The Minerals, Metals and Materials Society

Bulk Metallic Glasses 2006

Edited by Peter K. Liaw Raymond A. Buchanan

Symposium Sponsored by
The Mechanical Behavior of Materials Committee of
The Structural Materials Division (SMD) of
TMS (The Minerals, Metals & Materials Society)

March 12-16, 2006 San Antonio, Texas, USA

Printed from e-media with permission by:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 www.proceedings.com

ISBN: 978-0-87339-612-7

Some format issues inherent in the e-media version may also appear in this print version.

A Publication of TMS (The Minerals, Metals & Materials Society)

184 Thorn Hill Road Warrendale, Pennsylvania 15086-7528 (724) 776-9000

Visit the TMS web site at

http://www.tms.org

Statements of fact and opinion are the responsibility of the authors alone and do not imply an opinion on the part of the officers, staff, or members of TMS, The Minerals, Metals, and Materials Society. TMS assumes no responsibility for the statements and opinions advanced by the contributors to its publications or by the speakers at its programs. Registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not be considered unprotected by the law.

No part of this book may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, microfilming, recording, or otherwise, without written permission from the publisher.

Printed in the United States of America Library of Congress 2006920377 ISBN: 978-0-87339-612-7

Authorization to photocopy for internal or personal use beyond the limits of Sections 107 and 108 of the U.S. Copyright Law is granted by TMS, provided that the base fee of \$7.00 per copy is paid directly to the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923 USA, www.copyright.com. Prior to photocopying items for educational classroom use, please contact the Copyright Clearance Center, Inc.

For those organizations that have been granted a photocopy license by the Copyright Clearance Center, a separate system of payment has been arranged.

This consent does not extend to copying items for general distribution or for advertising or promotional purposes or to republishing items whole or in part in any work in any format.

Please direct republication or special copying permission requests to the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923 USA; (978) 750-8400; www.copyright.com.



Copyright 2006, The Minerals, Metals, and Materials Society. All rights reserved.

If you are interested in purchasing a copy of this book, or if you would like to receive the latest TMS publications catalog, please telephone (800) 759-4867 (U.S. only) or (724) 776-9000, EXT. 270.

Table of Contents

Elastic, Plastic Behavior, and Computation

Rate-Dependent Shear Banding in a Zr-Based Bulkmetallic Glass
H. Choo, and P.K. Liaw
Mechanical Behaviors
Mechanical Properties and Devitrification Behavior of Cu-Zr-Ti-NM (NM-Noble Metals) Bulk Glass-Forming Alloys
Evolution of Mechanical Properties of Tilt Cast Zr-Cu-Al Glassy Alloys by Annealing Treatment
Y. Yokoyama, P.K. Liaw, R.A. Buchanan, and A. Inoue
Fatigue Behavior of Bulk Metallic Glasses: Role of Free Volume
Elevated Temperature Mechanical Behaviour of Mg-Based Amorphous Alloys Produced by Low-Pressure Die-Casting
Atomic Study and Processing
Local Structural Fluctuations in a Supercooled Liquid
Optimizing Chemistry of Bulk Metallic Glasses for Improved Thermal Stability65 G.S. Dulikravich, and I.N. Egorov
Processing and Characterization
Atom Probe Tomography Characterization of a Gas Atomized Metallic Glass

Physical Properties

Fabrication of Amorphous Alloy Surface Composites by High-Energy Electron- Beam Irradiation	89
K. Lee, S. Lee, and N.J. Kim	
Metallic Glass Layers Produced by High Power Lasers	99
Numerical Prediction and Experiments on Casting Fe-Based Bulk Amorphous Strips on a Twin Roll Caster and on a Horizontal Single Belt Strip Caster D. Li, M. Isac, R.I.L. Guthrie, J. Wright, C. Qiu, F. Hamel, and S. Turcotte	109
Production of High Quality Bulk Metallic Glass Samples by Low-Pressure Die-Casting	119
K.J. Laws, B. Gun, and M. Ferry	
Processing and Mechanical Behaviors	
Mechanical Property of a Zr-Based Metallic Glass at 300 K and 77 K	129
Production of High Iron Content Amorphous Steels Without the Use of Rare Earth Elements	135
J. Cheney, and K. Vecchio	
Cu-Based Bulk Metallic Glass Composites Containing In-Situ TiC and TiB Particles <i>H. Wang, H.M. Fu, H.F. Zhang, and Z.Q. Hu</i>	145
Characterization and Mechanical Behaviors	
Densification Mechanism in Warm Extrusion of Al-Ni-Ce-Fe-Cu Alloy Powder Containing Amorphous Phase	155
Y. Liu, Z. Liu, S. He, S. Guo, and B. Huang	
The Effect of Pre-Annealing on Crystallization and Deformation Behavior of a Zr-Based Bulk Metallic Glass	163
M.S. Kim, HJ. Jun, K.S. Lee, and Y.W. Chang	
Author Index	171
Subject Index	173