Rigidity of branching microstructures in shape memory alloys

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Abstract

We present our results concerning the rigidity of a shape memory alloy undergoing cubic-to-tetragonal transformations. Starting from a geometrically linear elastic energy augmented by an interface penalization we derive a non-convex differential inclusion in the energy regime of branching microstructures. Without assuming additional regularity we classify all possible solutions and describe the qualitative rigidity properties of such microstructures. In particular, we recover rank-one connectedness of the average strains at macroscopic interfaces between mixtures of martensite variants.

We furthermore give insight into quantitative aspects, such as the possibly fractal dimension of the set of macroscopic interfaces, by analyzing the H-measures generated by the microstructures.