

## Mirrors for diagnostic and remote handling applications in ITER. Problems with commercial mirrors

**Piedad Martin**, Teresa Hernandez, Eric R. Hodgson  
CIEMAT, FUSION Avenida Complutense 22 28040 MADRID SPAIN

High quality mirrors for the optical UV - visible - NIR range will be required in ITER for diagnostic systems and remote handling applications. The commercially available high quality mirrors being considered for ITER applications consist of a thin evaporated aluminium layer on a solid glass substrate. To protect the delicate aluminium surface from damage the mirrors are covered (overcoated) with a controlled layer of transparent protective material (such as SiO and MgF<sub>2</sub>) of adequate thickness to obtain optimum optical constructive interference in a given wavelength range.

Radiation enhanced degradation of reflectivity of different commercial mirrors as a function of irradiation temperature and time (dose), as well as enhanced corrosion in a humid environment are being studied. During this work problems have been encountered with the as-received commercial mirrors concerning reflectivity and overcoating. Mirrors provided as identical, in the same batch by the manufacturer, have very different reflectivity in the UV range, implying wide variation in the overcoating thickness and/or refractive index. Analysis of the surface material has shown varying amounts of SiO and SiO<sub>2</sub> for nominally SiO overcoating. In another case the specified coating (magnesium fluoride) for an UV enhanced mirror was observed by XPS analysis to contain Hf, neither Mg nor F were found. It will therefore be very important to analyse composition and measure reflectivity for all commercial mirrors before use.

The varying amount of SiO found in the overcoating helps to explain the very different rates of radiation enhanced corrosion of nominally identical mirrors, those with higher SiO content being more susceptible. To check this, reflectivity changes after gamma irradiation and corrosion effects have been measured for two types of mirrors made at CIEMAT, one with SiO<sub>2</sub>, and one with Al<sub>2</sub>O<sub>3</sub> overcoating of Al on Pyrex glass.

\*Corresponding author:

P. Martin  
CIEMAT  
Avenida Complutense, 22  
28040 Madrid, Spain  
Phone: 34 91 3466770 Fax: 34 91 3466214  
E mail: [piedad.martin@ciemat.es](mailto:piedad.martin@ciemat.es)