

SPRING 2010



Message from our Chair, Julie Jessop

Dear PMSE Members,

I am honored to serve as Chair of the PMSE Division in 2010. The Division is in excellent condition, thanks to the leadership of the past Chairs, including most immediately Bryan Coughlin, Dean Webster, and Elliott Douglas, and I intend to continue this upward trajectory throughout my tenure. Of course, the success of our division is also due to the hard work of the volunteers on the Executive Committee and at the national and regional meetings, as well as the loyalty of our 4500+ members. I thank you all for the contributions you have made in the past and will make in the coming year! We need everyone's involvement in order to realize our vision: Reaching out across technical, generational, and international boundaries to create the premier home of materials science and engineering for the global chemistry community.

I am pleased to highlight the strides we have taken to meet the individual goals supporting our vision and strategic plan. As always, we welcome your new ideas and candid feedback as we seek to provide valuable services to our membership and increase the impact and

visibility of the division. Feel free to contact me via email (julie-jessop@uiowa.edu) or phone (319-335-0681) if you do not catch me at one of the national meetings.

Goal #1: Transform program content to capture emerging trends in materials science and engineering for the global chemistry community.

Our programming at national meetings is skillfully coordinated by the PMSE Program Chairs: Christopher Soles, Jeffrey Pyun, and Todd R. Younkin. For the spring meeting in San Francisco, they slated symposia hitting "hot" topics in materials development: polymeric coatings, synthesis and characterization of **nano**structured materials for a variety of applications, materials using principles of green chemistry and **sustainability**, and **bio**logical polymers (emphasis mine). Cutting-edge and interdisciplinary themes continue for the fall meeting in Boston as well. Please take time to look at the multi-year programming website, which is updated regularly as new symposia are proposed and organized: *http://pmse.sites.acs. org/meetings.htm*. Please contact any of the program chairs with your ideas for future symposium topics.

Goal #2: Create the premier interactive web portal in materials science and engineering for the global chemistry community. Our webmaster, Qinghuang Lin, is spearheading a committee to upgrade the PMSE website. His 2009 Innovative Project Grants for Divisional Enhancement proposal successfully secured \$5,000 for this web initiative. You may remember being surveyed last year regarding content and features you would desire to access on the PMSE website. We are also hoping to publish an electronic newsletter that would enable us to deliver articles and updates on more than a semiannual basis to keep our members informed of what is going on in PMSE, as well as the materials science and engineering community in general. I encourage you to check the website (*http://pmse.sites.acs.org/*) on a regular basis and give us feedback on our progress and ideas for enhanced content.

PMSE has also completed its move to on-line preprints through ACS Publications. This decision has been in the works for several years now and was enacted this year when the 3-year CD contract came up for renewal. Discontinuing the CD has many advantages to our members: (1) the division has realized a significant cost savings by eliminating the CD production and mailing (an important benefit in today's economy), (2) members have access to back issues (without the



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ACS 2010 Fall National Meeting Program BOSTON August 22-26, 2010

ACS Award in the Chemistry of Materials: Symposium in Honor of Robert D. Miller. Alshakim Nelson, IBM Research Center, 650 Harry Road, San Jose, California 95120, 408-927-2449, <u>alshak at us.ibm.com</u>.

AkzoNobel Student Award Symposium. John S. Thomaides, AkzoNobel Surface Chemistry, 10 Finderne Avenue, Bridgewater, New Jersey 08807, 908-685-5064, john.s.thomaides_at_akzonobel.com.

Functional Block Copolymers and Novel Materials via Self-Assembly. (*Co-sponsored with POLY, PMSE is primary.*) Chuanbing Tang, Dept. of Chemistry and Biochemistry, USC NanoCenter, University of South Carolina, 803-777-3628, tang.c_at_chem.sc.edu.

General Papers/New Concepts in Polymeric Materials. David Schiraldi, Case Western Reserve University, 216-368-4243, <u>das44_at_po.cwru.edu</u>.

Green Coating Technologies. James Rawlins, The University of Southern Mississippi, 601-266-4781, james.rawlins_at_usm.edu; Dean Webster, Dept. of Coatings and Polymeric Materials, North Dakota State University, 701-231-8709, dean.wester_at_ndsu.edu.

Joint PMSE/POLY Poster Session. David Schiraldi, Case Western Reserve University, 216-368-4243, <u>das44_at_po.cwru.edu</u>.

