

SPECIAL ISSUE

Multiscale Methods in Computer Materials Science

Guest Editors

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PREFACE

This special issue of the *International Journal for Multiscale Computational Engineering* is dedicated to symposium 033, Multiscale Methods in Computer Materials Science, which was organized within the World Congress on Computational Mechanics and 5th European Congress on Computational Methods in Applied Sciences and Engineering in Venice in 2008. The issue contains eight papers selected from those presented during this symposium.

The World Congress on Computational Mechanics (WCCM) and European Conference on Computational Methods in Applied Sciences and Engineering (ECCOMAS) brings together our scientific communities and identifies emerging research trends and issues. Such contacts are important for establishing cooperative research activities. Previous editions of the WCCM were held in Los Angeles (2006), Beijing (2004), Vienna (2002), Buenos Aires (1998), Tokyo (1994), Stuttgart (1990), and Austin (1986). Previous editions of the ECCOMAS Congress were held in Jyväskylä (2004), Barcelona (2000), Paris (1996), and Brussels (1992).

The objective of the symposium on Multiscale Methods in Computer Materials Science was to gather researchers working on various aspects of modeling of phenomena occurring in materials at various scales, from nano- to micro- and mezo- to macroscale, and to enable exchange of ideas and results. Papers on the following topics were presented: conventional multiscale approaches based on finite element modeling (XFEM, MSXFEM, GFEM); the theoretical basis of various applications of multiscale techniques, e.g., Monte Carlo (MC),

cellular automata (CA), and molecular dynamics (MD); alternative multiscale methods, e.g., combination of CA-FE methods, neuro-fuzzy cellular automata-finite element technique (nF-CAFE) or neuro expert cellular automata-finite element models (NESCAFE); applications of multiscale modeling to various industrial problems in materials processing; solving microstructural and fracture mechanics problems; application of multiscale modeling to functionally graded materials and nanolayers; multiscale approaches based on the mesh-free methods, particle-in-cell, and other particle methods; and development of new multiscale approaches. A total of 15 papers were presented during the symposium, and after evaluation of the presentations, 11 authors were invited to submit extended versions of their papers to this special issue of the *International Journal for Multiscale Computational Engineering* (IJMCE). After the usual review procedure for the IJMCE, eight articles were accepted for publication. The articles focus on topics connected with widely understood applications of multiscale methods, as well as atomistic and molecular static methods. Papers dealing with multiscale simulations in various branches of metallurgy and materials science are the largest group, and some papers address problems of nanoscale modeling.

The guest editors of this issue express their thanks to the authors of the papers for their contributions. Particular thanks are directed to the reviewers for their hard work in reviewing the submitted papers and for help in maintaining the high publication standards of the IJMCE. It is our hope that this special issue of the *International Journal for Multiscale Computational Engineering* will be a source of inspiration for the readers in their scientific work.

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