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The Nonlinear Theory of Thermoelastic Shells Undergoing Phase Transitions

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Summary

The aim of this work is to discuss the nonlinear theory of shells made of material undergoing phase transitions (PT). The interest to mechanics and thermodynamics of thin-walled structures with PT is motivated by the recent investigations of thin martensitic films and biological membranes. Here we present statements of the boundary-value problems of shells and plates with PT within the dynamically and kinematically exact theory of shells. In this shell theory the translation and rotation fields are the kinematically independent variables. The theoretical model is illustrated by the examples of thin circular cylindrical shell and circular plate made of two-phase material. The elastic solutions reveal the existence of the hysteresis loop whose size depends upon values of several loading parameters.