SM4S_11234

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Modeling of Thermo-Damage Coupling in Anisotropically Damaged Materials

Sumio Murakami(1), Mamoru Mizuno(2)

(1) *Aichi University of Technology, Aichi, Japan*
(2) *Akita Prefectural University, Akita, Japan*

A current damaged configuration $\mathrm{B_t}$ and the corresponding fictitious undamaged configuration $\mathrm{B_f}$ of a Representative Volume Element (RVE) characterized by a second rank anisotropic damage tensor D_{ij} are first postulated. Then, by taking account of the effective undamaged surface element of $\mathrm{B_f}$, the heat flux vector q_i^C due to heat conduction in $\mathrm{B_t}$ is formulated. The heat flux q_i^R through cavities is also formulated by calculating the gray-body radiation through a row of cavities in RVE of $\mathrm{B_t}$. The heat conduction law for overall heat flux $q_i = q_i^C + q_i^R$ and the equation of heat conduction in anisotropically damaged materials are expressed by defining the equivalent thermal conductivity tensor L_{ij}^{EQ} in the damaged material. The tensorial nature of the resulting equations and the variation of L_{ij}^{EQ} due to the development of anisotropic damage D_{ij} are discussed. Finally, the resulting equations are applied to the analysis of anisotropic creep damage problems under thermo-mechanical loading.

View the extended summary