

عنوان مقاله:

Dominant Environment Approach in Thin Film-Substrate Systems: Mechanical Behavior of a Coated Cylinder

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خلاصه مقاله:

Thin solid films have attracted great attention of many researchers in different fields due to their diverse applications in science and technology including optical mirrors, semiconductors, gossamer space structures, stretchable electronics, solar cells, sensors and actuators and MEMS/NEMS. Thin films deposited on a substrate are used to improve the mechanical, thermal, electrical and tribological properties of the system. The functionality and reliability of the system is influenced by the mechanical stresses developed in the structure; so that the role of the mechanical stresses in the appropriate functionality of the system, detaching the film from the substrate, or the fracture of the film is important. In order to escape the complexity of solving the coupled elasticity equations of the substrate and films (especially in multi-layer systems), a procedure is proposed in this work to find the stress and displacement field in the film/films and the substrate. The procedure is based on the assumption that the substrate is dominant on the system (i.e. the displacement field); and the films-substrate interactions are imposed to modify the presumed displacement field. Therefore, by using an iterative process and meeting convergence criteria, one may find the displacement and stress field on the film-substrate system. The procedure is implemented for special case of a rotating cylinder coated by a thin film to show the simplicity of the proposed approach.

کلمات کلیدی:

Thin solid film, Substrate, Elasticity, Rotating cylinder

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