

PMSE NEWS

Polymeric Materials: Science and Engineering Division of the American Chemical Society

FALL 2010 - ELECTION ISSUE

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Ballot Enclosed

Don't forget to vote!



PMSE Awards at the Spring '10 National Meeting

PMSE Fellows Inducted at Awards Luncheon



PMSE chair-elect Todd Emrick (right) with Benny Freeman (center) and Jeffrey Moore (left), who, along with Judy Riffle (not pictured), constitute the Tenth Class of PMSE Fellows. For details, see p. 4-5.

Cooperative Research Award Symposium

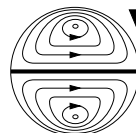


David J. Lohse (L) and Nikos Hadjichristidis, Co-recipients of the 2010 Cooperative Research Award



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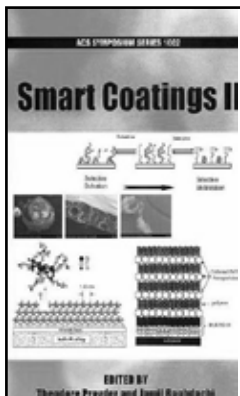
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PMSE Book Review

Smart Coatings II ACS Symposium Series 1002

Theodore Provder &
Jamil Baghdachi, Eds.
Oxford University Press, 2009

Reviewed by Peter Zarras



The book "Smart Coatings II" is a welcome addition to the Smart Coatings book series ("Smart Coatings I", ACS Symposium Series 957, 2007). In continuing this series, the editors have once again demonstrated a diverse subject matter and presented advances in smart coatings in a coherent manner. The coverage of the field is quite extensive, with several chapters devoted to the emerging field of nanotechnology and its application to coatings.

The flow of information for this ACS symposium book starts with a comprehensive introductory chapter on "Smart Coatings." This chapter is well written and provides the reader with a solid foundation for the field of "Smart Coatings", which it builds upon in subsequent chapters.

The book is divided into three sections: Bioactive Coatings, Nanotechnology, and Novel Coatings. The section on Bioactive Coatings focuses on antibacterial, antifouling/foul release and the emerging technology of microbial smart coatings. The next section, "Nanotechnology" is a comprehensive review on the incorporation of nanoparticles in coatings and composites and nanopatterning. Each of these chapters provides the reader with the fundamental background on the topic as well as a glimpse of possible future applications.

The final section, "Novel Coatings", has several chapters devoted to incorporating biocatalytic activity in coatings, superhydrophobicity, and smart corrosion-inhibiting coatings. These final chapters provide an up-to-date review on biocatalytic paints for decontamination of chemical warfare agents, theoretical understanding of superhydrophobicity, and smart corrosion protection using conductive polymers.

The overall impression of this "Smart Coating II" book is that the editors have produced a well-written, easy to read review of the current state-of-the-art smart coatings. The book is comprehensive and balanced. This book is suitable for the casual scientific reader as well as those requiring a more in depth knowledge into the field of "Smart Coatings."

About the reviewer: Peter Zarras received his MS (Chemistry) in 1989 and Ph.D (Polymer Chemistry) in 1996 from the Polytechnic University under the direction of Dr. Otto Vogl. He received an ASEE post-doctoral fellowship at the Naval Air Warfare Center Weapons Division,

China Lake, California under the direction of Dr. John D. Stenger-Smith. He has been at the Naval Air Warfare Center Weapons Division as a research chemist since October 1996. His research interests include the synthesis of conductive polymers for corrosion prevention, smart coatings, batteries and supercapacitors, non-linear optical polymers (NLOPs), polyimides for advanced devices, and electro-active polymers for light emitting diodes. He has authored and/or co-authored over 40 publications and has been issued several patents. Dr. Zarras has organized several symposia at national and regional ACS Meetings. He has also co-edited two ACS Symposium books, "Electroactive Polymers for Corrosion Control" and "New Developments in Coatings Technology."