Multifunctional Nanoparticles for Drug Delivery and Imaging. Sonke Svenson, Cerulean Pharma, Inc., 840 Memorial Drive, Cambridge, MA 02139, 617-661-9628, <u>ssvenson_at_ceruleanrx.com</u>.

Nano-Scaled Phenomena in Polymeric Systems. Janet Wong, Imperial College London, Dept.of Mechanical Engineering, +44 (0)20 7594 8991, <u>j.wong_at_imperial.ac.uk</u>; Albert Yee, University of California, Dept. of Chemical Engineering and Materials Science, Irvine, California , 949-824-7320, <u>afyee_at_uci.edu</u>; Hung-Jue Sue, Director Polymer Technology Center, Texas A & M University, Dept.of Mechanical Engineering, 979-845-5024, <u>hjsue_at_tamu.edu</u>; Atsushi Takahara, Institute for Materials Chemistry and Engineering, Kyushu University, 81-92-802-2517, <u>takahara_at_cstf.kyushu-u.ac.jp</u>.

Novel Polymeric and Nanocomposite Materials for Defense and Energy. Phil Costanzo, Dept. of Chemistry and Biochemistry, California Polytechnic State University, 805-756-2692, <u>pcostanz_at_calpoly.edu</u>.

Pushing the Limits of Nanolithography: Advanced Imaging for Sub 20 nm Patterning. George Barclay, Dow Advanced Materials, 455 Forest Street, Marlborough, MA 01752, 508-229-7262, <u>gbarclay_at_rohmhaas.com</u>.

Roy W. Tess Award: Symposium in Honor of Charles R. Hegedus. Clifford K. Schoff, Schoff Associates, 4736 Magnus Drive, Allison Drive, PA 15101, 412-487-5289, <u>c_schoff40_at_msn.com</u>.

Simulation of Interfaces and Multi-Component Polymeric Materials. (*Co-sponsored with COMP; COMP is primary*). Hendrik Heinz, University of Akron, 309-972-7467, <u>hendrik.heinz_at_uakron.edul</u>; Rajiv J. Berry, Air Force Research Laboratory, 937-255-2467, <u>rajiv.berry_at_wpafb.af.mil</u>.

WCU International Symposium on Energy Storage and Conversion. Kookheon Char, Dept. of Chemical and Biological Engineering, Seoul National University, <u>khchar_at_snu.ac.kr</u>; Patrick Theato, Institute of Organic Chemistry, University of Mainz, Duesbergweg 10-14, D-55099 Mainz, Germany, +49-6131-3926256, <u>theato_at_uni-mainz.de</u>.

Program Committee

Christopher Soles

National Inst. of Standards and Technology 100 Bureau Drive, Stop 8541 Gaithersburg, MD 20899-8541 Phone: (301) 975-8087 Fax: (301) 975 - 3928 christopher.soles_at_nist.gov Department of Chemistry University of Arizona 1308 E. University Blvd Tucson, AZ 85721 Phone: (520) 626-1834 Fax: (520) 621-84075 jpyun at email.arizona.edu

Jeffrey Pyun

Todd R. Younkin

Intel Corporation RA3-252 2501 N.W. 229th Avenue Hillsboro, OR 97124 Phone: (971) 214-9973 Fax: (971) 503-613-7997 todd.r.younkin_at_intel.com





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PMSE News Spring 2010

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2010 Roy W. Tess Award in Coatings



Dr. Charles R. Hegedus

Dr. Charles R. Hegedus of Air Products and chemicals will receive the **Roy W. Tess Award in Coatings for 2010**. The announcement was made by the PMSE Officers and the Award Committee. Dr. Hegedus is well known in the coatings industry and has made many contributions to it over a period of 30 years, first at the U.S. Naval Air Development Center and more recently at Air Products and Chemicals, Inc. He has carried out significant research and development in corrosion prevention without chromates, self-crosslinking polymer systems, zinc oxide nanoparticles, film formation and other aspects of waterborne coatings and in the characterization of coatings. He has been responsible for the invention and development of a number of products during his career.

Dr. Hegedus began his career developing organic coatings to be used on naval aircraft and other military equipment for corrosion prevention and detection/weapon countermeasures. He performed fundamental research on organic coating structure, property and performance relationships as well as investigating and resolving corrosion problems and coatings failures in the field. Probably his most significant accomplishment in the field of corrosion prevention was to develop UNICOAT, a self-priming topcoat for high performance applications, which is commercial at several paint companies. This material was one of the first corrosion preventive coating systems for aluminum that did not contain chromated materials. In addition, it demonstrated the benefits of

multi-functional coatings which eliminate the need for multi-coat systems.

