



Preface

Special Issue on Micromechanics of Composites

By J. W. Ju, Y.D.S. Rajapakse, and G. J. Weng

Micromechanics of composites has emerged as a critical research area investigating the micromechanical behavior and properties of random or deterministic heterogeneous particulate, fibrous and laminated composite materials. The Symposium on *Micromechanics of Composites*, a part of the 1993 ASME WAM at New Orleans, provides a forum for researchers in this field to present recent development and to exchange new ideas. All aspects of micromechanics of composites are considered, such as: micromechanics of brittle and ductile composites; ceramics and ceramic composites; metal matrix composites; cementitious composites; fiber and particle reinforced composites; random heterogeneous composites; micromechanical damage mechanics of composites; interfacial micromechanics; micromechanics of plasticity in composites; effective medium methods, mathematical bounds, and direct micromechanical interaction methods; computational micromechanics of composite materials and systems; and micromechanical experimental characterization of composites, etc..

The 26 papers in this special JEMT issue are selected after the usual ASME peer-review procedure. They are arranged according to the alphabetical order of the first authors' last names. In particular, Bazant and Jirasek present a nonlocal model based on crack interactions; Benveniste presents exact results concerning the local fields and effective properties in piezoelectric composites; Bohm, Fischer, Rammerstorfer and Siegmund study microscale arrangement effects on thermo-mechanical behavior of two-phase materials; Cherkaoui, Sabar and Berveiller present a micromechanical approach of coated inclusion problem; Deng and Nemat-Nasser present dynamic damage evolution of solids in compression; Demir and Zbib study the interface ring dislocation in fiber-matrix composites; and Gologanu, Leblond and Devaux study approximate models for ductile metals containing nonspherical voids. Furthermore, Honein, Honein and Herrmann present aspects of heterogenization; Hori and Nemat-Nasset present double-inclusion model and overall moduli of multi-phase composites; Ju and Chen investigate micromechanics and effective elastoplastic behavior

of metal matrix composites; Kouris and Marshall investigate damage mechanisms in Ti_3Al matrix composites; Kroner addresses nonlinear elastic properties of micro-heterogeneous media; Ladeveze, Gasser and Allix investigate damage mechanics modeling of ceramic composites; and Lagoudas, Boyd and Bo investigate micromechanics of active composites.

In addition, Lee and Mear study the growth and collapse of voids in viscous solids; Lin and Mura present constitutive equations of power-law composites; Mikata studies stress field in a continuous fiber composite with a variable interphase; Muller, Lemoine and Berveiller address nonlocal behavior of elastoplastic metals; Ostoja, Sheng, Jasiuk and Alzabdeh investigate effects of random geometry in composites; and Premachandran and Horii address a micromechanics-based model for polycrystalline ice. Finally, Selvadurai investigates matrix crack extension at a frictionally constrained fiber; Shau, Pluvinage, Parvizi and Chou present damage mechanics of two-dimensional woven SiC/SiC composites; Taya and Mori address dislocation punching from ceramic/metal interfaces; Tohgo and Weng investigate a progressive damage mechanics model in metal matrix composites; Wittig and Allen address effect of oxidation on metal matrix composites; and Zuiker and Dvorak study effective properties of composites by the linear field Mori-Tanaka method.

The organizers hope that putting these work together in this JEMT issue will illuminate some of our problems from several angles providing fresh ideas for future research and development.

The authors in the special issue demonstrated enthusiasm and cooperation and provided the readers with excellent papers adhering at the same time to tight deadlines. This symposium was sponsored by the ADM-MD Joint Committee on Constitutive Equations.

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