

POF004

**Anisotropic mechanical performance of TiO<sub>2</sub> coatings produced by magnetron sputtering at oblique incidence**Germán Alcalá<sup>1</sup>, Sandra Muñoz-Piña<sup>2</sup>, Iván Fernández<sup>2</sup>, Rafael Álvarez<sup>3</sup>, Alberto Palmero<sup>3</sup><sup>1</sup>Complutense University of Madrid, Madrid, Spain <sup>2</sup>Nano4Energy SLNE, Madrid, Spain <sup>3</sup>Instituto de Ciencia de Materiales de Se, Seville, Spain

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TiO<sub>2</sub> coatings are of great interests for optical application due to the porosity control achieved by glancing angle deposition techniques. In order to investigate the dependence of the deposition incidence direction on the mechanical integrity of the coatings, nanoscratch analyses were performed on samples produced at an incidence angle of 75°. The scratch direction on the sample surface was also investigated and its response analysed according to the atoms' arrival direction on the Si substrate. The plastic deformation produced was examined by Scanning Probe Microscopy (SPM) prior and subsequent to each test. Additionally, the specimens' cross section was studied by Scanning Electron Microscopy (SEM) in order to correlate the film structure to its mechanical behaviour. For constant scratch depths of 25, 50 and 100 nm and scratch lengths of 5 µm, normal and lateral friction forces were measured during the tests. A notable dependence between the nanocolumns inclination direction on the mechanical response of the coating has been determined.

**Keywords**

Anisotropic mechanical behaviour  
Magnetron sputtering  
Oblique angle  
Nanoscratch  
Plastic deformation