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Miroslav Šilhavý
Rotationally invariant equilibrium two-phase states of linear isotropic bodies
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During his stay at the Laboratory of Mechanics of Materials and Structures of Istituto di Scienza e Tecnologie dell'Informazione "A. Faedo", M. Šilhavý collaborated with C. Padovani and M. Girardi on the problem of phase transformations in linear isotropic materials with interfacial energy. The general equations of equilibrium were adapted to the situation of two—phase states with rotational symmetry. The rotational symmetry and the isotropy of the material allows to solve the equilibrium equations of the bulk phases. The continuity of the displacement on the interface permits one to obtain an explicit solution which depends on three constants that must be determined by the boundary displacement and the conditions of phase equilibrium on the interface. This gives a system of three algebraic nonlinear equations. It turned out that this system cannot be treated by analytic tools and procedures for numerical solving this system by using Mathematica and Maple were developed. The solutions so obtained exhibit interesting qualitative features. Namely, there can be more than one equilibrium state corresponding to the given boundary displacement. The stable state of these two depends continuously on the boundary displacement up to some limiting displacement, where the two phase state disappears and the stability is moved to the homogeneous state of the given boundary displacement. A further examination of the equations is planned. The results of the research will be consolidated into a paper by M. Girardi, C. Padovani & M. Šilhavý: "On phase equilibrium of rotationally invariant two phase states of isotropic materials with interfacial energy".