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Bioactive Coatings

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5. Performance Testing of Waterborne Antibacterial and High-Solids Coatings
6. Novel, Environmentally Friendly, Antifouling/Fouling Release Coatings Developed Using Combinatorial Methods

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9. Synthesis of Acrylic Polymer Nanoparticles: Speculation About Their Properties and Potential Uses
10. Preparation, Structure, and Properties of Organic-Inorganic Nanocomposite Coatings
11. Effects of Alumina and Silica Nanoparticles on Automotive Clear-Coat Properties

Novel Coatings

12. Biocatalytic Paints and Coatings
13. The Influence of Geometry on Superhydrophobicity
14. Intelligent Corrosion Protection by Conducting Polymers
15. Investigations of an Electrochemical Basis for the Protection of Steel and Aluminum by Polyaniline and Polyphenylene Ether Coatings

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Tenth Class of PMSE Fellows

The American Chemical Society Division of Polymeric Materials: Science and Engineering (PMSE) has chosen a new class of Fellows for 2010:

Benny D. Freeman

Jeffrey S. Moore

Judy S. Riffle

They were inducted as the tenth class of PMSE Fellows at the San Francisco ACS Meeting during the joint PMSE/POLY Awards Reception. PMSE is pleased to welcome this distinguished group of polymer scientists and engineers to the ranks of fellows. Here is a short description of each of their careers and accomplishments.

Professor Benny Freeman is the Kenneth A. Kobe and Paul D. and Betty Robertson Meek & American Petrofina Foundation Centennial Professor of Chemical Engineering at The University of Texas at Austin. He has been a faculty member for more than 20 years. He completed his graduate training in Chemical Engineering by earning a Ph.D. from the University of California, Berkeley in 1988. In 1988 and 1989, he was a postdoctoral fellow at the Ecole Supérieure de Physique et de Chimie Industrielles de la Ville de Paris (ESPCI), Laboratoire Physico-Chimie Structurale et Macromoléculaire in Paris, France. Dr. Freeman's research is in polymer science and engineering and, more specifically, in mass transport of small molecules in solid polymers. He currently directs 18 Ph.D. students and 2 postdoctoral fellows performing fundamental research in gas and liquid separations using polymer membranes and barrier packaging. His research group focuses on include structure/property correlation development for desalination and vapor separation membrane materials, new materials for hydrogen separation and natural gas purification, nanocomposite membranes, reactive barrier packaging materials, and new materials for improving fouling resistance and permeation performance in liquid separation membranes. His research is described in more than 250 publications, and he has co-edited 4 books on these topics. He has won a number of national awards, including the ACS Award in Applied Polymer Science (2009), the AIChE Institute Award for Excellence in Industrial Gases Technology (2008), and the Strategic Environmental Research and Development Program Project of the Year (2001). He has served as chair of the Polymeric Materials: Science and Engineering Division of the American Chemical Society, chair of the Gordon Research Conference on Membranes: Materials and Processes, President of the North American Membrane Society, chair of the Membranes Area of the Separations Division of the American Institute of Chemical Engineers, and he is currently First Vice Chair of the Separations Division.



Professor Jeffrey Moore was born outside of Joliet, IL in 1962. He received his B.S. in chemistry (1984) and Ph.D. in Materials Science and Engineering with Samuel Stupp (1989), both from the University of Illinois. He then went to Caltech as an NSF postdoctoral fellow working with Robert Grubbs. In 1990 he joined the chemistry faculty at the University of Michigan in Ann Arbor, and then in 1993 returned to the University of Illinois where he is currently the Murchison-Mallory Chair in the Department of Chemistry. In 1995 he became a part-time Beckman Institute faculty member. His awards include an Alfred P. Sloan Fellowship, Arthur C. Cope Scholar Award, and Fellow of the American Association for the Advancement of Science, the Royal Society of Chemistry, and the American Academy of Arts & Sciences. He has served as an Associate Editor for the Journal of American Chemical Society since July of 1999.

Professor Moore is internationally recognized for his work in the field of organic materials and polymer chemistry. His early work established the utility of the phenylacetylene moiety in the construction of a broad range of important nanoscale structures, including macrocycles, dendrimers, and abiotic mimics of protein secondary structure. Working with colleagues in engineering, he played a central role in the

demonstration of a self-healing polymeric material and has shown recently that mechanical energy can be used to direct chemical reactions.

Moore has published more than 260 manuscripts, he holds 19 patents, and has been an invited guest speaker to over 275 national and international lectures.

Professor Judy Riffle is a professor of Polymer Chemistry and the Director of Macromolecular Science and Engineering education at Virginia Tech. Her career has included ~5 years of industrial research at Union Carbide and at the Thoratec Corporation in Berkeley, CA, then ~25 years in academia. The common research thrust throughout her career has been the synthesis of precise polymeric materials and the development of multiphase block copolymers and nanostructures, and she works with researchers in a broad range of disciplines to tailor the materials for biotechnological applications. Her research has been of interest in both academia, as well as in industrial applications. She has more than 250 contributions to the literature including refereed publications, conference proceedings, and U.S. patents.



