

Reviews on Advanced Materials Science

Volume 1, Number 2, December 2000

Editorial Policy. The journal "Reviews on Advanced Materials Science" provides an international medium for the publication of reviews in the area of theoretical and experimental studies of advanced materials. Focuses are placed on nanostructured materials, high-transition-temperature superconductors, and high-melting point compounds. We encourage prospective authors to correspond with the principal editor before submitting an article. Proposals should include an outline with key citations. All papers submitted will be rigorously peer-reviewed prior to publication. The journal "Reviews on Advanced Materials Science" is published in both paper and electronic versions.

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FORTHCOMING PAPERS

Diffusion and related phenomena in bulk nanostructured materials

M.D.Baró et al

Universitat Autònoma de Barcelona, Spain

The paper reviews results of experimental and theoretical studies of diffusion and related phenomena (grain growth, creep, superplasticity) in bulk nanostructured materials. The particular attention is paid to the following: (i) Recent developments in fabrication of bulk nanostructured materials. (ii) Microstructural characterization of bulk nanostructured materials and their evolution during heating. (iii) Experimental study of grain boundary diffusion in bulk nanostructured materials. (iv) Theoretical modeling of grain boundary diffusion in bulk nanostructured materials. (v) Related phenomena (grain growth, creep, superplasticity) in bulk nanostructured materials.

Acid-base properties of melts of the M_2O - GeO_2 system (M= Li, Na, K)

S.A.Bessedina, V.G.Konakov and M.M.Shultz

Institute of Silicate Chemistry, Russian Academy of Sciences, St.Petersburg, Russia

In the article the problem of describing the acid-base properties of oxide melts is reviewed. Various versions of the acid-base equilibria description in terms of electroneutral particles, ion-molecular and oxygen components are considered.

Phase transformations in semiconductors under contact loading

V. Domnich and Y. Gogotsi

*Drexel University, Department of Materials Engineering,
Philadelphia, PA 19104, USA*

Phase transformations and amorphization that occur in many semiconductors under contact loading such as indentation with hard indenters, scratching or machining will be described. Contact loading is one of the most common mechanical impacts that materials can experience during processing or use. Examples are cutting, polishing, indentation testing, wear, friction and erosion. This kind of loading has a very significant nonhydrostatic component of stress that may lead to dramatic changes in the materials structure, such as amorphization and phase transformations. Simultaneously, processes of plastic deformation, fracture and interactions with the environment and/or counterbody can occur. The latter ones have been studied by mechanical engineers and tribologists, but the processes of phase transformations at the sharp contact have been investigated only for a very few materials and the data obtained so far can be only considered as preliminary. One of the reasons for the lack of information may be the fact that the problem is at the interface between at least three scientific fields, namely materials science, mechanics and solid state physics. Thus, an interdisciplinary approach is required to solve this problem and understand how and why a nonhydrostatic (shear) stress in the two-body contact can drive phase transformations in materials.

Misfit dislocation structures in single crystalline films

M. Yu. Gutkin

*Institute of Problems of Mechanical Engineering, Russian Academy of Sciences,
St. Petersburg, Russia*

Nucleation and development of misfit dislocation arrangements in thin-film single-crystalline structures are discussed. Various theories and recent experiments are reviewed with special attention being paid to the exact account for the influence of interphase boundaries. Other possibilities of strain accommodation in heteroepitaxial system (misfit dislocation walls and misfit disclinations) are also considered.

Disclinations in large-strain plastic deformation and work-hardening

M. Seefeldt

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B-3001 Heverlee, Belgium*

Large strain plastic deformation of f.c.c. metals at low homologous temperatures results in the subdivision of monocrystals or polycrystal grains into mesoscopic fragments and deformation bands. Since stage IV of single crystal work-hardening and the substructural contribution to the mechanical anisotropy emerge at about the same equivalent strain as the fragment structure, the latter is likely to be the reason for the new features in the macroscopic mechanical response. The present paper reviews some recent models which tackle the fragment structure development as well as its impact on the macroscopic mechanical response with the help of disclinations. Incidental or stress-induced formation of disclination dipoles and non-conservative propagation of disclinations are considered as «nucleation and growth» mechanisms for dislocation rotation boundaries. Propagating disclinations get immobilized in fragment boundaries to form new triple junctions with orientation mismatches and thus immobile disclinations with long-range stress fields. The substructure development is described in terms of dislocation and disclination density evolution equations; the immobile defect densities are coupled to flow or critical resolved shear stress contributions.

