

Preface

This volume on *Mechanics of Carbon Nanotubes*, mechanics of graphene and nanocomposites, molecular dynamics simulations of carbon nanotubes and low-dimensional carbon allotropes grew out of the state-of-the-art research carried out at several research laboratories in the United States and Taiwan. A recent discovery of *a nanoscale analog of the Pauli principle* involving *an effect of the spatial exclusion of π -electrons* or the so-called *SEE effect* has prompted *Nanodesigns Consulting* staff to share the new research findings of our technical reports with the wider scientific community. Another recent development of the new *Matrix Registry Analysis* for modeling and analysis of nanoscale interfacial sliding along the atomic scale registry potentials and the energetically favorable atomic lattice paths has allowed the *Nanodesigns Consulting* staff to analyze the nanoscale controllability of graphene-based configurations for nanoscale electronic applications. These new developments should stimulate further scientific research and discovery involving nanoscale sciences.

This edited volume follows the first volume of *Trends in Nanoscale Mechanics* (2003), which grew out of discussions held at the NASA Langley Research Center (LaRC), talks and events shared by many researchers. A team of NASA and NASA contract scientists of the ICASE Institute was at the forefront of these scientific activities as the new NASA programs in Nanotechnology, Nanostructured Materials, and Multifunctional Materials and Structures were being established. The goal of these interactions was to foster collaborations between academic researchers and a university-based ICASE institute, which has pioneered world-class computational, theoretical, and experimental research in disciplines that are important to NASA. In 2002, a team of ICASE staff scientists and supporting staff have received the NASA Public Service Group Achievement Award for their outstanding work.

Nanodesigns Consulting itself is a 2004 NASA spin-off from the NASA Langley Research Center. It was formed to serve the research needs of the new NASA founded URETI Institute (<http://bimat.org>), which was based at Princeton University. This URETI Institute still provides new publications that are available to the public. The American Society of Mechanical Engineers (ASME) has invited the editor of this volume to present a short course on new and novel research at its

Annual Congress in 2012. This volume highlights some material from the 2012 ASME Short Course entitled *New Trends in Nanoscale Mechanics*. This new short course is based on the technical reports published by Nanodesigns Press (Wilmington, Delaware) of Nanodesigns Consulting. The editor has also authored a 2011 monograph entitled *Mechanics of Carbon Nanotubes*. New results from the technical reports concerning nanoscale mechanics of graphene sheets, nanotechnology of carbon nanotubes and safety, as well as mechanics of nanodesigns are briefly reviewed in this volume. Results of our technical reports on Nanodesign Standards are beyond the scope of this volume except the well-known nanoscale homogenization criterion and classification of carbon nanotubes. This volume also presents new research results of world-class researchers from Rensselaer Polytechnic Institute, Rice University and Taiwan.

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