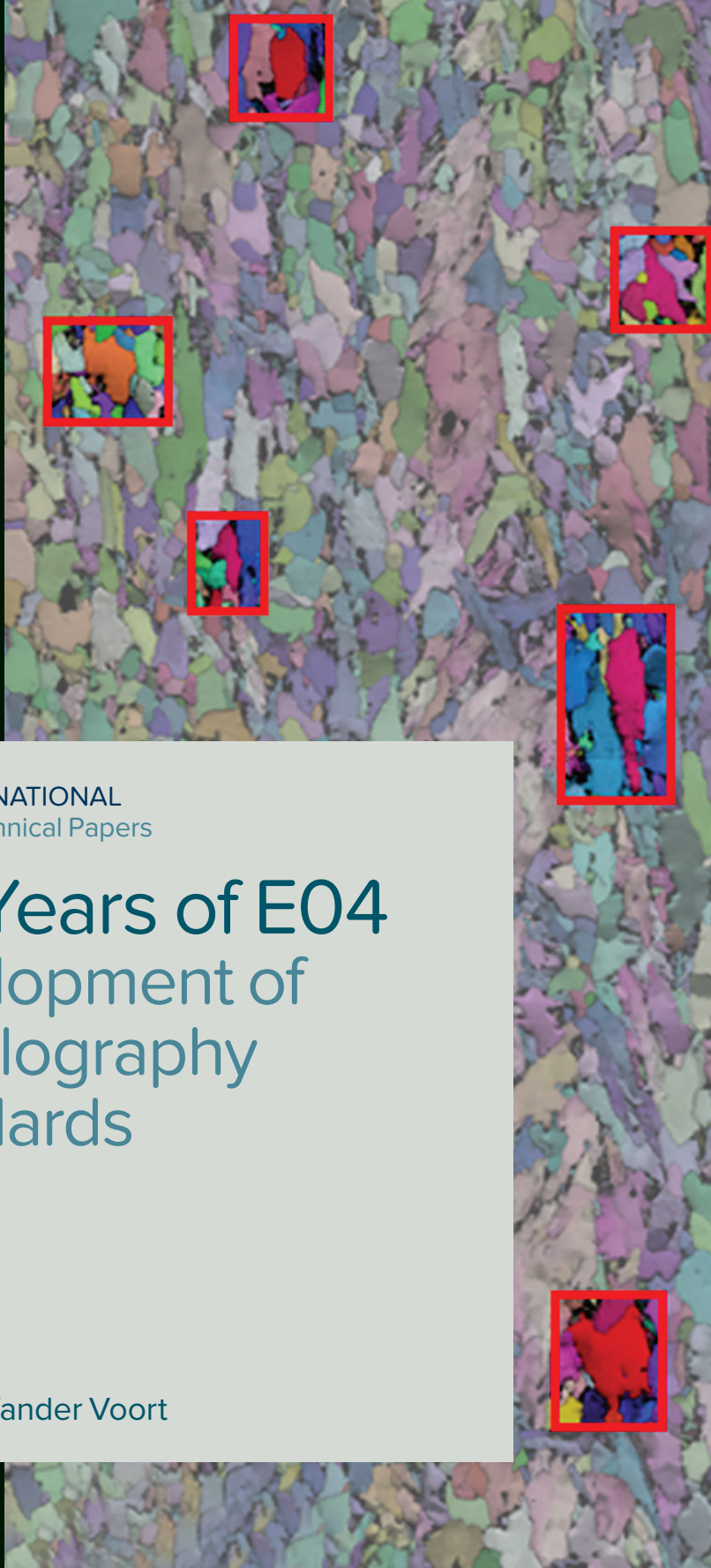

ASTM INTERNATIONAL
Selected Technical Papers

100 Years of E04
Development of Metallography Standards

STP 1607
Editor:
George F. Vander Voort

SELECTED TECHNICAL PAPERS
STP1607

Editor: George F. Vander Voort

100 Years of E04 Development of Metallography Standards

ASTM STOCK #STP1607
DOI: 10.1520/STP1607-EB

ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959
Printed in the U.S.A.

Library of Congress Cataloging-in-Publication Data

Names: Vander Voort, George F., editor.

Title: 100 years of E04 development of metallography standards / editor, George Vander Voort.