At Air Products, Dr. Hegedus focused on waterborne materials, directing and performing research and development leading to new polymers and additives that have proved to be of considerable use to the coatings industry. Probably his most interesting project employed Atomic Force Microscopy to study film formation in waterborne coatings, particularly two-component polyurethanes, research that led to new products and several publications. Other efforts led to waterborne primers for water repellent coatings, waterborne acrylic-epoxy coatings and aqueous acrylic-polyurethane hybrid dispersions. These products include Adura® polyester polyols, Hybridur® acrylic-urethane latexes, Ancarez® AR550 epoxy resin and amine-based crosslinkers.

Dr. Hegedus has authored over 46 papers and publications and is credited with 20 patents (an additional five pending) on coatings related topics. He has served as the Corrosion Committee Chairman for the Federation of Societies for Coatings Technology (FSCT) and has sat on the Journal of Coatings Technology and Society of Automotive Engineers Editorial Review Boards. Dr. Hegedus is a member of the FSCT Publications Committee and the Philadelphia Coatings Society Technical Committee. He has been a course lecturer for ASM International, the National Association for Corrosion Engineers, FSCT and Drexel University. Dr. Hegedus has also been responsible for establishing and promoting interaction between coatings and materials related groups within Air Products.

Dr. Hegedus has received the two highest awards conferred by FSCT: the Mattiello Lectureship for technical accomplishments and the George B. Heckel Award for coatings industry support. In addition, he received a U.S. EPA Administrator's Award for Pollution Prevention for UNICOAT, two FSCT Roon Awards for outstanding papers presented at Federation Annual Meetings and an FSCT Corrosion Committee Award for his publications on anti-corrosion coatings. In addition he received an Air Products Technology Award in 1996.

Dr. Hegedus will receive the Tess Award from Dr. Julie L. P. Jessop, Chair of the PMSE Division, on Monday, August 23, 2010 during the 240th National Meeting of the American Chemical Society in Boston, MA. Dr. Hegedus will present an Award Address at that time. An evening reception sponsored by the PMSE Division will follow the Award Symposium.

The Tess Award is presented annually by the Division of Polymeric Materials: Science and Engineering in recognition of outstanding contributions to coatings science and technology. It is funded by a grant to the Division from Dr. and Mrs. Roy W. Tess. The purpose of the award is to encourage interest and progress in coatings science technology and engineering and to recognize significant contributions to the field. The Award consists of a plaque and a \$3000 cash prize.

For information on nominations, visit: http://pmse.sites.acs.org/tessaward.htm



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Chair's Message, Continued from front page

worry of using their own storage space), and (3) the web version is much "greener" than the paper and CD versions. We continue to look for ways to enhance the usability and visibility of *PMSE e-Prints*. We are considering an external vendor to host the preprint collection, allow easier searching through the archives, and enable citation listing through the electronic indexes. Finally, please note the request in this newsletter for early volumes of *PMSE Preprints*. Our goal is to acquire a full set of preprints and scan and add them to our on-line archive.

Goal #3: Strengthen the chemistry community in materials science and engineering by fostering interactions and creating an enhanced global presence.

We are continuing to advance program changes that facilitate networking of our members at the national meetings. The reformatted PMSE/POLY poster sessions were well-received at the D.C. meeting last fall, so we are continuing and refining this experiment. PMSE is also expanding its outreach to graduate students in polymer departments across the country. Our initial venture with the Case Western Reserve University Macro Student Organization has gone well, with PMSE offering support for its professional development activities and yearly regional conference. We are now partnering with our sister division, Polymer Chemistry, to develop strong ties with other schools and encourage the students to be active in the polymer community both as they are in school and after they graduate. Our hope is that these relationships will provide domestic and international students with mentoring and perspective as they begin their careers and our divisions with new ideas and fresh energy in an ever-changing global environment.

