

Preface

The IUTAM symposium “Advanced Materials Modelling for Structures”, held in Paris in April 23–27, 2012, was co-organised by Onera (The French Aerospace Lab) and the Ecole des Mines de Paris under the auspice of the International Union of Theoretical and Applied Mechanics. The meeting was a new version of the previous IUTAM symposia “Creep in Structures” proposed every 10 years (Stanford, U.S.A., 1960; Gothenburg, Sweden, 1970; Leicester, U.K., 1980; Cracow, Poland, 1990; Nagoya, Japan, 2000) to discuss recent advances and results in this fundamental field of applied mechanics [1–5].

These last years an important progress was observed in testing practice for high temperature behaviour as well as in observation techniques, giving important information on deformation patterns and damage evolutions in interaction with the material microstructure which can be used to propose more physically based constitutive models. At the same time, the research fields in solid mechanics and particularly the modelling of advanced materials have evolved considerably thanks to the development of multiscale approaches. Although some progress has been made in the theoretical field, the application of multi-scale modelling to compute real components subjected to strong thermo-mechanical loads is still at an early stage, with different groups around the world following a wide range of approaches. This is particularly the case for high temperature structures where nonlinear phenomena, like creep, are predominant and drive lifetime.

The aims of the Symposium were not only to consolidate the advance in high temperature materials research, but also to provide a forum to discuss the new horizon placing a particular emphasis on multiscale approaches at several length-scales applied to nonlinear and heterogeneous materials. Discussion of new approaches have been emphasised from various related disciplines, including metal physics, micromechanics, mathematical and computational mechanics.

According to the spirit and following the Rule and Guidelines of IUTAM symposia, this Symposium gathered a group of active scientists and engineers researching within well-defined fields. The single session format conference gave the opportunity for in-depth discussions between delegates and for young doctorate students to interact with seniors. The Symposium brought together some 60

participants from 11 countries. Forty-nine invited oral presentations were divided into relatively long talks (45 min General Lectures and 35 min ordinary ones) in order to encourage interactions and discussions. Lunches taken in a single room during the conference as well as an informal dinner on a boat trip on the river Seine brought in a warm and convivial atmosphere.

A wide range of topics have been discussed during the meeting. Accordingly, the program was divided into the following main fields:

- Crystal Plasticity (3 sessions)
- Mechanical Modelling (2 sessions)
- Continuum Damage Mechanics (2 sessions)
- Coupled Fields (2 sessions)
- Material Science (2 sessions)
- Cyclic Plasticity (2 sessions)
- Creep Modelling and Interactions (2 sessions)
- Multiscale Modelling (2 sessions)

The editors wish to thank all the authors and delegates for their contribution. After reviewing, 32 papers are finally presented in this volume that aims to become a helpful and valuable reference in the field of mechanics for scientists as well as for engineers.

The success of this event is due to the help of many people. We would like to thank the International Scientific Committee, the Organising Committee and the session chairpersons who were really effective in leading discussions. Our special thanks are extended to Prof. David Hayhurst for his encouraging support in the preparation of this conference. We would like to express our thanks to the editorial staff of Springer-Verlag for their co-operation in publishing this volume.

Magdeburg, November 2012
Paris

Holm Altenbach
Serge Kruch

References

1. Hoff, N.J. (ed.): Creep in Structures. Springer, Berlin (1962)
2. Hult, J. (ed.): Creep in Structures. Springer, Berlin (1972)
3. Ponter, A.R.S., Hayhurst, D.R. (eds.): Creep in Structures. Springer, Berlin (1981)
4. Zyczkowski, M. (ed.): Creep in Structures. Springer, Berlin (1991)
5. Murakami, S., Ohno, N. (eds): IUTAM Symposium on Creep in Structures. Kluwer, Dordrecht (2001)

Advanced Materials Modelling for Structures

Altenbach, H.; Kruch, S. (Eds.)

2013, XXII, 361 p. 239 illus., 60 illus. in color., Hardcover

ISBN: 978-3-642-35166-2