Thermo-mechanical Fatigue Behavior of Materials

THIRD VOLUME

HUSEYIN SEHITOGLU
AND HANS J. MAIER, EDITORS

STP 1371

ASTM

STP 1371

Thermo-mechanical Fatigue Behavior of Materials: Third Volume

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ASTM Stock Number: STP1371

ASTM
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

Printed in the U.S.A.

Library of Congress Cataloging-in-Publication Data

Thermo-mechanical fatigue behavior of materials. Third volume / Huseyin Sehitoglu and Hans J. Maier, editors.
p. cm. -- (STP ; 1371)
ASTM Stock Number: STP1371.
Includes bibliographical references and index.
ISBN 0-8031-2853-3
1. Alloys--Thermomechanical properties. 2. Composite materials--Thermomechanical properties. 3. Fracture mechanics. I. Title: Thermomechanical fatigue behavior of materials. II. Sehitoglu, Huseyin, 1957- . III. Maier, Hans J., 1960- . IV. Symposium on Thermomechanical Fatigue Behavior of Materials (3rd: 1998: Norfolk, Va.) V. ASTM special technical publication; 1371.
TA483.T48 2000
620.1'126--dc21 00-020035

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Printed in Baltimore, MD
March 2000

Foreword

This publication, *Thermo-mechanical Fatigue Behavior of Materials: Third Volume*, contains papers presented at the symposium of the same name held in Norfolk, Virginia, on 4–5 November 1998. They symposium was sponsored by ASTM Committee E8 on Fatigue and Fracture. The symposium co-chairmen were Huseyin Sehitoglu, University of Illinois, and Hans J. Maier, Universität Paderborn.

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COMPOSITES

EXPERIMENTAL TECHNIQUES

Overview

The area of thermal and thermo-mechanical fatigue of structural alloys has been a topic of intense interest to scientists and engineers. ASTM has sponsored two successful symposia on this topic in the last seven years. The current symposium is aimed at exposing the deformation and damage mechanisms in thermo-mechanical fatigue in all materials. Papers published represent contributions in the disciplinary areas of materials science, mechanics and engineering applications. Specifically, the symposium focused on the study of stress-strain response in a number of technologically important materials, damage mechanisms in thermo-mechanical fatigue (creep, oxidation effects), microscopic investigations of materials subjected to thermo-mechanical fatigue, life prediction under thermo-mechanical fatigue (including fracture mechanics, damage mechanics, and initiation life approaches), solutions to thermo-mechanical fatigue problems in industry (including gas turbines, automotive engines), and novel experimental techniques for thermo-mechanical fatigue (high frequency, multiaxial testing, and round robin results). Materials studied included metals, intermetallics, and composites. Critical isothermal experiments that shed insight into thermo-mechanical fatigue were presented as well as thermal fatigue tests on different component geometries.

The 20 contributions in this STP range from gaining a deeper understanding of crack initiation and growth as influenced by the underlying microstructure to studies on developing engineering relationships and mathematical models for macroscopic behavior. The authors have been active researchers in high-temperature fatigue and have all made notable contributions in their specific areas of interest. The participation from outside U.S. was very strong reflecting the world wide interest in this field. A collection of recent articles on the topic would be of considerable value for the preparation of new design criteria, standards, and new texts in this field. We hope that, taken all together, this STP will be of considerable interest to the engineering and scientific community.

We would like to thank the international advisory board which included: Dr. John Allison, Ford Motor Company, USA; Dr. J. Bressers, Institute for Advanced Materials- JRC Petten, The Netherlands; Professor H. J. Christ, Universität-GH-Siegen, Germany; Dr. Gary Halford, NASA Lewis, USA; Prof. D. Löhe, Universität Karlsruhe, Germany; Professor H. Mughrabi, Universität Erlangen-Nurnberg, Germany; Prof. R. Ohtani, Kyoto University, Japan; Dr. L. Remy, Ecole Nationale Superieure des Mines de Paris Armines, France; and Dr. Peter Skelton, Imperial College, United Kingdom. We would like to express our gratitude to all authors, reviewers, and ASTM staff for their contribution to the publication of this STP.

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ISBN 0-8031-2853-3