

On the constitutive relations for isotropic and transversely isotropic materials

ABSTRACT

In this work the strain and stress spaces constitutive relations for isotropic and transversely isotropic softening materials are developed. The loading surface is considered in the strain space and the normality rule; the stress relaxation is proportional to the gradient of the loading surface, is adopted. It is found that the strain space plasticity theory allows us to describe the hardening, perfectly plastic and softening materials more accurately. The validity of the strain space constitutive relation for transversely isotropic materials are confirmed by comparing with the experimental data for fiber reinforced composite materials. Some numerical examples in two and three dimensional elasto-plastic problems for various loading–unloading conditions are presented, and give a very good agreement with the existing results.

Keyword: Strain space; Stress space; Constitutive relation; Softening materials; Isotropic; Transversely isotropic.