

# polymer

the international journal for the science and technology of polymers

[www.elsevier.com/locate/polymer](http://www.elsevier.com/locate/polymer)



## AIMS AND SCOPE

*Polymer* publishes *original* research from all areas of polymer science and technology, with emphasis on molecular or meso-scale interpretation of data. Papers from new emerging areas of the field are particularly welcome. In addition to regular articles and communications, the journal also publishes review articles, usually invited by the Editors.

### *Polymer* (ISSN 0032-3861)

#### Publishing and Subscription Offices

Elsevier Ltd, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, UK. Tel: +44(0) 1865 843000, Fax: +44(0) 1865 843010.

**Advertising information:** Advertising orders and enquiries can be sent to: **USA, Canada and South America:** Mr Tino DeCarlo, The Advertising Department, Elsevier Inc., 360 Park Avenue South, New York, NY 10010-1710, USA; phone: (+1) (212) 633 3815; fax: (+1) (212) 633 3820; e-mail: t.decarlo@elsevier.com. **Europe and ROW:** Katrina Barton, Advertising Department, Elsevier Limited, 84 Theobald's Road, London WC1X 8RR, UK; phone (+44) 207 6114117; fax: (+44) 207 4463; e-mail: k.barton@elsevier.com.

#### Frequency: Published biweekly

**Publication information:** *Polymer* (ISSN 0032-3861). For 2006, volume 47 is scheduled for publication. Subscription prices are available upon request from the Publisher or from the Regional Sales Office nearest you or from this journal's website (<http://www.elsevier.com/locate/polymer>). Further information is available on this journal and other Elsevier products through Elsevier's website: (<http://www.elsevier.com>). Subscriptions are accepted on a prepaid basis only and are entered on a calendar year basis. Issues are sent by standard mail (surface within Europe, air delivery outside Europe). Priority rates are available upon request. Claims for missing issues should be made within six months of the date of dispatch.

**Orders, claims, and journal enquiries:** please contact the Customer Service Department at the Regional Sales Office nearest you:

**Orlando:** Elsevier, Customer Service Department, 6277 Sea Harbor Drive, Orlando, FL 32887-4800, USA; phone: (877) 8397126 or (800) 6542452 [toll free numbers for US customers], (+1) (407) 3454020 or (+1) (407) 3454000 [customers outside US]; fax: (+1) (407) 3631354 or (+1) (407) 3639661; e-mail: usjcs@elsevier.com or elspsc@elsevier.com

**Amsterdam:** Elsevier, Customer Service Department, PO Box 211, 1000 AE Amsterdam, The Netherlands; phone: (+31) 20 4853757; fax: (+31) 20 4853432; e-mail: nlinfo-f@elsevier.com

**Tokyo:** Elsevier, Customer Service Department, 4F Higashi-Azabu, 1-Chome Bldg, 1-9-15 Higashi-Azabu, Minato-ku, Tokyo 106-0044, Japan; phone: (+81) (3) 5561 5037; fax: (+81) (3) 5561 5047; e-mail: jp.info@elsevier.com

**Singapore:** Elsevier, Customer Service Department, 3 Killiney Road, #08-01 Winsland House I, Singapore 239519; phone: (+65) 63490222; fax: (+65) 67331510; e-mail: asiainfo@elsevier.com

**USA mailing notice:** *Polymer* (ISSN 0032-3861) is published 26 issues per year bimonthly, by Elsevier Ltd, (P.O. Box 211, 1000 AE Amsterdam, The Netherlands). Annual subscription in the USA US\$ 6943 (valid in North, Central and South America), including air speed delivery. Periodical postage rate paid at Jamaica, NY 11431.

**USA POSTMASTER:** Send address changes to *Polymer*, Elsevier, 6277 Sea Harbour Drive, Orlando, FL 32887-4900.

**AIRFREIGHT AND MAILING:** In the USA by Publications Expediting Inc., 200 Meacham Avenue, Elmont, NY 11003.

© 2006 Elsevier Ltd. All rights reserved.