Some of her most visible research has included functional polydimethylsiloxane (PDMS) oligomers, their incorporation into multiphase, linear block copolymers and thermosets and investigations of their surface and bulk morphologies. She recognized early on that surface and bulk structure could be accessed independently by blending minor concentrations of surface-active, multiphase segmented copolymers with polymer matrices, and this concept led to the strong, elastic, biocompatible poly(urethane-urea)s that today comprise the blood contacting materials for Thoratec's platform of cardiovascular products. Prof. Riffle later conceptualized a co-continuous morphological structure involving polysiloxanes incorporated into otherwise hydrophilic thermosets, wherein the PDMS would allow for rapid oxygen permeation through a soft hydrophilic matrix, and these thermosets now form the basis for commercial extended-wear, soft contact lenses. More recently, she has developed biocompatible PDMS magnetic fluids for potential treatments of retinal detachment. For the past few years, Prof. Riffle's research has focused on the design and synthesis of amphiphilic block copolymers and their assembly into core-corona nanostructures that contain image-enhancing agents or drugs in their cores. This approach allows for the independent molecular design of cores that interact with the therapeutic molecules or imaging agents and coronas that interact with physiological and cellular environments. She has discovered that coronas comprised of amphiphilic polyethers with select block lengths can induce small (colloidally stable) controlled clusters of nanoparticles with magnetite cores. The transverse NMR relaxivities of these materials are ~3X faster than presently-used relaxivity agents, so they have potential as MRI agents that are more sensitive than current materials. She has also synthesized core-corona assemblies containing antibiotics in the cores for treating bacterial pathogens that reside within cells. Again, amphiphilic block copolyether coronas that contain flexible polyether blocks large enough to span lipid bilayer membranes are rapidly taken up by the macrophages that house these difficult-to-reach pathogens.

As always, Prof. Riffle focuses on the molecular design and assembly of well-defined macromolecules and collaborates closely with others in the biological sciences, physics and engineering to understand how the properties of her materials relate to societal needs.

Dr. Riffle has also led the initiation and growth of interdisciplinary, interdepartmental graduate degree programs in Macromolecular Science and Engineering at Virginia Tech, which began the first class in Fall, 2001, and she has been the program's Director since its inception. The program now comprises ~50 graduate students spanning 9 departments and 3 colleges.

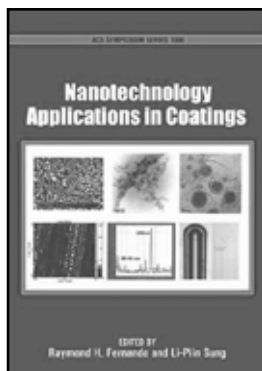
PMSE is pleased to welcome Benny D. Freeman, Jeffrey S. Moore and Judy S. Riffle to the ranks of fellows. The Division thanks everyone who has helped in this process by submitting nominations or participating in the selection. To nominate worthy candidates for future classes of this prestigious position, please see the instructions on the PMSE website <http://pmse.sites.acs.org>.

PMSE Book Review

Nanotechnology Applications in Coatings ACS Symposium Series 1008

**Raymond H. Fernando and
Li-Piin Sung, Eds.**
Oxford University Press, 2009

Reviewed by Diep Nguyen



This book, based on a 2006 PMSE symposium, arrives at the right time when nanotechnology is gaining popularity in the coatings community.

The book organization is excellent. Chapter one begins with an introduction to the basic definition of nano-materials, continues with an overview of the different types of nanomaterials used in coatings, and ends with examples of some successful applications of nanomaterials in coatings, as well as the challenges facing the field. The first chapter therefore lays a good introduction and background to the subsequent topics.

The crucial aspect of nanomaterial applications in polymeric coatings is how to achieve a good dispersion. To this end, the normal practice in coating, for example, grinding with a media, is usually not sufficient. The nano-material, therefore, has to be functionalized, e.g., attached to specific functional groups, in order to form chemical or physical interactions with the matrix and ensure proper mixing. Chapters 2 to 4 discuss the various synthetic methods that can be used to obtain a good dispersion. Often, functionalization alone is not enough to obtain good mixing. A combination of nanomaterial surface modification and processing techniques can be used to achieve good mixing. These topics are discussed in Chapter 5 to 7.

