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Peeling Behavior of Thin Elastic Films Bonded to Rigid Substrate of Random Surface Topology

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Abstract : We study the fracture mechanics of peeling of thin films perfectly bonded to a rigid substrate of any random surface topology using an analytical formulation. A generalized theoretical model has been developed to determine the peel strength of thin elastic films. It is demonstrated that an improvement in the peel strength can be achieved by modifying the surface characteristics of the rigid substrate. Characterization study has been performed to analyze the effect of different parameters on effective peel force from the rigid surface. Different surface profiles such as circular and sinusoidal has been considered to demonstrate the bonding characteristics of film-substrate interface. Condition for the instability in the debonding of the film is analyzed, where the localized self-debonding arises depending upon the film and surface characteristics. This study is towards improved adhesion strength of thin films to rigid substrate using different textured surfaces.

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