This journal and the individual contributions contained in it are protected under copyright by Elsevier Ltd, and the following terms and conditions apply to their use:

#### Photocopying

Single photocopies of single articles may be made for personal use as allowed by national copyright laws. Permission of the publisher and payment of a fee is required for all other photocopying, including multiple or systematic copying, copying for advertising or promotional purposes, resale, and all forms of document delivery. Special rates are available for educational institutions that wish to make photocopies for non-profit educational classroom use.

Permissions may be sought directly from Elsevier Rights Department in Oxford, UK; phone: (+44) 1865 843830, fax: (+44) 1865 853333, e-mail: permissions@elsevier.com. Requests may also be completed on-line via the Elsevier homepage (<http://www.elsevier.com/locate/permissions>).

In the USA, users may clear permissions and make payments through the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, USA; phone: (+1) (978) 7508400, fax: (+1) (978) 7504744, and in the UK through the Copyright Licensing Agency Rapid Clearance Service (CLARCS), 90 Tottenham Court Road, London W1P 0LP, UK; phone: (+44) 20 7631 5555; fax: (+44) 20 7631 5500. Other countries may have a local reprographic rights agency for payments.

#### Derivative Works

Subscribers may reproduce tables of contents or prepare lists of articles including abstracts for internal circulation within their institutions. Permission of the publisher is required for resale or distribution outside the institution.

Permission of the publisher is required for all other derivative works, including compilations and translations

#### Electronic Storage or Usage

Permission of the publisher is required to store or use electronically any material contained in this journal, including any article or part of an article.

Except as outlined above, no part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior written permission of the publisher.

Address permissions requests to: Elsevier Rights Department, at the mail, fax and e-mail addresses noted above.

#### Notice

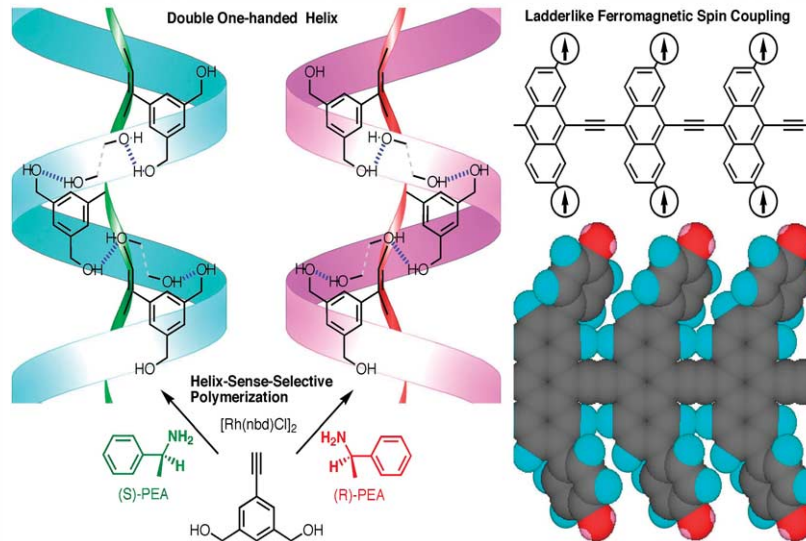
No responsibility is assumed by the publisher for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions or ideas contained in the material herein. Because of rapid advances in the medical sciences, in particular, independent verification of diagnoses and drug dosages should be made.

Although all advertising material is expected to conform to ethical (medical) standards, inclusion in this publication does not constitute a guarantee or endorsement of the quality or value of such product or of the claims made of it by its manufacturer.

