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A 3D dynamic constitutive model for stress-induced phase transformation in isotropic material with N transforming phases[1] YANGBO GUO, ZHIPING TANG, SONGLIN XU, Key Laboratory for Mechanical Behavior and Design of materials (LMBD), Department of Modern Mechanics, University of Science and Technology of China — In this article, based on the Hayes model for phase transformation[1], a 3D dynamic constitutive model considering deviatoric stress is established to describe the stress-induced phase transformation behavior in isotropic material with N transforming phases. The model includes three parts: the critical criterion of transformation among the N phases; a 3D incremental constitutive equation describing the deformation behavior of the mixture with N phases; and the evolution equation of phase transformation considering the over driving traction and the growing space decrease of the product phase during transformation. The simple 1D models under 1D stress and 1D strain are given respectively. Using the constitutive model established, the phase transformation behavior of TiNi alloy is predicted, the predictions are in good agreement with the experimental results. [1] Hayes D B, J. Appl. Phys. 46(8)(1975), 3438.

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