Other titles: One hundred years of E04 development of metallography standards

Description: West Conshohocken, PA : ASTM International, [2019] | Series: Selected technical papers ; STP 1607 | "ASTM Stock #STP1607." | Includes bibliographical references.

Identifiers: LCCN 2018040886 (print) | LCCN 2018041340 (ebook) | ISBN 9780803176607 (ebook) | ISBN 9780803176591 (pbk.)

Subjects: LCSH: American Society for Testing and Materials. Committee E-4 on Metallography. | Metallurgy--Standards--United States. | Metallurgy--Research--United States.

Classification: LCC TN673 (ebook) | LCC TN673 .O64 2019 (print) | DDC 669.02/1873--dc23

LC record available at https://lccn.loc.gov/2018040886

ISBN: 978-0-8031-7659-1

Peer Review Policy

Each paper published in this volume was evaluated by two peer reviewers and at least one editor. The authors addressed all of the reviewers' comments to the satisfaction of both the technical editor(s) and the ASTM International Committee on Publications.

The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of the peer reviewers. In keeping with long-standing publication practices, ASTM International maintains the anonymity of the peer reviewers. The ASTM International Committee on Publications acknowledges with appreciation their dedication and contribution of time and effort on behalf of ASTM International.

Citation of Papers

When citing papers from this publication, the appropriate citation includes the paper authors, "paper title," STP title, STP number, book editor(s), ASTM International, West Conshohocken, PA, year, page range, paper doi. A citation is provided on page one of each paper.

Printed in Atlanta, GA

March, 2019

Foreword

THIS COMPILATION OF Selected Technical Papers, STP1607, *100 Years of E04 Development of Metallography Standards*, contains peer-reviewed papers that were presented at a symposium held November 15–17, 2017, in Atlanta, Georgia, USA. The symposium was sponsored by ASTM International Committee E04 on Metallography.

Symposium Chair and STP Editor:

George F. Vander Voort
Vander Voort Consulting LLC
Wadsworth, IL, USA

Contents

Overview

ASTM Committee E04 on Metallography was created in 1916. On May 8–10, 1991, E04 celebrated its 75th anniversary with a conference in Atlantic City, NJ, resulting in publication of STP1165, *Metallography: Past, Present and Future*. On November 15–17, 2017, E04 celebrated its 100th anniversary at its fall meeting in Atlanta, GA. These 100 years have seen a vast growth in the science and technology of metallography, and E04 has continued to create new standards and update older standards as technology continues to grow and improve.

This new STP contains seven articles on the use and improvement of ASTM standards. Several years of experiments led to the development of an improved method to assess the degree of banding segregation in hot- or cold-worked steels, led by our Russian advisor, Alexander Kazakov, and his wife and students, and a vast improvement to E1268. Two other papers discuss how surface preparation can alter the measurement of retained austenite in steels and how proper preparation is required to assess and characterize thermal barrier coatings. Other talks were related to extending the knowledge on specific topics of concern to metallographers, such as improving the use of stereology when making quantitative measurements of microstructure or examining the errors and uncertainty that exist when performing such measurements. Two talks covered topics related to micro-indentation hardness tests: avoiding very low-test loads that yield diagonal lengths of less than 21 μm where normal variability in measuring the indents can create substantial errors, and the use of the control chart method in E2554 to show when a hardness tester has encountered problems that yield bad data and also allow for a simple determination of the uncertainty of the test data.

The new STP also contains a number of interesting papers on the use of metallographic techniques to better understand and control problems and quality. One paper discusses the influence of intermetallic particles on the quality of aluminum-to-steel friction welds, while a second paper covers the analysis and detection of intermetallic phases on the toughness and corrosion resistance of duplex stainless steels. Another author discusses the mechanical behavior and fractography of a hot-stamped steel as a function of strain rate while another author discusses the effect of strain rate on the properties and behavior of a dual-phase steel. Efforts to develop deep learning methods to assist in the interpretation and measurement of microstructures is a new topic of considerable interest, and authors from Germany, led by Dominik Britz, present an interesting study of the use of LePera's etchant in

color metallography to improve the use of this technology in evaluating the microstructure of low-carbon steels.

We hope that our readers will enjoy reading these papers and benefit from the knowledge they provide.

George F. Vander Voort
Symposium Chairman and STP Editor

ASTM INTERNATIONAL
Helping our world work better

ISBN: 978-0-8031-7659-1
Stock #: STP1607

www.astm.org