange (MO), a potent environmental pollutant, was added to these nanocoatings. Subsequently, the sensor was subjected to ultraviolet (UV) light irradiation while continuously monitoring the mass changes at the solid-air interface in real-time. Results indicated that when the mass of the dye was lower than approximately 3% of the mass of the catalyst, MO could be photocatalytically degraded in approximately six hours of continuous UV irradiation. Conversely, higher MO loadings only exhibited partial degradation. The morphology and elemental compositions of the QCMs were characterized before and after irradiation using Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Spectroscopy (EDX), and X-ray Photoelectron Spectroscopy (XPS). This study offers ample comprehension and profound insight into the molecular-level phenomena taking place during photocatalytic degradation at the solid-air interface, thereby enabling successful modelling and evaluation of the effectiveness of self-cleaning photocatalytic coatings.

Keywords: Methyl orange, Photocatalytic degradation, QCM, Thin films, Titania