I would also like to call to your attention the various national and divisional awards our members are receiving. The first class of **ACS Fellows** was inducted last year. Of the 163 fellows inducted, 14 are PMSE members: Frank D. Blum, Edwin A. Chandross, Timothy E. Long, James E. McGrath, Christopher K. Ober, Donald R. Paul, Eli M. Pearce, Elsa Reichmanis, Ann Beal Salamone, Thomas W. Smith, E. Thomas Strom, S. Richard Turner, C. Grant Willson, and Kenneth J. Wynne. Congratulations to you all for an honor well-deserved and a strong representation of the impact our members have in chemistry and the community! The PMSE nomination committee for the 2010 ACS Fellows program is headed by Daniel Savin, and I look forward to more PMSE members in the second class as well. The **PMSE Fellows** program is in its tenth year now, and Jaime C. Grunlan and Qinghuang Lin lead the selection committee. Again, we have an excellent list of inductees: Benny D. Freeman, Jeffrey S. Moore, and Judy S. Riffle. Several other PMSE members were also honored at the awards reception and through symposia at the spring meeting: Andrew J. Lovinger (*ACS Award in Applied Polymer Science*), David J. Lohse and Nikos Hadjichristidis (*PMSE Cooperative Research Award*), Timothy P. Lodge (*ACS Award in Polymer Chemistry*), Harry R. Allcock (*Paul J. Flory Polymer Educational Award*), and Michael Jaffe (*PMSE Distinguished Service Award*). I applaud you all for your respective contributions to the field!

Although we are always looking for ways to reduce costs and keep in step with technological advancements, I must point out that our PMSE Investment Committee, chaired by David Chung, has been doing an excellent job protecting and advancing the PMSE investment portfolio even in the midst of such uncertain economic times. Their conscientious efforts have allowed us to meet all our financial obligations, including the cash prizes for our divisional awards. Finally, I would like to thank all the members who ran for PMSE offices in the fall elections. It is wonderful to have so many people willing to serve! I congratulate our 2010-2012 Councilor, Michael Jaffe, and Alternate Councilor, Frank Jones, along with our 2010-2011 Members-at-Large: Lisa Saunders Baugh, Kevin Cavicchi, John Gilmer, Zhiqun Lin, Anjali Patil, and Leslie Sperling. I look forward to serving PMSE with you! We are always seeking new volunteers to assist with the division's activities throughout the year, so please let me know if **you** are interested in serving alongside us.

- Julie Jessop

Wanted!!!

Wanted!!!

Wanted: PMSE Preprints volumes 1 - 45, 55, 60, 70 and 83

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Distinguished Service Award



Dr. Michael Jaffe

The recipient of the **2010 Distinguished Service Award**, given by the ACS Division of Polymeric Materials: Science and Engineering (PMSE) is Dr. **Michael Jaffe**. Mike joined the Polymeric Materials: Science and Engineering Division of the American Chemical Society of the ACS over 25 years, ago and has served the Division in several capacities. He served as Secretary in the late 1980's progressing through the offices to become Chair in 1991, He organized symposia for PMSE in the areas of liquid crystalline polymers, high performance fibers, polymer blends and other topics. After serving as chairman, Mike then became a PMSE counselor, serving on several ACS committees including the Committee on Professional Training (CPT), The Committee on Science and Budget and Finance 1985 to 1995,

Professor Jaffe is a Research Professor of Biomedical Engineering and Chemistry at the New Jersey Institute of Technology and the Director of the Medical Device Concept Laboratory. Previously, he was a Research Fellow at the Hoechst Celanese Corporation,

which he joined upon completion of his Ph.D. in Chemistry from Rensselaer Polytechnic Institute in 1967. His work has focused on understanding the structure-property relationships of polymers and related materials, the application of biological paradigms to materials design and the translation of new technology to commercial reality. During his Celanese and Hoechst career Mike led groups that developed HMLS polyester tire cord and Vectra® thermotropic liquid crystalline polymer. He is a past chairman of the U.S. Policy Committee for IUPAC, a member of the ACS Committee on Science and an editor of the Journal of Engineered Fibers and Fabrics. He is a past member of the National Materials Advisory Board, is a past chairman of the Polymeric Materials: Science and Engineering Division of the American Chemical Society and has served on panels of the NSF, DOD, DOE, NASA and NIST. He has authored more than 75 technical publications, fifteen book chapters and 15 patents. He is a fellow of IUPAC, AAAS, PMSE and NATAS, a National Associate of the National Research Council and was the recipient of the 1995 Thomas Alva Edison Patent Award presented by the Research and Development Council of New Jersey.

2009 Akzo Nobel Student Award in Applied Polymer Science

The Division is pleased to announce that **Michelle M. Mok** is the winner of the 2009 AkzoNobel Student Award in Applied Polymer Science. This Award, which is sponsored by AkzoNobel and administered through the Joint Polymer Education Committee of the ACS Divisions of Polymeric Materials: Science and Engineering (PMSE) and Polymer Chemistry (POLY), is given for the best paper presented at the AkzoNobel Award Symposium as part of the PMSE program at the 2009 Fall ACS Meeting.