When nanoparticles are well incorporated in the coating, the next question is, how does this change the performance of the coating? The "Functionality and Performance" section of the book deals with the enhanced performance of coatings containing nanoparticles. This section includes review articles that cover a wide range of nanoparticles applied in different fields. Performance enhancements include improving corrosion resistance, adhesion, self cleaning, and anti-scratch surfaces. The coating systems range from clear coat and ink-jet inks to UV curable films.

Characterization is one of the challenges facing the growth of nanotechnology-based coatings. The normal characterization tools in most companies are not sufficient for nano-containing coatings; for example, surface characterization techniques may require AFM or SEM, which may not be common in most coatings laboratories. The final section of the book is devoted to the characterization of coatings containing nanomaterials.

Overall, this book is a good, up-to-date reference book on the subject of nano-containing materials and would be useful to anyone who would like to learn more about nano-containing coatings.

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Functionality and Performance

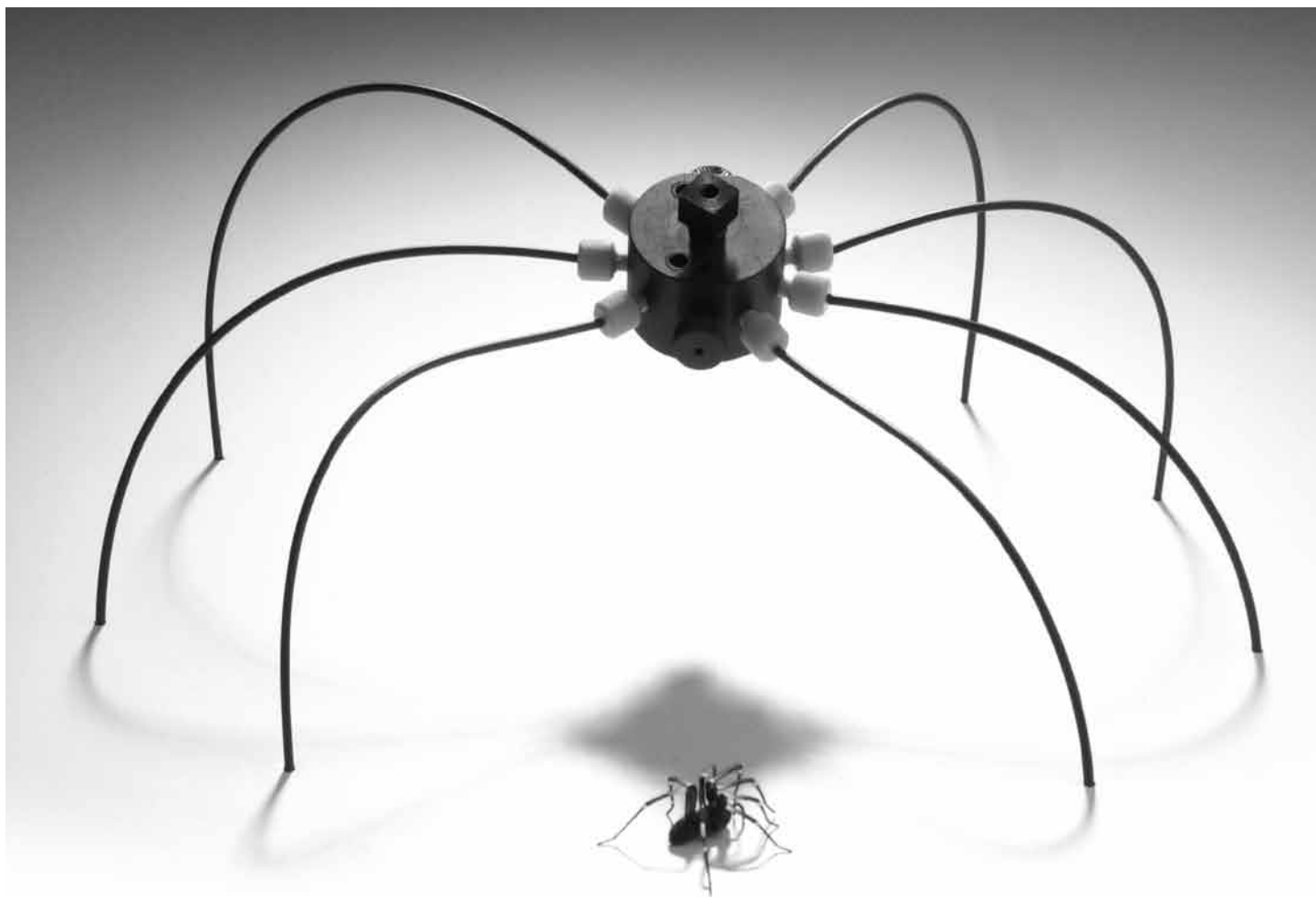
8. Increasing Coating Functionality Using Nanodimensioned Materials
9. Formulation of Reactive Nanostructured Adhesive Microbial Ink-Jet Inks for Miniature Biosensors and Biocatalysis
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Characterization

