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Creep Damage Anisotropy of Thinwalled Elements Structures

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The paper is devoted to damage-induced due to a creep anisotropy (transversally-isotropic) of metallic materials under thermo-mechanical loading. Both types of an initially isotropic and anisotropic material were considered. For the description of ini-tial anisotropy and damage-induced anisotropy the second-order damage tensor has been used. Constitutive equations are based on irreversible thermodynamics, namely the Helmholtz free energy. Theoretical results were compared with experimental data; the results of comparison were satisfactory. The proposed model was generalized to describe damage anisotropy and lifetime prediction in thin-walled elements of structures, using the engineering models of plates and shallow shells. The method of numerical simulation of an anisotropic creep damage analysis on the basis of finite element scheme was elaborated. Various creep properties of damage-induced anisotropy plates depending on the orientation of anisotropy axes of a material concerning to a direction of loading and from a degree initial anisotropy have been established.

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