UNIVERSITE PIERRE ET MARIE CURIE

MASTER THESIS

Optical and electronic properties of ZrO_2 For ITER first mirrors

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Declaration of Authorship

I, Zakaria AZDAD, declare that this thesis titled, 'Optical and electronic properties of ZrO_2 For ITER first mirrors' and the work presented in it are my own. I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University.
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.
- Where I have consulted the published work of others, this is always clearly attributed.
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- I have acknowledged all main sources of help.
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"There are only two ways to live your life. One is as though nothing is a miracle. The other is as though everything is a miracle."

Albert Einstein

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Abstract

Faculty of physics
Department of physics

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by Zakaria AZDAD

Metallic First Mirrors (FMs) are the core part of the optical diagnostics in the International Thermonuclear Experimental Reactor (ITER). It is extremely important that the high reflectivity of the mirrors stays constant during the plasma exposure in the harsh ITER environment. More precisely, the FMs are going to be subject to erosion and/or deposition and high neutron bombardment . ZrO_2 is the most radiation resistant ceramic currently known and due to its high transparency, it is interesting to use it as a protective coating for high reflective materials. The optimization of the optical and electronic properties of ZrO_2 to suit ITER criteria are the subject of this present study. In order to select the best film properties, pulsed DC and radio-frequency reactive magnetron sputtering are used to deposited ZrO_2 thin film. The influence of Ar sputtering on the optical and electronic properties are also presented. The characterisation of the deposits were carried out by the mean of ellipsometry, X-ray diffraction, Scanning Electron Microscopy Atomic Force Microscopy, UV-Vis, Insitu X-ray Photoelectron Spectroscopy and Ultraviolet Photon Spectroscopy.

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