

UNDERSTANDING THE BUCKLING PHENOMENON OF COATINGS

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Keywords: Buckling, Delamination, Adherence, Stress

Abstract

Thin films and coatings are used in a wide range of technological applications, such as wear or buffer adherence layers or corrosion/diffusion barriers for engines. They often develop high residual stresses during the deposition process, sometimes about few GPa in compression. Such large compressive stresses may cause the nucleation and growth of buckling structures that generally result in the lost of functional properties that were initially conferred to such film/substrate composites. The aim of our studies is consequently to have a better understanding of the buckling phenomenon, by identifying the relevant parameters to prevent, to limit, or to control its occurrence. It concerns particularly the effect of both elasticity [1] and plasticity [2] of the substrates, the observation of specific buckling structures depending on the mechanical properties of the considered coatings [3], the question of vacuum below the buckling structures [4], the limit of the elastic theory framework to understand the buckling when plastic folding are observed [5,6] and the evidence of dislocation nucleation and propagation inside the buckles and induced by the elastic buckling [7].

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