

Depth resolved structural studies in thin films and multilayers using X-ray standing waves

Prof. Ajay GUPTA

(Director of Indore Center - UGC-DAE Consortium for Scientific Research - University of Indore, INDIA)

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Thin films and multilayers have emerged as an important class of nanostructured materials with immense possibility of tailoring their properties in order to achieve the desired functionality. Interfacial region plays a dominant role in determining the properties of multilayers. Therefore, it is important to elucidate the interface structure in multilayers in order to both understand their novel properties as well as to tailor the same through tailoring the interface structure. Since the width of the interfacial region ranges from a fraction of a nm to a few nm, it is necessary to use experimental techniques with a depth resolution of 1 nm or better. X-ray based techniques like fluorescence, XRD, XAFS, and Nuclear Resonance Scattering are powerful techniques for structural characterization. In general, x-rays being highly penetrating radiations, these techniques, lack the depth resolution. However, X-ray standing waves (XSW) formed by the superposition of two coherently coupled X-ray beams, make it possible to localize the X-ray intensity into interference fringes of an XSW field, and thereby attain a spatially localized periodic probe with a length scale equivalent to the period of XSW.

In the present talk the use of XSW will be demonstrated in measuring: i) elemental concentration profiles through fluorescence measurement, ii) concentration profile of a specific isotope (e.g. ^{57}Fe) by making use of nuclear resonance fluorescence, iii) depth resolved XRD and XAFS. The examples taken include, i) study of the effects of swift heavy ion irradiation on metal/silicon systems, ii) measurement of self-diffusion of Fe in amorphous and nanocrystalline alloys, and iii) melting of Langmuir-Blodgett films.

Formalités d'entrée : accès libre dans l'amphi du Pavillon d'Accueil. Si la manifestation a lieu dans le Grand Amphi Soleil du Batiment Central, merci de vous munir d'une pièce d'identité et de prévenir le secrétariat en charge de l'événement.

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Secrétariat Division Expériences : sandrine.vasseur@synchrotron-soleil.fr