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17. Assessment of Spectrophotometric Assay Methods on Nanostructured Pigments
18. Size Determination of Nanoparticles Used in Coatings

About the reviewer: *Diep Nguyen is the Industrial Professor at the Illinois Institute of Technology in Chicago, IL. She is also the Director of the Professional Science Master (PSM) Program in Analytical Chemistry. The IIT analytical degree is unique in that students also take professional courses, such as project management, communication, and business principles in addition to specialized analytical courses. Prof. Nguyen received her Ph.D. at McGill University in Montreal. Before joining IIT, she worked at Brookhaven National Laboratory, PPG Ind. and Cabot Microelectronics Inc.*

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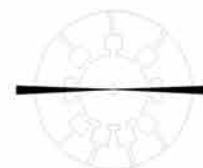
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PMSE Election: Candidates for Councilor

BENNY D. FREEMAN

Dr. Freeman is the Kenneth A. Kobe and Paul D. and Betty Robertson Meek & American Petrofina Foundation Centennial Professor of Chemical Engineering at the University of Texas at Austin. His research focuses on the use of polymers and polymer-based materials for selective control of small molecule transport in applications such as gas and liquid separation membranes and barrier packaging. He has been a faculty member for 22 years and actively involved in PMSE leadership, in various positions up to and including Chair of the Division, for more than a decade. Professor Freeman is running for Councilor to be able to represent and advance PMSE's interests on the ACS Council.

THEODORE PROVDER

Dr. Provder received his Ph.D. from the University of Wisconsin in physical chemistry. Currently, he is Managing Director of Polymer and Coatings Consultants, LLC. He was Director of the Coatings Research Institute (CRI) at Eastern Michigan University (EMU) from 2001-2007. He also was Director of the NSF I/UCRC Research Center in Coatings at EMU. He has held previous adjunct research professor positions at the Institute of Materials Science in New Paltz, NY, Case Western Reserve University, Kent State University and North Dakota State University. He has over 41 years of industrial experience in polymers and coatings, most spent at The Glidden Company (ICI Paints) as a Principal Scientist. He is credited with over 140 publications, 21 edited/co-edited books, and 4 patents. He has received numerous technical awards including the ACS Roy W. Tess Award in Coatings, the Federation of Societies for Coatings Technology (FSCT) coveted Joseph J. Mattellio Lectureship Award, FSCT 1999 First Place and 2006 First Place Room Awards, the University of Missouri-Rolla Coatings Institute Distinguished Scientist Award, appointment to the first class of PMSE Fellows and the 2003 PMSE Distinguished Service Award.

He has been a member of ACS since 1967. In the Division of Polymeric Materials: Science and Engineering, he has been a Councilor 1996-2010; Alternate Councilor 1994-95; Chair, 1988; Chair-Elect, 1987; Vice-Chair 1986; Treasurer, 1984-85; Membership Committee, Chair, 1981-83. For PMSE he currently is the Chair of the nomination and selection committees for the Roy W. Tess Award. He also was on the Joint Polymer Education Committee of Polymeric Materials: Science and Engineering and Polymer Chemistry Divisions as Treasurer from 1989-1997. As a Councilor he has served on the Patents and Related Matters (CP&RM) committee, and on the Divisional Activities (DAC) committee and currently is a member of the Meetings and Exposition (M & E) committee. He thoroughly enjoys serving PMSE and ACS as a Councilor and a member of M & E. He also has been actively involved in FSCT (ACA) Publications Committee and a Technical Editor for the Journal of Coatings Technology Research.

