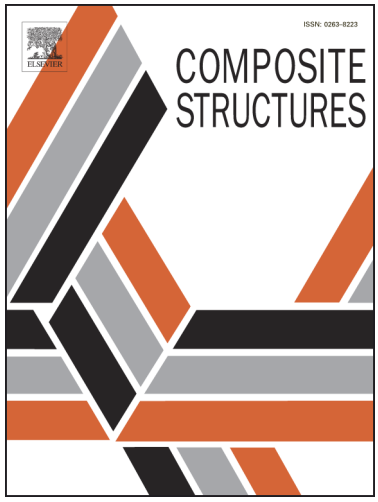

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Simulating the Warping of Thin Coated Si Wafers Using Ansys Layered Shell Elements

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Abstract

The feasibility of simulating thin-film-on-substrates behaviour of large thin coated wafers using Ansys® "layered shells" is estimated. Layered shell elements are based on Mindlin-plates with coupled intrinsic layers. These elements can be used with an update Lagrange algorithm (NLGEOM). They are of interest because they are easy to use and require a minimum of degrees of freedom to discretize a coated wafer. More traditional discretisations with two separate element layers are used for evaluating the Finite Element (FE) solution.

The simulation results are further compared to results reported in the literature and to the analytical approach of Stoney [1]. For this purpose, a thorough review of the Stoney approach is done. We present an extended version with a plate stiffness for cubic anisotropic material and an additional formula to calculate the curvature from the thermal strain mismatch. It is shown that Stoney's approach to estimate the film stress from the curvature is inadequate for large deflections. A direct comparison to bending experiments

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