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PHASE-FIELD APPROACH FOR DESCRIPTION OF THE PACKAGING BEHAVIOR IN METALLIC CLOSED-CELL FOAMS

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Recently the structural elements made of aluminum foams are often used in the automotive industry. Complex internal structure of foams leads to the specific behavior of material under the compressive load. Consistent destruction of internal cells of the material is observed on the stress-strain diagram as large plastic region with respectively low stresses. The aim of this paper is to model behavior of the aluminum closed-cell foam compressed upto fully packaged state.

The constitutive equations are derived from the double-well elastic energy assumption, defined for small strains. Two principal approaches are used for description of two-phase material state: sharp interface approach and phase-field method. For available uniaxial compression test data for aluminum closed-cell foam (Alulight®) we calibrate the constitutive model using sharp interface approach. The propagation of packaged domain of cells through material is simulated by means of phase-field approach. Results are compared with experimental data.