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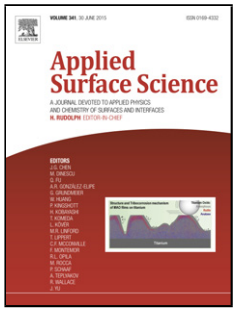

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Depth resolved compositional analysis of aluminium oxide thin film using non-destructive soft x-ray reflectivity technique

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Highlights

- In-depth compositional analysis of 240 Å thick aluminium oxide thin film is carried out using soft X-ray reflectivity (SXR) and X-ray photoelectron spectroscopy (XPS) techniques.
- SXR technique is used to analyze composition of 30Å thick interface layer at film /substrate region nondestructively.
- The method distinctly determines the difference between interface composition and film composition.
- SXR technique provides the insight of the growth mechanism as well as the compositional analysis of principal and interfacial layer.

Abstract: In-depth compositional analysis of 240 Å thick aluminium oxide thin film has been carried out using soft x-ray reflectivity (SXR) and x-ray photoelectron spectroscopy technique (XPS). The compositional details of the film is estimated by modelling the optical index profile obtained from the SXR measurements over 60-200 Å wavelength region. The SXR measurements are carried out at Indus-1 reflectivity beamline. The method suggests that the principal film region is comprised of Al_2O_3 and AlO_x (x=1.6) phases whereas the interface region comprised of SiO_2 and AlO_x (x=1.6) mixture. The soft x-ray reflectivity technique combined with XPS measurements explains the compositional details of principal layer. Since the interface region cannot be analyzed with the XPS technique in a non-destructive manner in such a case the SXR technique is a powerful tool for nondestructive compositional analysis of interface region.

Keywords: Aluminum Oxide; Thin Film; Soft X-ray Reflectivity; X-ray Photoelectron Spectroscopy; Optical index profile