The first section presents a semi-phenomenological application to the cell and fragment structure development and their impact on the flow stress for either single crystals with symmetric orientation or polycrystals with constant average Taylor factor. The model is capable of reproducing stages III and IV of the work-hardening curve for copper. The second section presents an extension to a coupled substructure and texture development model. The substructure part is based on separate but coupled rate equations for dislocation and disclination densities in the 12 f.c.c. slip systems and for six cell wall and fragment boundary families. The texture part is based on a Taylor full constraints algorithm. This model is able to predict the cell and fragment structure development depending on the crystallite orientation. Coupling the immobile defect densities to critical resolved shear stress contributions reproduces the emerging substructural component of the mechanical anisotropy.

CALENDAR OF MEETINGS

July 1-6, 2001

"Nanoscale Materials and Technologies" Symposium, International Conference on Materials for Advanced Technologies (ICMAT 2001), MRS (Singapore), Singapore International Convention and Exhibition Center, Singapore

(Contact: P. Zee, AV Consultants Pte. Ltd., 232A River Valley Rd., Singapore 238290, FAX: +65-7352091, EMAIL: icmat2001@pacific.net.sg, WEBSITE: <http://www.mrs.org.sg/icmat2001>)

July 23-27, 2001

First International Conference on Applied Statistical Physics: Molecular Engineering (ASTATPHYS-MEX-2001), Cancun, Mexico

(Contact: M. Lozada-Cassou, Dept. of Physics, Universidad Autonoma Metropolitana, EMAIL: marcelozada@www.imp.mx, WEBSITE: <http://www.aspm2001.com.mx>)

July 29-August 3, 2001

Gordon Research Conference on "Clusters, Nanocrystals, & Nanostructures," Connecticut College, New London, Connecticut

(Contact: Gordon Research Conferences, 3071 Route 138, Kingston, RI 02881, FAX: 401-783-7644, EMAIL: grc@grcmail.grc.uri.edu, WEBSITE: <http://www.grc.uri.edu>)

August 12-17, 2001

Novel Synthesis and Processing of Nanostructured Coatings for Protection Against Degradation, Davos, Switzerland

(Organizers: Enrique J. Lavernia, Dept. of Chemical and Biochemical Engineering and Materials Science and Dept. of Mechanical and Aerospace Engineering, University of California USA; Christopher C. Berndt, SUNY at Stony Brook, Dept. of Materials Science and Engineering, USA; Julie M. Schoenung, Department of Civil and Environmental Engineering, University of California Irvine, USA; Horst Hahn, Thin Films Division, Institute of Materials Science, Darmstadt University of Technology, Germany; Lawrence Kabacoff, Office of Naval Research, USA; WEBSITE: <http://www.uefoundation.org>)

September 3-7, 2001

Science of Metastable and Nanocrystalline Alloys - Structure, Properties and Modeling, 22nd Risø International Symposium on Materials Science, Risø National Laboratory, Roskilde, Denmark

(Contact: The Secretariat, 22nd Risø International Symposium, Materials Research Department, Risø National Laboratory, P.O. Box 49, DK-4000 Roskilde, Denmark, FAX: +45-46775758, EMAIL: symp22@risoe.dk, WEBSITE: <http://www.risoe.dk/afm/symp22>)

September 7-11, 2001

First Seeheim Conference on Magnetism (Focus on Nanomagnetism): SCM2001, Lufthansa Training Center, Seeheim, Germany

(Contacts: M. Ghafari, H. Hahn, and J. Kuebler, Darmstadt University of Technology, Petersenstr. 23, 64287 Darmstadt, Germany, FAX: +49-6151-166335, EMAIL: scm@tu-darmstadt.de, WEBSITE: <http://www.tu-darmstadt.de/magnetism>)

September 10-14, 2001

Nanostructured Materials Symposium, 4th Yugoslav Materials Research Society Conference (YUCOMAT 2001), Herceg Novi, Yugoslavia

[Contacts: D. Uskokovic, Serbian Academy of Sciences, P.O. Box 745, Knez-Mihailova 35/IV, Belgrade 11000, Yugoslavia, FAX: +38-11-185263, EMAIL: uskok@itn.sanu.ac.yu; and J. Nedeljkovic, EMAIL: jowned@rt270.vin.bg.ac.yu; WEBSITE: <http://www.yu-mrs.org.yu>)

September 16-21, 2001

11th International Workshop on Glasses, Ceramics, Hybrids, and Nanocomposites from Gels, Abano Terme (Padova), Italy