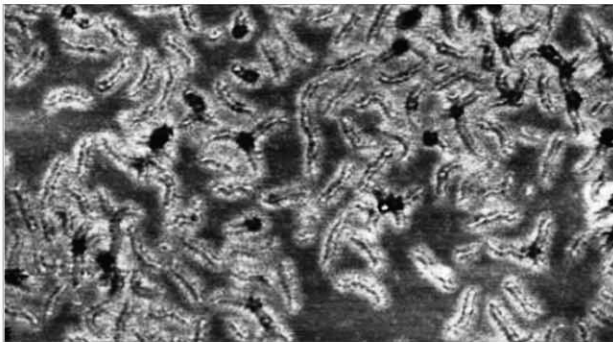
© The paper used in this publication meets the requirements of ANSI/NISO Z39.48-1992 (Permanence of Paper)

Typeset and printed by the Alden Group, Oxford.

## Cover Images

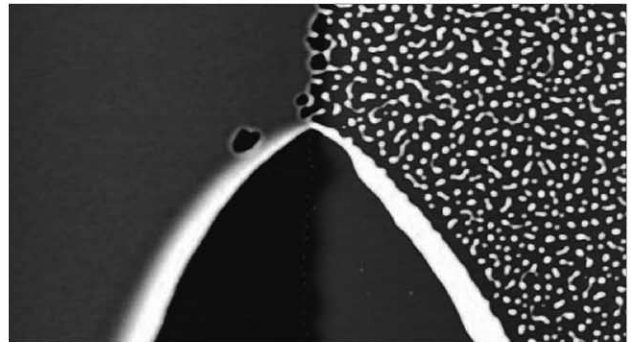


Courtesy of T. Aoki, T. Kaneko and M. Teraguchi, Niigata University, Ikarashi, Niigata, Japan [From Polymer 2006; 47(14): 4867–4892]



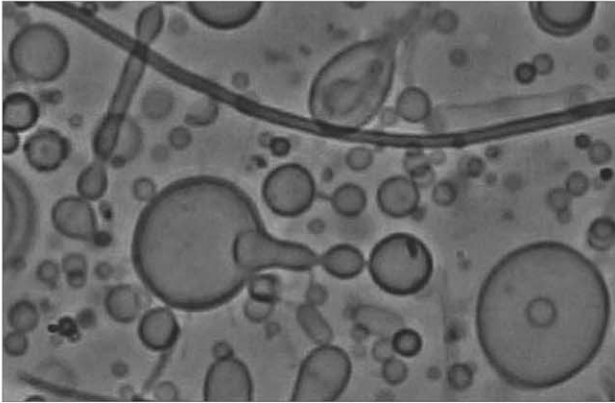
Core-shell nanocylinders (polymer Brushes) with 1500 poly(acrylic acid)-b-poly(n-butyl acrylate) side-chains each. AFM phase image on mica,  $2\ \mu\text{m} \times 2\ \mu\text{m}$

Courtesy of Mingfu Zhang and Axel H. E. Müller, University of Bayreuth, Germany



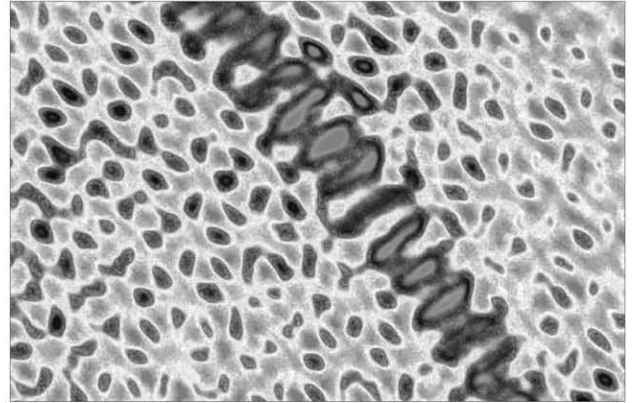
$(15\ \mu\text{m})^2$  AFM scan of a 5 nm thick polystyrene film on a Si wafer that has been covered partly by a MgF<sub>2</sub> layer (on the right side of the image). The MgF<sub>2</sub> layer changes the effective interface potential of the system such that the polystyrene film is unstable and beads off via spinodal dewetting. The wedge was generated during the spin coating of the PS film from toluene solution. The spreading of the solution was somehow hindered at the top of the wedge

