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Thermally assisted peeling of an elastic strip in adhesion with a substrate via molecular bonds

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Abstract

A statistical model is proposed to describe the peeling of an elastic strip in adhesion with a flat substrate via an array of non-covalent molecular bonds. Under an imposed tensile peeling force, the interfacial bonds undergo diffusion-type transition in their bonding state, a process governed by a set of probabilistic equations coupled to the stretching, bending and shearing of the elastic strip. Because of the low characteristic energy scale associated with molecular bonding, thermal excitations are found to play an important role in assisting the escape of individual molecular bonds from their

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