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Influence of Ti interlayer on Photoactive Properties of TiO₂Darina Manova¹, D. Jha¹, J.W. Gerlach¹, W. Assmann², E. Valcheva³, S. Mändl¹¹Institute for Surface Modification, Leipzig, Germany ²Maier-Leibnitz-Laboratorium, Ludwig-Maximilians-Universität München, Garching, Germany ³Faculty of Physics, Sofia University, Sofia, Bulgaria

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Titania thin films have a variety of applications, including photovoltaics and antibacterial surface finish. Rutile and anatase – the two main phases – with different properties can be formed in non-equilibrium processes with increasing particle energy favoring the high-temperature, high-pressure rutile phase. However, it is possible to obtain photoactive thin films at room temperature using plasma based ion implantation and deposition (PBIID). Thick films of about 400 – 1000 nm demonstrated UV-induced superhydrophilicity in terms of water contact angle much less than 5°. Nevertheless, a strong influence of the interface region was noticed. By inserting a metallic Ti layer on top of the Si substrate, a much weaker response of the deposited thin film was observed, taking more than 20 hours of illumination to show the same contact angle as after 3-5 hours without an interlayer. Correlated measurements of the phase composition by Raman spectroscopy and the depth distribution of elements by elastic recoil detection analysis do not show any significant differences. Secondary effects as grain boundaries or electronic defects may be able to explain these results.

Keywords

PIII

TiO₂

photoactivity

ERDA

Raman