Courtesy of Ralf Seemann, University of Ulm, Dept. of Applied Physics, D-89069 Ulm, Germany, Karin Jacobs, Saarland University, Dept. of Experimental Physics, D-66123 Saarbrücken, Germany



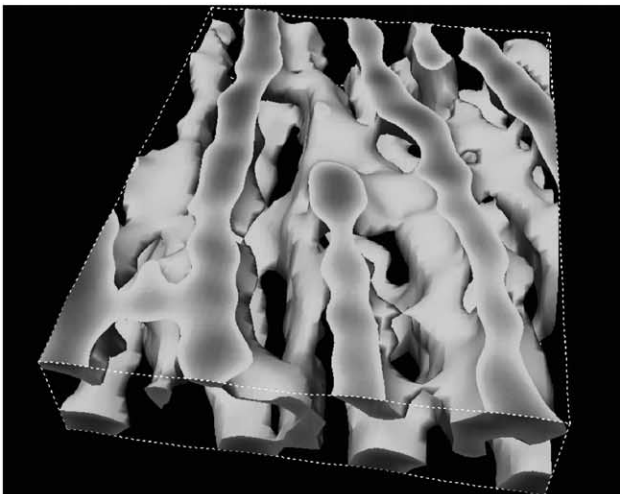
An image from an optical micrograph showing giant block copolymer vesicles exhibiting fascinating shapes

Courtesy of Stephan Förster, University of Hamburg



A TEM picture showing a defect in double-gyroid-network ordered phase in a block copolymer/homopolymer blend

Courtesy of Tadashi Matsushita, Hirokazu Hasegawa, and Takeji Hashimoto, University of Kyoto, Japan



An experimental 3d image of a microdomain structure of a Kraton-like block-copolymer, taken by Nanotomography, a new volume imaging technique based on AFM. It shows a 200 x 160 x 45 nm portion of the material

Courtesy of Robert Magerle, University of Bayreuth, Germany

From R. Magerle "Nanotomography", Phys.Rev.Lett. 85, 2749 (2000).  
© American Physical Society, 2000. Reproduced with the kind permission of the author



Lamellar crystals of the monodisperse centrally-branched alkane  $C_{96}H_{193}.CH(C_4H_9)$ .  $C_{94}H_{189}$  form cylindrical tubes at high crystallization temperatures with all branches on the outside of the tube. Surface packing considerations must, therefore, outweigh distortion of the crystal lattice

Courtesy of HM White, IL Hosier and DC Bassett, University of Reading, UK

Reprinted with permission from Macromolecules, August 27, 2002, 35, 6763-6765. © American Chemical Society, 2002

# polymer

the international journal for the science and technology of polymers

[www.elsevier.com/locate/polymer](http://www.elsevier.com/locate/polymer)

## FEATURE ARTICLE

- 4867** Synthesis of functional  $\pi$ -conjugated polymers from aromatic acetylenes  
**T. Aoki, T. Kaneko, M. Teraguchi**

## POLYMER COMMUNICATIONS

- 4893** Thermo-optic coefficients of polymers for optical waveguide applications  
**Z. Zhang, P. Zhao, P. Lin and F. Sun**
- 4897** SANS study of the early stages of crystallization in polyethylene solutions  
**H. Wang**
- 4901** Continuous aligned polymer fibers produced by a modified electrospinning method  
**H. Pan, L. Li, L. Hu and X. Cui**

