Computational Methods and Experiments in Materials Characterisation II

WIT PRESS

WIT Press publishes leading books in Science and Technology.
Visit our website for new and current list of titles.
www.witpress.com

WIT eLibrary

Home of the Transactions of the Wessex Institute.
Papers presented at Computational Methods and Experiments in Material Characterisation II are archived in the WIT eLibrary in volume 51 of WIT Transactions on Engineering Sciences (ISSN 1743-3533).

The WIT eLibrary provides the international scientific community with immediate and permanent access to individual papers presented at WIT conferences.
http://library.witpress.com

High Performance Structures and Materials

EDITORIAL BOARD

SECOND INTERNATIONAL CONFERENCE ON
COMPUTATIONAL METHODS AND EXPERIMENTS IN
MATERIALS CHARACTERISATION

MATERIALS CHARACTERISATION II

Organised by
Wessex Institute of Technology, UK
and
University of New Mexico, USA

Sponsored by:
WIT TRansactions on Engineering Sciences

Computational Methods and Experiments in Materials Characterisation II

Editors

C.A. Brebbia
Wessex Institute of Technology, UK

A.A. Mammoli
University of New Mexico, USA

WIT PRESS Southampton, Boston

C.A. Brebbia
Wessex Institute of Technology, UK

A.A. Mammoli
University of New Mexico, USA

Published by

WIT Press
Ashurst Lodge, Ashurst, Southampton, SO40 7AA, UK
Tel: 44 (0) 238 029 3223; Fax: 44 (0) 238 029 2853
E-Mail: witpress@witpress.com
http://www.witpress.com

For USA, Canada and Mexico

Computational Mechanics Inc
25 Bridge Street, Billerica, MA 01821, USA
Tel: 978 667 5841; Fax: 978 667 7582
E-Mail: infousa@witpress.com
http://www.witpress.com

British Library Cataloguing-in-Publication Data

A Catalogue record for this book is available
from the British Library

ISBN: 1-84564-031-4
ISSN: 1746-4471 (print)
ISSN: 1743-3533 (on-line)

The texts of the papers in this volume were set individually by the authors or under their supervision. Only minor corrections to the text may have been carried out by the publisher.

Printed in Great Britain by Athenaeum Press, Gateshead.

Preface

Characterisation is the connection between an abstract material model and its real-world behavior. It allows one to predict the response of the material under an arbitrary set of conditions based on a finite series of tests. In some cases, the model does not have a closed-form solution, but is cast in terms of differential equations that are solved numerically. The solutions for a particular set of boundary conditions can be related to a set of material parameters which characterise the material.

As increasingly high performance is sought, engineering materials are becoming ever more complex. As a consequence, characterisation is increasingly difficult. A trend is being established where characterisation proceeds through a combination of numerical modeling and experimental testing. Several papers in this book describe such an approach.

Increasingly high performance is in many cases sought through the small scale. Hence, much attention is given to the micro-and nano-structure of materials. Experimental techniques for small-structure characterisation are becoming more sophisticated as diagnostic equipment and data processing merge. Optical and electron microscopy is often coupled with digital image processing. X-ray microtomography is a particularly effective way of obtaining 3-D micro structural information. These methods are the topic of several papers.

Industrial applications are the driving force behind the development of a wide variety of materials, from concretes to foams to special surfaces. While the research and techniques which aid in the development of such materials are the primary focus of the conference, it is appropriate, as well as informative, to include a number of applications-oriented papers in this book.

With the hope of providing useful information to practitioners in the materials research area, the Editors also wish to thank their colleagues in the Scientific Advisory Committe, who helped to ensure the quality and appropriateness of the papers in this book.

The Editors,
Portland, Maine, 2005

Contents

Section 3: Cements

Section 4: Biomaterials

Section 5: Damage mechanics

Section 6: Thermal analysis

Section 7: Image analysis

Section 8: Continuum methods

Section 9: Particle models