

Explicit phase diagram for a one-dimensional blister model

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We consider a thin film bonded to a substrate. The film acquires a residual stress upon cooling because of the mismatch of thermal expansion coefficient between the film and the substrate. The film tends to lift off the substrate when this residual stress is compressive and large enough. In this work, this phenomenon is described by a simplified one-dimensional variational model. This model was formally derived, in [1], from 3D elasticity in the asymptotics of thin films. We minimize an energy and study its global minimizers. Our problem depends on three parameters: the length of the film, its elasticity and a thermal parameter. Our main result consists in describing a phase diagram depending on those parameters in order to identify three types of global minimizers: a blister, a fully delaminated blister and a trivial solution (without any delamination). Moreover, we prove various qualitative results on the shape of the blisters and identify the smallest blister which may appear.

Références

- [1] R. MONNEAU, *Some remarks on the asymptotic invertibility of the linearized operator of nonlinear elasticity in the context of the displacement approach*, J. of ZAMM Z. Angew. Math. Mech., (2006), 110.

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