## POLYMER PAPERS

- 4905** Synthesis and self-association in aqueous media of poly(ethylene oxide)/poly(ethyl glycidyl carbamate) amphiphilic block copolymers  
**P. Dimitrov, A. Utrata-Wesołek, S. Rangelov W. Wałach, B. Trzebicka and A. Dworak**
- 4916** Nylon surface modification. Part 1. Targeting the amide groups for selective introduction of reactive functionalities  
**X. Jia, M. Herrera-Alonso and T.J. McCarthy**
- 4925** Synthesis and characterization of novel monomers and polymers containing chiral (-)-menthyl groups  
**J.-H. Liu and P.-C. Yang**
- 4936** Soluble polyimides containing *trans*-diaminotetraphenylporphyrin: Synthesis and photoinduced electron transfer  
**W. Anannarukan, S. Tantayanon, D. Zhang E.A. Alemán, D.A. Modarelli and F.W. Harris**
- 4946** Synthesis and properties of readily recyclable polymers from bisfuranic terminated poly(ethylene adipate) and multi-maleimide linkers  
**M. Watanabe and N. Yoshie**

- 4953** Electrosynthesis of poly(3,4-ethylenedioxythiophene) microcups in the aqueous solution of LiClO<sub>4</sub> and tri(ethylene glycol)  
**Y. Gao, L. Zhao, C. Li and G. Shi**

- 4959** The influence of monomer types on the colloidal stability in the miniemulsion copolymerization involving alkoxysilane monomer  
**Y. Luo, H. Xu and B. Zhu**

- 4967** Novel chemical-bonded polymerizable sulfur-containing photoinitiators comprising the structure of planar *N*-phenylmaleimide and benzophenone for photopolymerization  
**H. Wang, J. Wei, X. Jiang and J. Yin**

- 4976** Green electroluminescent polyfluorenes containing 1,8-naphthalimide moieties as color tuner  
**C. Mei, G. Tu, Q. Zhou, Y. Cheng, Z. Xie, D. Ma, Y. Geng and L. Wang**

- 4985** 'Nano-tree'—type spherical polymer brush particles as templates for metallic nanoparticles  
**Y. Lu, Y. Mei, R. Walker, M. Ballauff and M. Drechsler**

- 4996** The development and characterisation of polyaniline—single walled carbon nanotube composite fibres using 2-acrylamido-2 methyl-1-propane sulfonic acid (AMPSA) through one step wet spinning process  
**V. Mottaghitalab, G.M. Spinks and G.G. Wallace**

- 5003** Ex situ hydrolytic degradation of sulfonated polyimide membranes for fuel cells  
**G. Meyer, C. Perrot, G. Gebel, L. Gonon, S. Morlat and J.-L. Gardette**

- 5012** Batch foaming of poly( $\epsilon$ -caprolactone) using carbon dioxide: Impact of crystallization on cell nucleation as probed by ultrasonic measurements  
**J. Reignier, J. Tatibouët and R. Gendron**

- 5025** Determination of reactivity ratios and swelling characteristics of 'stimuli' responsive copolymers of *N*-acryloyl-*N'*-ethyl piperazine and MMA  
**G.R. Deen and L.H. Gan**

