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Two-Wave Refractometry of Surface Layers

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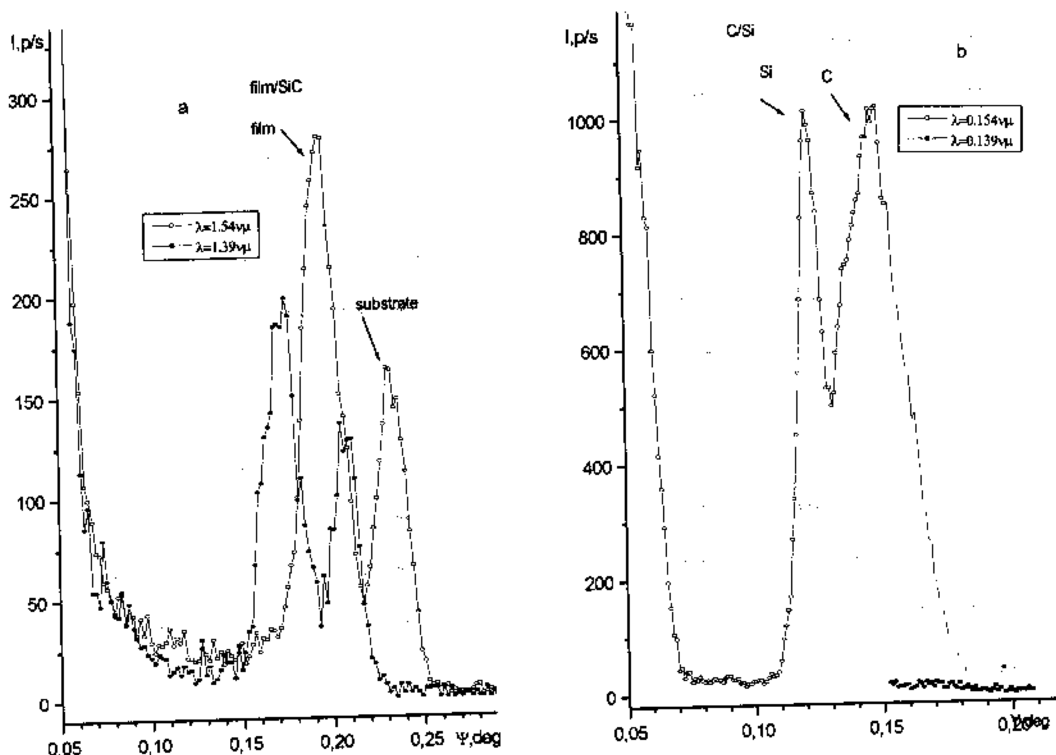
A new approach to surface layer and thin film analysis based on primary beam deviation due to X-ray refraction is developed. For a set of grazing angles strongly collimated polychromatic radiation is consecutively transmitted through a side face and polished surface of the sample. Parts of direct and refracted beams are simultaneously analyzed by semitransparent monochromators tuned to different characteristic line [1]. An opportunity to use the Snell's law for a number of angle positions in two spectral bands gives highly reliable data for refractive index of substrate, modified surface layer or deposited film. Advantages of the proposed metrology are demonstrated for samples, which are usually considered unsuitable for standard X-ray reflectometry. Fig. below shows refractograms of thermally processed SiC substrate with SiC epilayer (a) and a diamondlike film on Si wafer (b). SiC plate has a form of an irregular polyhedron with slightly rounded surface resulted from polishing; C/Si sample has a curvature radius 6 m due to strain induced by the C film growth.



[1].**A.G. Tour'yanskii at al.** *Instrum. Experimental Techniques* **42**, 1 (1999).