~ Voting Instructions ~

If you are a member in good standing of the PMSE Division, look for your official ballot, blank ballot envelope, and pre-addressed return envelope attached inside this newsletter.

Seal your cast ballot inside the smaller blank envelope, then seal inside the pre-addressed return envelope, sign, and return to the PMSE secretary.

Important! For your vote to count, be sure to leave the blank ballot envelope unmarked, and don't forget to sign the outer return envelope.

Ballots must be postmarked by Nov. 1, 2010.

List of Candidates (*this is not the official ballot*)

Candidates for Councilor for 2011-2013 Term
(Vote for 1)

Benny Freeman

Theodore Provder

(The candidate receiving the most votes will become Councilor, the other will become Alternate Councilor)

Candidates for Member-at-Large
for 2011-2012 Term
(Vote for 2)

Rajeswari Kasi

Jodie Lutkenhaus

Mahesh Mahanthappa

Javid Rzayev

For questions about the election, please contact

PMSE Secretary: Dr. Jamil Baghdachi

(734) 487-3192

jamil.baghdachi@emich.edu

~ Don't forget to vote! ~

Election Candidates for Member-at-Large

RAJESWARI M KASI

Rajeswari M. Kasi is an Assistant Professor at the University of Connecticut's Polymer Program and Chemistry Department, where her research focuses on stimuli-responsive polymers. She received her B.Sc. in Chemistry from University of Madras (1996), M.Sc. in Chemistry from Indian Institute of Technology, Madras (1998) and her Ph.D from the Polymer Science and Engineering Department under Professor Bryan Coughlin at the University of Massachusetts, Amherst (2004). From 2004 to 2006, she was a postdoctoral fellow under Professor Marc Hillmyer at the University of Minnesota. She has been with the University of Connecticut since 2006.

Dr. Kasi has been a member of ACS since 2002. She currently serves as the chair of PMSE's Ford Travel Grant committee. She looks forward to serving a more active role in PMSE as a Member-at-Large. She is especially interested in helping PMSE continue its tradition of strong technical presentation by increasing the participation of graduate students both as presenters and symposium organizers.

JODIE L. LUTKENHAUS

Jodie L. Lutkenhaus is currently an Assistant Professor in the Artie McFerrin Department of Chemical Engineering at Texas A&M University.

She received her B.S. in Chemical Engineering in 2002 from University of Texas at Austin and her Ph.D. in Chemical Engineering with Paula T. Hammond in 2007 from Massachusetts Institute of Technology. Following graduate school, she completed a postdoctoral fellowship with Thomas P. Russell at University of Massachusetts Amherst. In 2008, she joined the Department of Chemical Engineering at Yale University, and moved to Texas A&M University in 2010. Current research areas include organic thin films, electrochemical energy conversion, and thermal analysis.

Dr. Lutkenhaus was recently awarded NSF funding in 2009. She has 13 publications from her post-doctoral work and graduate education, and 2 recent publications from her laboratory. A member of ACS and PMSE since 2003, Dr. Lutkenhaus has participated in a number of ACS conferences as a session chair and presenter. She is committed to maintaining and enhancing diversity within ACS and PMSE, is honored to have been nominated for the Member-At-Large position, and looks forward to this leadership opportunity.

MAHESH K. MAHANTHAPPA

Mahesh Mahanthappa is currently an Assistant Professor of Chemistry at the University of Wisconsin-Madison. His research interests lie in the development of new synthetic methods in polymer chemistry and the physical characterization of the resulting polymeric materials directed toward rapid identification of new functional materials targets and their flexible and scalable synthesis. Dr. Mahanthappa's group is currently focused on the synthesis of new biodegradable polymers and amphiphiles, understanding the effects of polydispersity on block copolymer phase behavior, and the synthesis of new lyotropic liquid crystalline materials for energy applications

Dr. Mahanthappa received his B.A. in Chemistry and Mathematics at the University of Colorado-Boulder in 1997. As a Fannie and John Hertz Foundation Fellow at Stanford University, he completed his Ph.D. in Chemistry in 2003 under the supervision of Prof. Robert M. Waymouth in mechanistic studies of transition metal-mediated olefin polymerizations. Mahesh's interests in polymer physics stem from his experiences as a postdoctoral research associate with Profs. Frank S. Bates and Marc A. Hillmyer at the University of Minnesota Department of Chemical Engineering and Materials Science and Department of Chemistry.

