



Софийски университет „Св. Климент Охридски“  
Физически факултет

## ФАКУЛТЕТЕН СЕМИНАР

сряда, 29 юни 2011 г., 15:15 часа, зала А209

**PJ Kelly**

Surface Engineering Group, Manchester Metropolitan University, UK

### *Photocatalytic Activity of Sputtered Titania Coatings and Titania Nanoparticles*

There is increasing interest in titania-based coatings for use in 'self-cleaning' surfaces and many other applications. Titania nanoparticles can also be incorporated into building materials and paints to reduce organic pollutants. However, the effectiveness of these surfaces is limited by the structure and properties of the titania film and its composition. It is well known that, depending on deposition or production conditions, titania may exist in amorphous, anatase, rutile, etc., or a mixture of phases, and that the anatase phase is the most promising photocatalyst for the degradation of organic pollutants. Also, the photocatalytic activity of titania is largely limited to UV radiation. It is usually necessary to dope the coatings to extend their activity into the visible range. In this study, titania coatings have been deposited by pulsed magnetron sputtering both from metallic targets in reactive mode and directly from oxide powder targets. The coatings were analysed by scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDX), X-ray diffraction (XRD) and micro-Raman spectroscopy. The photocatalytic activity of the coatings has been investigated through measurements of the degradation of organic dyes, such as methyl orange and methylene blue, under the influence of UV and fluorescent light sources. Further sets of coatings have been produced both from metallic and powder targets in which the titania is doped with transition metals, such as W, Mo, Ta and Nb. These coatings have also been analysed and the influence of the dopant element on photocatalytic activity has been investigated. It has been found that, after annealing, both sputtering processes produced photo-active surfaces and that activity increased with increasing dopant content over the range tested. Furthermore, the activity of these coatings under exposure to fluorescent lamps was some 50-60 % of that observed under exposure to UV lamps.