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Peeling of elastic thin films on heterogeneous solids LAURENT PONSON, SHUMAN XIA, GURUSWAMY RAVICHANDRAN, KAUSHIK BHATTACHARYA, California Institute of Technology — Thin film adhesives have become increasingly important in various applications such as packaging and coating, and we benefit daily of their adhesion properties by using various kinds of tape. Here, we study the effect of heterogeneities on their peeling properties. From the theoretical side, we show how perturbations of the peeling front induced by heterogeneities of fracture energy at the film-substrate interface result in additional bending and stretching of the thin film. The energetical cost associated with these deformations is balanced by the wandering of the peeling front that takes advantage of area of lower interfacial fracture energy. This leads to various peeling front geometries that are calculated as a function of the landscape of fracture energy. These predictions are confronted with experimental measurements performed on a model system where we follow in real time the adhesion front during the peeling of an elastic thin film on a rigid substrate with controlled heterogeneous properties. A PDMS thin film produced by spin coating is peeled from a rigid solid on which patterns are designed by using a regular printer, taking advantage of the high adhesion energy of the ink-PDMS interface. The measured peeling front geometry is compared with the theoretical predictions and the toughening effect induced by the heterogeneities is finally discussed.

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