

Smart Materials & Structures

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Lu-Wen Zhang

Shanghai Jiao Tong University, China

Carbon nanocomposites and materials

Understanding the mechanical behavior of nanocomposites and materials remains one of the most difficult challenges in the field of material science. In this talk, we will present a multi-scale framework for computational modeling of the mechanical behavior of carbon nanotube (CNT) reinforced cement composites. The geometry of a cylindrical representative volume element (RVE) of composites is considered in which the CNT and matrix are used as elastic continua. In a macroscopic scale treatment, reinforcement is assumed to be embedded in the overall domain in the corresponding volume fraction. Accounting for the volume fraction, orientation and arrangement of the reinforcing components, CNTs and a matrix are simulated by different nonlinear constitutive models to represent the composites; CNTs are considered as one-dimensional and distributed in a uniform orientation. A mesoscopic scale description is considered in order to depict the mesostructured morphology of the reinforced composites and the bond-slip of its mutual interaction. Two length-scale systems of equations are coupled together using a staggered technique and the modified Newton-Raphson method is adopted to solve the nonlinear system equations in order to track the full load-displacement path of the composites. Several carefully selected case studies and benchmark problems will be presented in the talk.

Biography

Dr. Zhang is the Distinguished Research Professor of mechanics in Shanghai Jiao Tong University. She received her PhD in 2010 from Shanghai University and continued her postdoctoral study in Shanghai University and City University of Hong Kong. Dr. Zhang's main research trust is focused on computational mechanics, multi-scale modeling, Nano composite materials and optimization. Her research areas are on theoretical development and application of numerical algorithms and computational methods for problems in mechanics and nano materials. Dr. Zhang has published over 70 SCI journal articles and her publications have been cited over 1,200 (ISI). Her current h-index is 19 (ISI). She is Editor of Journal of Modeling in Mechanics & Materials (De Gruyter), Guest Editor on a Special Issue of Mathematical Problems in Engineering Journal (Hindawi Publishing) on Computational Methods for Engineering Science in 2014, and Editorial board member of Polymer Science (iMedPub).

lwzhang@sjtu.edu.cn

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