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Implementation of thermo-viscoplastic constitutive equations
into the finite element code ABAQUS

Samson Youn and Soon-bok Lee

Korea Advanced Institute of Science and Technology
Department of Mechanical Engineering
373-1 Kusong-dong, Yusong-gu
Taejon, Korea 305-701

Jong-Bum Kim, Hyeong-Yeon Lee and Bong Yoo

Korea Atomic Energy Research Institute
P.O. Box 105, Yusong-gu, Taejon, Korea

Abstract

Sophisticated viscoplastic constitutive laws describing material behavior at high temperature have been implemented in the general-purpose finite element code ABAQUS to predict the viscoplastic response of structures to cyclic loading. Because of the complexity of viscoplastic constitutive equation, the general implementation methods are developed. The solution of the non-linear system of algebraic equations arising from time discretization is determined using line-search and back-tracking in combination with Newton method. The time integration method of the constitutive equations is based on semi-implicit method with efficient time step control. For numerical examples, the viscoplastic model proposed by Chaboche is implemented and several applications are illustrated.