- 5035** Crystallization behavior of star-shaped poly(ethylene oxide) with cubic silsesquioxane (CSSQ) core  
**K.Y. Mya, K.P. Pramoda and C.B. He**
- 5044** Proton exchange membranes based on poly(vinylidene fluoride) and sulfonated poly(ether ether ketone)  
**S. Xue and G. Yin**
- 5050** Softening and melting mechanisms of polyamides interfering with sliding stability under adhesive conditions  
**P. Samyn, G. Schoukens, I. Van Driessche, J. Van Craenenbroeck and F. Verpoort**
- 5066** Nanohole volume dependence on the cure schedule in epoxy thermosetting networks: A PALS study  
**W. Salgueiro, J. Ramos, A. Somoza, S. Goyanes and I. Mondragón**
- 5071** High temperature behaviour of the crystalline phases in unfilled and clay-filled nylon 6 fibers  
**C. Ibanes, M. de Boissieu, L. David and R. Seguela**
- 5080** Diffusion of liquids in molten polymers: Mutual diffusion coefficient dependence on liquid miscibility and polymer molar mass  
**R. Bella, P. Cassagnau, F. Fenouillot, L. Falk and C. Lacoste**
- 5090** Crosslinking induced volume expansion in the glass state  
**X. Wang and V.J. Foltz**
- 5097** Structural studies of electrospun cellulose nanofibers  
**C.-W. Kim, D.-S. Kim, S.-Y. Kang, M. Marquez and Y.L. Joo**
- 5108** Effect of oscillatory shear on the interfacial morphology of a reactive bilayer polymer system  
**H.Y. Kim, D.H. Lee and J.K. Kim**
- 5117** Vibrational dynamics and heat capacity in syndiotactic poly(propylene) form I  
**V. Saxena, A. Pathak, P. Tandon, V.D. Gupta and M. Singh**
- 5124** Micromolding of PDMS scaffolds and microwells for tissue culture and cell patterning: A new method of microfabrication by the self-assembled micropatterns of diblock copolymer micelles  
**Y. Mi, Y. Chan, D. Trau, P. Huang and E. Chen**
- 5131** Intercalation and viscoelasticity of poly(ether-block-amide) copolymer/montmorillonite nanocomposites: Effect of surfactant  
**I.-K. Yang and P.-H. Tsai**
- 5141** Electric activity in rigid rod-like polymer, poly( $\beta$ -hydroxybutyrate)  
**A. Sugita, M. Mitsubayashi and S. Tasaka**
- 5145** Time–electric field superposition in electrically activated polypropylene/layered silicate nanocomposites  
**J.U. Park, Y.S. Choi, K.S. Cho, D.H. Kim, K.H. Ahn and S.J. Lee**
- 5154** Vibrational dynamics of *trans*-1,4-polyisoprene ( $\beta$ -form)  
**A. Pathak, V. Saxena, P. Tandon and V.D. Gupta**
- 5161** Synthesis and crystallization kinetics of silsesquioxane-based hybrid star poly( $\epsilon$ -caprolactone)  
**J. Xu and W. Shi**
- 5174** Large tensile deformation behavior of PC/ABS alloy  
**Q.-Z. Fang, T.J. Wang and H.-M. Li**
- 5182** Microphase separation in ABA triblock copolymer-based model conetworks in the bulk: Effect of loop formation  
**M. Karbarz, Z. Stojek, T.K. Georgiou and C.S. Patrickios**
- 5187** A molecular thermodynamic model for binary lattice polymer solutions  
**J. Yang, Q. Yan, H. Liu and Y. Hu**
- 5196** Insight into molecular interactions between constituents in polymer clay nanocomposites  
**D. Sikdar, D.R. Katti, K.S. Katti and R. Bhowmik**
- 5206** Molecular dynamics simulation of diffusion of gases in pure and silica-filled poly(1-trimethylsilyl-1-propyne) [PTMSP]  
**J.-H. Zhou, R.-X. Zhu, J.-M. Zhou and M.-B. Chen**
- 5213** The effect of chain interpenetration on an ordering process in the early stage of polymer crystal nucleation  
**Z. Zhang and X. Yang**

## Author Index

Ahn, K. H. 5145  
 Alemán, E. A. 4936  
 Anannarukan, W. 4936  
 Aoki, T. 4867  
 Ballauff, M. 4985  
 Bella, R. 5080  
 Bhowmik, R. 5196  
 Cassagnau, P. 5080  
 Chan, Y. 5124

Chen, E. 5124  
 Chen, M.-B. 5206  
 Cheng, Y. 4976  
 Cho, K. S. 5145  
 Choi, Y. S. 5145  
 Cui, X. 4901  
 David, L. 5071  
 de Boissieu, M. 5071  
 Deen, G. R. 5025  
 Dimitrov, P. 4905

Drechsler, M. 4985  
 Dworak, A. 4905  
 Falk, L. 5080  
 Fang, Q.-Z. 5174  
 Fenouillot, F. 5080  
 Foltz, V. J. 5090  
 Gan, L. H. 5025  
 Gao, Y. 4953

