

An investigation on the bilayer buckling technique for thin film metrology

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Summary

Recently, a novel technique based on the wrinkling of a bilayer composite film resting on a compliant substrate was proposed to measure the elastic moduli of thin films. In this paper, this technique is studied via theoretical analysis and finite element simulations. We find that under an applied compressive strain, the composite system may exhibit various buckling modes, depending upon the applied compressive strain, the geometric and material parameters of the system. We elucidate the physical mechanisms underlying the occurrence of two most typical buckling modes from the view point of energy. When the intermediate layer is much thicker than the top layer, the condition under which the bilayer buckling will occur prior to other modes is given. The results reported here may facilitate the design of the bilayer buckling technique for the thin film metrology.

Keywords: Wrinkling, bilayer, thin film metrology, finite element method

