

Effects of Tangent Operators on Prediction Accuracy of Meso-mechanical Constitutive Model of Elasto-plastic Composites

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Summary

With a newly developed homogenization cyclic constitutive model of particle reinforced metal matrix composites (Guo et al., 2011), the effects of tangent operators, i.e., continuum and algorithmic tangent operators [defined by Doghri and Ouaar (2003)] on the accuracy of the developed meso-mechanical constitutive model to predict the monotonic tensile and uniaxial ratchetting deformation of SiCP/6061Al composites were investigated in this work. The predicted results were obtained by the developed model with the choices of different tangent operators and various magnitudes of loading increments. Some useful accuracy comparison and error analysis on the predicted results were conducted. It is shown that: the total stress or strain difference is the accumulated result of the increment stress or strain difference; the predicted result accurate enough should be obtained by employing a loading incremental step small enough, especially when the algorithmic tangent operator is used in predicting the uniaxial ratchetting of the composites.