(Contact: M. Guglielmi, Dipartimento di Ingegneria Meccanica, Settore Materiali, via Marzolo 9, 35131, Padova, Italy, FAX: +39-049-8275505, EMAIL: solgel01@ux1.unipd.it, WEBSITE: <http://www.unipd.it/solgel2001>)

September 19-21, 2001

2nd Georgia Tech Conference on Nanoscience and Nanotechnology, Georgia Institute of Technology, Atlanta, Georgia

(Contact: Z.L. Wang, Department Of Materials Science and Engineering, Georgia Institute of Technology, 778 Atlantic Dr., Atlanta, GA 30332-0245, FAX: 770-894-9140, EMAIL: cnngt@mse.gatech.edu, WEBSITE: http://www.conted.gatech.edu/programs/conferences_and_symposiums/main.html)

September 24-26, 2001

Symposium on Nanotechnology and Thermal Analysis, 29th Annual Conference of the North American Thermal Analysis Society, Adams Mark Hotel, St. Louis, Missouri

[Contact: R. Vaia, Air Force Research Laboratory, Wright Patterson AFB, Dayton, OH, FAX: 937-255-9157, EMAIL: richard.vaia@wpafb.af.mil, WEBPAGE: <http://www.natasinfo.org>)

September 30 - October 5, 2001

Nonstoichiometric Ceramics and Intermetallics, Barga, Italy

(Organizers: Rüdiger Dieckmann, Department of Materials Science and Engineering, Cornell University, USA; C.T. Liu, Metals and Ceramics Division, Oak Ridge National Laboratory, USA, WEBSITE: <http://www.uefoundation.org>)

October 1-4, 2001

"Nanomaterials" Symposium, Materials Week (International Congress on Advanced Materials, their Processes and Applications), International Congress Centre, Munich, Germany

[Contact: Materials Week Congress Office, c/o Werkstoffwoche-Partnerschaft, Hamburger Allee 26, D-60486 Frankfurt, Germany, FAX: +49-69-7917733, EMAIL: materialsweek@dgm.de, WEBSITE: <http://materialsweek.org>)

October 14-16, 2001

Fine, Ultrafine, and Nano Particles 2001, Holiday Inn Chicago City Center Hotel, Chicago, Illinois

(Contact: S. Faust, Conference Coordinator, Business Communications Co., Inc., 25 Van Zant St., Norwalk, CT 06855, FAX: 203-853-0348, EMAIL: conference@bccresearch.com)

October 28-29, 2001

First IEEE Workshop on Nanotechnology (**IEEE-NANO 2001**), Outrigger Wailea Resort, Maui, Hawaii

(Contacts: T. Fukuda, Center for Cooperative Research in Advanced Science and Technology, Nagoya Univ., 1, Furo-cho, Chikusa-ku, Nagoya 464-8603, Japan, FAX: +81-52-7893115, EMAIL: fukuda@mein.nagoya-u.ac.jp; R. Shull, NIST, 100 Bureau Dr., MS8552, Gaithersburg, MD 20899-8552, EMAIL: shull@nist.gov; WEBSITE: <http://www.mein.nagoya-u.ac.jp/IEEE-NANO> [after Jan 10, 2001])

October 29-November 2, 2001

Nanotubes: Science and Technology, AVS 48th International Symposium, Moscone Convention Center, San Francisco, California

(Contacts: M. Meyyappan, NASA Ames Research Center, MS 229-3, Moffett Field, CA 94035-1000, FAX: 650-604-5244, EMAIL: meyya@orbit.arc.nasa.gov; S. Sinnott, University of Florida; and P. Ajayan, Rensselaer Polytechnic Institute, WEBSITE: <http://www.vacuum.org>)

October 31-November 2, 2001

2001 International Microprocesses and Nanotechnology Conference (MNC 2001), Kunibiki Messe, Matsue-shi, Shimane, Japan

(Contact: Secretariat-MNC 2001, Business Center for Academic Societies Japan, Conference Dept., 5-16-9 Honkomagome, Bunkyo-ku, Tokyo 113-8622, Japan, FAX: +81-3-58145823, EMAIL: mnc@bcasj.or.jp, WEBSITE: <http://vip.nano.ee.es.osaka-u.ac.jp/mnc>)

November 5-8, 2001

Symposium on Nanomaterials and Nanotechnologies, ASM International Materials Solutions 2001 Conference, Indianapolis, Indiana

[Contact: S. Raghunathan, President, Nanomat, Inc., 1061 Main Street, Bldg. 1, Drawer 18, North Huntingdon, PA 15642-7425, FAX: 724-861-6119, EMAIL: sraghunathan@nanomat.com, WEBSITE: <http://www.asminternational.org>)

