

Thin Films of Martensitic Materials: Can We Predict Their Microstructure?

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Abstract

The shape memory effect is an important manifestation of the martensitic phase transformation - a striking phenomenon observed in various metallic alloys, ceramics, and biological systems. In view of their technological applications as microactuators, thin films of martensitic materials utilizing the shape memory effect have been intensively studied in recent years. From a mathematical point of view one needs to understand how appropriate thin film models can be rigorously derived from Nonlinear Elasticity via dimensional reduction. Using an approach based on Young measures (parametrized probability measures), I will revisit the derivation of Bhattacharya and James' theory of martensitic thin films in the absence of interfacial energy contributions to the total bulk energy. The key analytical ingredient is a decomposition result for sequences of scaled gradients of Sobolev functions obtained in joint work with Irene Fonseca.