Dr. Mahanthappa has strong interests in maintaining PMSE's strong and diverse national programming at ACS Meetings that help to define the emerging frontiers in polymer science, while also working on education and science literacy projects related to the implications of polymer science for the public at large.

JAVID RZAYEV

Javid Rzayev is an Assistant Professor in the Department of Chemistry at the University at Buffalo. He received his B.S. (1998) in Chemistry from the Middle East Technical University in Turkey and his Ph.D. (2003) in Polymer Science & Engineering from the University of Massachusetts Amherst. He then completed two and a half years of postdoctoral studies at the University of Minnesota working on developing nanoporous polymer membranes with tailored surface properties. Dr. Rzayev's research interests include synthesis of unique nanomaterials from bottlebrush copolymers, developing new polymerization methodologies, and understanding phase behavior of block copolymers with unconventional architectures. He recently received an NSF Career Award (2009). Dr. Rzayev is interested in strengthening PMSE Division's technical programming and expanding its international ties.

Scenes from the 2010 Spring ACS National Meeting



Left: Dr. Michael Jaffe receives the 2010 Distinguished Service award. Right: Michelle M. Mok receives the 2009 AkzoNobel Student Award in Applied Polymer Science



Left: Dr. Richard Vaia accepts a 2009 Arthur K. Doolittle award for outstanding paper presented before the division at the national meeting. Right: Dr. Andrew J. Lovinger receives the 2010 American Chemical Society Award in Applied Polymer Science.

Countdown to International Year of Chemistry (IYC) 2011: Get Involved Now!

We need your ideas! Through the IYC-2011 initiative 365: Chemistry for Life, a different aspect of chemistry will be highlighted every day on www.acs.org. Submit ideas for a favorite element, compound, discovery, process, chemist, or chemistry innovation at www.acs.org/iy2011, by September 17, 2011. Suggestions should fall into one of four categories:

- Energy
- Environment
- Materials
- Health

Selected submissions will receive recognition and an IYC-2011 pin and t-shirt.

PMSE PREPRINT ARCHIVE

STILL SEEKING VOLUMES 1-29 (pre-1970 Division of Paint, Plastics, and Printing Ink Chemistry)

Thanks to the generosity of current and past members, PMSE has assembled a complete archive of pre-electronic PMSE and ORPL Preprints, Vols. 30-85 (1970-2001). We hope that ACS will eventually scan and add these issues to the online preprint collections so their contents will be permanently available. We are still missing all pre-1970 volumes 1-29 (Division of Paint, Plastics, and Printing Ink Chemistry). If anyone has volumes from this period and is willing to donate them, please contact Lisa Baugh (Lisa.S.Baugh@ExxonMobil.com). PMSE will reimburse you for shipping and provide a tax deduction form for the value of the preprints.

Big thanks to those who donated volumes: Dan Kruh, The Polymer Science & Engineering Department of UMass-Amherst (especially Bryan Coughlin and Thomas McCarthy), and William Feld. And to those others who offered: Pat Heiden, Kirk Abbey, Les Sperling, Rufina Alamo, Dan Hertz, Taek Seung Lee, Phillip Geil, Harry Gibson, Scott Schricker, Patrick Theato, Morton Litt, Patrick Cassidy, Veronica Reichert, Penny Chatterton, David Son, Susan Metcalf, and Julie Jessop.



The advertisement features a large Waters HPLC system with a computer monitor and keyboard in the foreground. The background is dark with a pixelated, wave-like pattern at the bottom. The text 'POLYMER ANALYSIS SOLUTIONS' is enclosed in large square brackets. Below this, the text 'Waters HPLC, GPC, GC/MS, and LC/MS Systems' is displayed. The Waters logo and tagline 'THE SCIENCE OF WHAT'S POSSIBLE.™' are in the bottom right corner. A URL 'Visit www.waters.com/products for more information' is in the bottom left corner.

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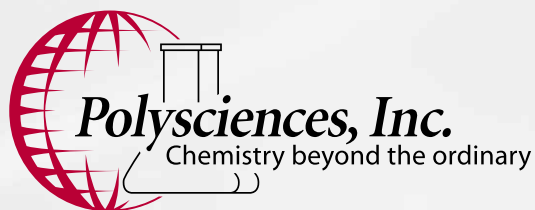
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