Mechanical Properties of Thin Films Characterized by a Combination of $\sin^2\psi$ and X-ray Diffraction Substrate Techniques

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X-ray diffraction is routinely used to characterize elastic strains in polycrystalline thin films by applying $\sin^2\psi$ method. Those strains are however dependent on the *hkl* reflection measured. Macroscopic stresses imposed on the film can be easily determined by X-ray diffraction substrate curvature technique which is based on the measurement of rocking curves on the substrate symmetrical reflections at different sample positions. The macroscopic stress can be then calculated using Stoney's formula.
By comparing experimental macroscopic stresses (from the curvature method) and elastic strains (from $\sin^2\psi$ technique), it is possible to evaluate a variety of parameters like thin films X-ray elastic constants, mechanical elastic constants and grain-interaction models. In this contribution, the possibilities of the use of both techniques will be demonstrated.
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