

Editorial Board:

**A. Abe · A.-C. Albertsson · K. Dušek · W.H. de Jeu
J.-F. Joanny · H.-H. Kausch · S. Kobayashi
K.-S. Lee · L. Leibler · T.E. Long · I. Manners
M. Möller · E.M. Terentjev · M. Vicent · B. Voit
G. Wegner · U. Wiesner**

Advances in Polymer Science

Recently Published and Forthcoming Volumes

Polymer Characterization

Vol. 230, 2010

Modern Techniques for Nano- and Microreactors/-reactions

Volume Editor: Caruso, F.

Vol. 229, 2010

Complex Macromolecular Systems II

Volume Editors: Müller, A.H.E.,

Schmidt, H.-W.

Vol. 228, 2010

Complex Macromolecular Systems I

Volume Editors: Müller, A.H.E.,

Schmidt, H.-W.

Vol. 227, 2010

Shape-Memory Polymers

Volume Editor: Lendlein, A.

Vol. 226, 2010

Polymer Libraries

Volume Editors: Meier, M.A.R., Webster, D.C.

Vol. 225, 2010

Polymer Membranes/Biomembranes

Volume Editors: Meier, W.P., Knoll, W.

Vol. 224, 2010

Organic Electronics

Volume Editors: Meller, G., Grasser, T.

Vol. 223, 2010

Inclusion Polymers

Volume Editor: Wenz, G.

Vol. 222, 2009

Advanced Computer Simulation Approaches for Soft Matter Sciences III

Volume Editors: Holm, C., Kremer, K.

Vol. 221, 2009

Self-Assembled Nanomaterials II

Nanotubes

Volume Editor: Shimizu, T.

Vol. 220, 2008

Self-Assembled Nanomaterials I

Nanofibers

Volume Editor: Shimizu, T.

Vol. 219, 2008

Interfacial Processes and Molecular Aggregation of Surfactants

Volume Editor: Narayanan, R.

Vol. 218, 2008

New Frontiers in Polymer Synthesis

Volume Editor: Kobayashi, S.

Vol. 217, 2008

Polymers for Fuel Cells II

Volume Editor: Scherer, G.G.

Vol. 216, 2008

Polymers for Fuel Cells I

Volume Editor: Scherer, G.G.

Vol. 215, 2008

Photoresponsive Polymers II

Volume Editors: Marder, S.R., Lee, K.-S.

Vol. 214, 2008

Photoresponsive Polymers I

Volume Editors: Marder, S.R., Lee, K.-S.

Vol. 213, 2008

Polyfluorenes

Volume Editors: Scherf, U., Neher, D.

Vol. 212, 2008

Chromatography for Sustainable Polymeric Materials

Renewable, Degradable and Recyclable

Volume Editors: Albertsson, A.-C.,

Hakkarainen, M.

Vol. 211, 2008

Wax Crystal Control · Nanocomposites Stimuli-Responsive Polymers

Vol. 210, 2008

Functional Materials and Biomaterials

Vol. 209, 2007

Polymer Characterization

Rheology, Laser Interferometry, Electrooptics

Volume Editors: Karel Dušek
Jean-François Joanny

With contributions by

J.-F. Berret · V.A. Bershtein · D. Bogdal · S. Lerouge
K. Matras-Postolek · P.N. Yakushev

 Springer

Editors

Karel Dušek
Institute of Macromolecular Chemistry
Czech Academy of Sciences
of the Czech Republic
Heyrovský Sq. 2
16206 Prague 6, Czech Republic
dusek@imc.cas.cz

Jean-François Joanny
Institut Curie
Physiochimie Curie
Rue d'Ulm 26
75248 Paris Cedex 05
France
jean-francois.joanny@curie.fr

ISSN 0065-3195

e-ISSN 1436-5030

ISBN 978-3-642-13531-6

e-ISBN 978-3-642-13532-3

DOI 10.1007/978-3-642-13532-3

Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2010930980

© Springer-Verlag Berlin Heidelberg 2010

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilm or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

The use of general descriptive names, registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Cover design: WMXDesign GmbH, Heidelberg

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Volume Editors

Karel Dušek

Institute of Macromolecular Chemistry
Czech Academy of Sciences
of the Czech Republic
Heyrovský Sq. 2
16206 Prague 6, Czech Republic
dusek@imc.cas.cz

Jean-François Joanny

Institut Curie
Physiochimie Curie
Rue d'Ulm 26
75248 Paris Cedex 05
France
jean-francois.joanny@curie.fr

Editorial Board

Prof. Akihiro Abe

Professor Emeritus
Tokyo Institute of Technology
6-27-12 Hiyoshi-Honcho, Kohoku-ku
Yokohama 223-0062, Japan
aabe34@xc4.so-net.ne.jp

Prof. Hans-Henning Kausch

Ecole Polytechnique Fédérale de Lausanne
Science de Base
Station 6
1015 Lausanne, Switzerland
kausch.cully@bluewin.ch

Prof. A.-C. Albertsson

Department of Polymer Technology
The Royal Institute of Technology
10044 Stockholm, Sweden
aila@polymer.kth.se

