

Preface

Micromechanics aims mainly at establishing the quantitative relation between the macroscopic mechanical behavior and the microstructure of heterogeneous materials. It provides an efficient tool for understanding the deformations and strength of materials, and for the design of new materials as well. The basic idea of micromechanics dates back to some pioneer works of continuum mechanics, in which a matter with discrete molecular microstructure is idealized as a homogenized one endowed with appropriate “effective” material properties. Significant progress has been made in this domain due to the need of quantitative prediction of the mechanical and physical properties of composite materials since the late 60’s of the last century, and it is also revitalized since the 90’s by the urgent need of characterizing size effects observed for micro- and nano-structured materials. More recently, micromechanics is refueled by the dynamic homogenization of heterogeneous materials, which is especially important for design of metamaterials. Micromechanics is also recognized as an efficient method in understanding the interplay between processes at different scales, providing deep insights for multi-physics phenomena.

The idea of editing this theme issue on micromechanics was born after the Beijing-Paris Workshop on Micromechan-

ics and Nanomechanics, which, supported by the French Research Center for Science (CNRS) via the Fédération Française de Mécanique (F2M) and by the Labex MMCD “Multi-Scale Modelling and Experimentation of Materials for Sustainable Construction”, was held on September 6–7, 2012, in Marne-la-Vallée, France.

This theme issue consists of four articles contributed by experts. They concern random microstructures in micromechanical modelling, physical mechanisms for high graded models, high frequency waves in lattice structures, and interactions between a water droplet and a soft substrate. We hope that the papers collected in this issue will stimulate new ideas and discussions in the field of micromechanics.

We appreciate the effort of the contributors of this theme issue. We are also grateful to the staff of the editorial office of Acta Mechanica Sinica for the assistance. And finally we thank the editor in chief of Acta Mechanica Sinica, Prof. Quan-Shui Zheng, for inviting us to be the guest editors of this theme issue.

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