Gardette, J.-L. 5003  
Gebel, G. 5003  
Gendron, R. 5012  
Geng, Y. 4976  
Georgiou, T. K. 5182  
Gonon, L. 5003  
Goyanes, S. 5066  
Gupta, V. D. 5117, 5154

Harris, F. W. 4936  
He, C. B. 5035  
Herrera-Alonso, M. 4916  
Hu, L. 4901  
Hu, Y. 5187  
Huang, P. 5124

Ibanes, C. 5071

Jia, X. 4916  
Jiang, X. 4967  
Joo, Y. L. 5097

Kaneko, T. 4867  
Kang, S.-Y. 5097  
Karbarz, M. 5182  
Katti, D. R. 5196  
Katti, K. S. 5196  
Kim, C.-W. 5097  
Kim, D. H. 5145  
Kim, D.-S. 5097  
Kim, H. Y. 5108  
Kim, J. K. 5108

Lacoste, C. 5080  
Lee, D. H. 5108  
Lee, S. J. 5145  
Li, C. 4953  
Li, H.-M. 5174  
Li, L. 4901  
Lin, P. 4893  
Liu, H. 5187  
Liu, J.-H. 4925  
Lu, Y. 4985  
Luo, Y. 4959

Ma, D. 4976  
Marquez, M. 5097  
McCarthy, T. J. 4916  
Mei, C. 4976  
Mei, Y. 4985  
Meyer, G. 5003  
Mi, Y. 5124  
Mitsubayashi, M. 5141  
Modarelli, D. A. 4936  
Mondragón, I. 5066  
Morlat, S. 5003  
Mottaghitalab, V. 4996  
Mya, K. Y. 5035

Pan, H. 4901  
Park, J. U. 5145  
Pathak, A. 5117, 5154  
Patrickios, C. S. 5182  
Perrot, C. 5003  
Pramoda, K. P. 5035

Ramos, J. 5066  
Rangelov, S. 4905  
Reignier, J. 5012

Salgueiro, W. 5066  
Samyn, P. 5050  
Saxena, V. 5117, 5154  
Schoukens, G. 5050  
Seguela, R. 5071  
Shi, G. 4953  
Shi, W. 5161  
Sikdar, D. 5196  
Singh, M. 5117  
Somoza, A. 5066  
Spinks, G. M. 4996  
Stojek, Z. 5182  
Sugita, A. 5141  
Sun, F. 4893

Tandon, P. 5117, 5154  
Tantayanon, S. 4936  
Tasaka, S. 5141  
Tatibouët, J. 5012

Teraguchi, M. 4867  
Trau, D. 5124  
Trzebicka, B. 4905  
Tsai, P.-H. 5131  
Tu, G. 4976

Utrata-Wesołek, A. 4905

Van Craenenbroeck, J. 5050  
Van Driessche, I. 5050  
Verpoort, F. 5050

Wałach, W. 4905  
Walker, R. 4985  
Wallace, G. G. 4996  
Wang, H. 4967, 4897  
Wang, L. 4976  
Wang, T. J. 5174  
Wang, X. 5090  
Watanabe, M. 4946  
Wei, J. 4967

Xie, Z. 4976  
Xu, H. 4959  
Xu, J. 5161  
Xue, S. 5044

Yan, Q. 5187  
Yang, I.-K. 5131  
Yang, J. 5187  
Yang, P.-C. 4925  
Yang, X. 5213  
Yin, G. 5044  
Yin, J. 4967  
Yoshie, N. 4946

Zhang, D. 4936  
Zhang, Z. 4893, 5213  
Zhao, L. 4953  
Zhao, P. 4893  
Zhou, J.-H. 5206  
Zhou, J.-M. 5206  
Zhou, Q. 4976  
Zhu, B. 4959  
Zhu, R.-X. 5206