Prof. Shiro Kobayashi

R & D Center for Bio-based Materials
Kyoto Institute of Technology
Matsugasaki, Sakyo-ku
Kyoto 606-8585, Japan
kobayash@kit.ac.jp

Prof. Karel Dušek

Institute of Macromolecular Chemistry
Czech Academy of Sciences
of the Czech Republic
Heyrovský Sq. 2
16206 Prague 6, Czech Republic
dusek@imc.cas.cz

Prof. Kwang-Sup Lee

Department of Advanced Materials
Hannam University
561-6 Jeonmin-Dong
Yuseong-Gu 305-811
Daejeon, South Korea
kslee@hnu.kr

Prof. Dr. Wim H. de Jeu

Polymer Science and Engineering
University of Massachusetts
120 Governors Drive
Amherst MA 01003, USA
dejeu@mail.pse.umass.edu

Prof. L. Leibler

Matière Molle et Chimie
Ecole Supérieure de Physique
et Chimie Industrielles (ESPCI)
10 rue Vauquelin
75231 Paris Cedex 05, France
ludwik.leibler@espci.fr

Prof. Timothy E. Long
Department of Chemistry
and Research Institute
Virginia Tech
2110 Hahn Hall (0344)
Blacksburg, VA 24061, USA
telong@vt.edu

Prof. Ian Manners
School of Chemistry
University of Bristol
Cantock's Close
BS8 1TS Bristol, UK
ian.manners@bristol.ac.uk

Prof. Martin Möller
Deutsches Wollforschungsinstitut
an der RWTH Aachen e.V.
Pauwelsstraße 8
52056 Aachen, Germany
moeller@dwf.rwth-aachen.de

Prof. E.M. Terentjev
Cavendish Laboratory
Madingley Road
Cambridge CB 3 0HE, UK
emt1000@cam.ac.uk

Maria Jesus Vicent, PhD
Centro de Investigacion Principe Felipe
Medicinal Chemistry Unit
Polymer Therapeutics Laboratory
Av. Autopista del Saler, 16
46012 Valencia, Spain
mjvicent@cipf.es

Prof. Brigitte Voit
Institut für Polymerforschung Dresden
Hohe Straße 6
01069 Dresden, Germany
voit@ipfdd.de

Prof. Gerhard Wegner
Max-Planck-Institut
für Polymerforschung
Ackermannweg 10
55128 Mainz, Germany
wegner@mpip-mainz.mpg.de

Prof. Ulrich Wiesner
Materials Science & Engineering
Cornell University
329 Bard Hall
Ithaca, NY 14853, USA
ubw1@cornell.edu

Advances in Polymer Sciences

Also Available Electronically

Advances in Polymer Sciences is included in Springer's eBook package *Chemistry and Materials Science*. If a library does not opt for the whole package, the book series may be bought on a subscription basis. Also, all back volumes are available electronically.

For all customers who have a standing order to the print version of *Advances in Polymer Sciences*, we offer the electronic version via SpringerLink free of charge.

If you do not have access, you can still view the table of contents of each volume and the abstract of each article by going to the SpringerLink homepage, clicking on "Browse by Online Libraries", then "Chemical Sciences", and finally choose *Advances in Polymer Science*.

You will find information about the

- Editorial Board
- Aims and Scope
- Instructions for Authors
- Sample Contribution

at springer.com using the search function by typing in *Advances in Polymer Sciences*.

Color figures are published in full color in the electronic version on SpringerLink.

Aims and Scope

The series *Advances in Polymer Science* presents critical reviews of the present and future trends in polymer and biopolymer science including chemistry, physical chemistry, physics and material science. It is addressed to all scientists at universities and in industry who wish to keep abreast of advances in the topics covered.

Review articles for the topical volumes are invited by the volume editors. As a rule, single contributions are also specially commissioned. The editors and publishers will, however, always be pleased to receive suggestions and supplementary information. Papers are accepted for *Advances in Polymer Science* in English.

In references *Advances in Polymer Sciences* is abbreviated as *Adv Polym Sci* and is cited as a journal.

Special volumes are edited by well known guest editors who invite reputed authors for the review articles in their volumes.

Impact Factor in 2009: 4.600; Section “Polymer Science”: Rank 4 of 73

Publisher’s Note for Volumes with Independent Contributions

This volume was not originally planned as a topical volume by the stated Volume Editors. It contains substantial review articles on interesting and valuable subjects which were invited and reviewed by the stated Editors on an independent basis and then – upon receipt – put together in one volume by the Publisher.

Marion Hertel
Executive Editor Chemistry, Springer

Contents

Shear-Induced Transitions and Instabilities in Surfactant Wormlike Micelles	1
Sandra Lerouge and Jean-François Berret	
Laser-Interferometric Creep Rate Spectroscopy of Polymers	73
Vladimir A. Bershtein and Pavel N. Yakushev	
Polymer Nanocomposites for Electro-Optics: Perspectives on Processing Technologies, Material Characterization, and Future Application	221
Katarzyna Matras-Postolek and Dariusz Bogdal	
Index	283