November 9-11, 2001

9th Foresight Institute Conference on Molecular Nanotechnology, The Westin Hotel, Santa Clara, California
(Contact: Foresight Institute, Box 61058, Palo Alto, CA 94306, EMAIL: foresight@foresight.org, WEBSITE:
<http://www.foresight.org/conference>)

February 17-21, 2002

International Symposium on Science and Technology of Interfaces in Honor of Dr. Bhakta Rath, 2002
TMS Annual Meeting, Seattle, Washington, USA
(Organizers: S. Ankem: University of Maryland, USA; I.A. Ovid'ko, Institute of Problems of Mechanical
Engineering, Russia; C.S. Pande, Naval Research Laboratory, USA; S. Ranganathan: Indian Institute of
Science, India; WEBSITE: <http://cms.tms.org/domino/published/cms/conf-man.nsf/>)

June 16-21, 2002

NANO 2002, 6th International Conference on Nanostructured Materials, Rosen Centre Hotel, Orlando,
Florida
(Contacts: L. Kabacoff, Office of Naval Research, Materials Division #332, 800 North Quincy St., Arling-
ton, VA 22217-5660, FAX: 703-696-0934, EMAIL: Kabacol@onr.navy.mil; E. Lavernia, University of
California-Irvine, EMAIL: lavernia@uci.edu; and M. Trudeau, Hydro-Quebec Research Institute, EMAIL:
trudeau.michel@ireq.ca)

July 1-5, 2002

2nd International workshop, "Nucleation and Non-Linear Problems in the First-Order Phase Transitions"
(NPT'2002), St.-Petersburg, Russia
(Organizers: D.M. Klimov, Russia; J.L. Katz, USA; S.A. Kukushkin, Russia; G. Shi, USA; WEBSITE:
<http://www.ipme.ru/ipme/conf/npt2002/Npt2002.htm>)

August 25-30, 2002

11th International Conference on Rapidly Quenched and Metastable Materials (RQ11), University of
Oxford, Oxford, England
[Contacts: B. Cantor and K. O'Reilly, RQ11 Conference Organizers, Beggars Roost, Channels End
Road, Colmworth, Bedford MK44 2NS, U.K., FAX: +44-1234-376219, EMAIL: rq11@materials.ox.ac.uk,
WEBSITE: <http://www.materials.ox.ac.uk/rq11>)

The updated list of future meetings on nanostructured materials may be found on the web-site:
<http://www.metallurgy.nist.gov/magnet/shull/nanomeet.html>

To list an event in the Calendar of Meetings, please contact Dr. Ivan Archakov,
e-mail: mpm@def.ipme.ru

NEW JOURNAL

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- Superlattices, Quantum Dots, Quantum Wires, Quantum Wells, Nanoscale Thin Films;
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- Supramolecules, Dendrimers, Self-Assemblies, Low-dimension Structures;
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A cover sheet should be included that contains the complete title, the names, affiliations, mailing addresses of the authors, fax and e-mail address of the corresponding author and the abstract.

TITLE – bold, centered. (14 pt)

Author(s) – bold, centered, e.g. **S. R. Brown and T. Klein**

Affiliation(s) – centered, complete postal address for all authors, e-mail address of corresponding author.

ABSTRACT. About 150-200 words.

Tables: type each table on the separate page, number consecutively in arabic numerals and supply a heading.

References:

References should be indicated in the text by consecutive numbers in square parentheses, e.g. [1,2,5-7], as a part of the text, the full reference being cited at the end of the text. References should contain the names of the authors together with their initials, the title of the journal, volume number, year and the first page number as illustrated below. References to books should contain the names of the authors, the title (the names of editors), the publisher name, location and year, as illustrated below.

REFERENCES

[1] R. Birringer, H. Gleiter, H.P. Klein and P. Marquardt // *Phys. Lett.* **102** (1984) 365.

[2] F.R. Nabarro, *Theory of Crystal Dislocations* (Clarendon Press, Oxford, 1967).

[3] V. Provenzano, In: *Nanostructured Materials: Science and Technology*, ed. by G.-M. Chow and N.I. Noskova (Kluwer, Dordrecht, 1998), p. 335.

Figures:

For best results submit illustrations in the actual size at which they should be published. The line drawings of the original should be laser printed, the photographs should be original, with somewhat more contrast than is required in the printed version. Each figure should be typed on separate page, the listing of the figure captions must be included.

Equations must be clearly printed and numbered sequentially with arabic numbers enclosed with round parentheses at the right-hand margin.

Units – the authors are encouraged to use the SI-units, other units are also acceptable.

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