Artificially Induced Grain Alignment in Thin Films

MATERIALS RESEARCH SOCIETY
SYMPOSIUM PROCEEDINGS VOLUME 1150

Artificially Induced Grain Alignment in Thin Films

Symposium held December 2–3, 2008, Boston, Massachusetts, U.S.A.

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MRS

Materials Research Society
Warrendale, Pennsylvania

CAMBRIDGE UNIVERSITY PRESS
Cambridge, New York, Melbourne, Madrid, Cape Town,
Singapore, São Paulo, Delhi, Mexico City

Cambridge University Press
32 Avenue of the Americas, New York NY 10013-2473, USA

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org
Information on this title: www.cambridge.org/9781107408357

Materials Research Society
506 Keystone Drive, Warrendale, PA 15086
http://www.mrs.org

First published 2009
First paperback edition 2012

Single article reprints from this publication are available through
University Microfilms Inc., 300 North Zeeb Road, Ann Arbor, MI 48106

CODEN: MRSPDH

ISBN 978-1-107-40835-7 Paperback

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PREFACE

Thin film growth is a very old art and an established scientific field in materials science. Within this field, growth of monocrystal-like films has been practiced for many decades by making use of epitaxy on monocrystalline substrates. In the quest for greater control of materials, the next level of achievement would be to grow well-oriented thin films on arbitrary substrates, i.e., without the need of monocrystalline substrates. This is what is attempted by artificially inducing grain alignment in thin films. We use the term "artificially" to refer to film growth methods that do not utilize a monocrystalline substrate to obtain in-plane alignment. Uniaxial, out-of-plane film texture can be obtained for many materials by surface energy minimization. The absence of a template for epitaxy usually means that something else needs to determine the crystalline orientation in the plane of the film and break rotational symmetry. The source of this biaxial alignment can be an off-axis energetic beam impinging during deposition or the deposition flux itself. Over the last three decades a variety of methods for grain alignment have been demonstrated with varying degrees of success.

Symposium RR, "Artificially Induced Grain Alignment in Thin Films," held December 2–3 at the 2008 MRS Fall Meeting in Boston, Massachusetts, represents a first attempt to bring together researchers from around the world working on artificial grain alignment in films. Our particular emphasis for the symposium, based on our own experiences, was in physical vapor deposition methods for growth of inorganic thin films, with special attention paid to ion beam assisted deposition (IBAD) texturing. The symposium speakers and attendees represented a range of organizations from academia, national laboratories and industry. These proceedings capture some of about 40 presentations made at the symposium and some of the lively discussion. The symposium Round Table discussion session is transcribed starting on page 99.

We look forward to many exciting future developments in the field, and we feel confident that this field will radically change thin film growth and its applications. Grain alignment in films promises to be an enabler for a number of new technologies. We expect that a new generation of advanced film-based devices will result from the critical advancements in this field.

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September 2009

ACKNOWLEDGMENTS

We would like to thank the following organizations for their generous support for this symposium:

Materials Research Society

Bruker HTS

k-Space Associates Inc.

Staib Instruments Inc.

Los Alamos National Laboratory

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