Ms. Mok is a graduate student at Northwestern University where her thesis advisor is Professor John Torkelson. The title of her paper, which was presented at the Fall 2009 ACS Meeting in Washington, DC, was "Advantages of Gradient Sequencing in Copolymers for Unusual, Tunable Properties and Phase Behavior".

The other finalists who presented papers at the Award Symposium were: **Kathleen E. Feldman** (University of California, Santa Barbara); **Wonhee Jeong** (Stanford University); **John Layman** (Virginia Tech); **Chia-Ling Pai** (Massachusetts Institute of Technology); and **Mark E. Roberts** (Stanford University). The Award, consisting of \$1600 and a plaque, was presented to Ms. Mok at the PMSE Awards Reception at the Spring 2010 ACS Meeting in San Francisco, CA.



Akzo Nobel award finalists (L to R): Wonhee Jeong, Kathleen Feldman, John Layman, Michelle Mok, Chai-Ling Pai, and Mark Roberts

2010 Cooperative Research Award in Polymer Science and Engineering



Dr. David J. Lohse Prof. Nikos Hadjichristidis

The 2010 winners of the **Cooperative Research Award in Polymer Science and Engineering** are Professor **Nikos Hadjichristidis**, University of Athens and Dr. **David J. Lohse**, ExxonMobil Research & Engineering Co. Prof. Hadjichristidis and Dr. Lohse have worked together for over 20 years in many areas of polymer science, including the synthesis of model long chain branched polymers and their rheology, the synthesis and morphology of miktoarm polymers, and polymer blend thermodynamics. All of this work is characterized not only by a strong academic/industrial international partnership, but also a highly interactive collaboration between the devising the chemistry needed to make novel polymeric architectures and the discovery of the new physics exhibited by these materials. This research is thus cooperative in several senses: it combines academic interest in the science of

polymers with the technological needs of the marketplace, and it joins the synthesis of precisely controlled molecules with a careful analysis of their basic physical properties. This work has chiefly been focused on three areas:

Long Chain Branching: It is well known that long chain branching (LCB) has a strong effect on the rheology and properties of polyethylene, but detailed molecular level understanding of the effect of architecture on these physical properties has been lacking. The awardees showed how the details of LCB architecture impact processing and performance. This involved the precise techniques of anionic polymerization to make a wide variety of polydienes with well-defined structures, including linear, star, comb, pom-pom, and dendritic topologies, followed by saturation to make the corresponding model polyolefins. Next, they studied their physical properties, especially their rheology, to establish fundamental structure-property relations. They showed, e.g. that while all forms of LCB dramatically affect shear rheology, only chains with multiple branch points, such as combs, produce extensional thickening. Besides yielding 19 papers and 3 patents, this work has directly impacted the development of new, easier processing polyolefins by ExxonMobil.

Block Copolymer Morphology: One of the great successes of polymer science has been the development of block copolymers that exhibit microphase separation into well-ordered, nm-scale domains. However, for linear block copolymers, the basic morphology of the domains (spheres, cylinders, lamellae, bi-continuous) is strongly determined by the percentage of each block, which makes it impossible to significantly vary the volume fractions where a given type of morphology can be found. The work of the awardees has shown that this restriction can be overcome by using non-linear block polymers. These are the so called "miktoarm" star copolymers, where the arms of the star are made from two (or more) chemically different species. They first developed robust ways to synthesize such polymers and discovered that the rigid relationships between morphology and volume fraction do not apply for "miktoarms". They showed how the morphology depends on the relative numbers of arms of each component, as well as the intrinsic stiffness of each chain. Such results open up the possibilities for new applications such as membranes with highly controlled pore sizes.

Polymer Blend Thermodynamics: A significant fraction (> 30%) of polyolefins is used as blends, but it has been difficult to predict which polyolefins will mix and which will not. The awardees have shown how the chemical structure of these polymers controls their miscibility. The ability to predict their mixing has aided in the development of several new products from ExxonMobil Chemical Co. This work has also had a great influence on the direction of polymer blend science, as evidenced by the over 1000 citations.

David J. Lohse received B.S. degrees in both Physics and Computer Science from Michigan State University in 1974, and a Ph. D. in Materials Science from the University of Illinois in 1978. After two years at the National Bureau of Standards in Gaithersburg, MD under an NSF-NRC Fellowship, he joined Exxon Mobil Corporation, where he currently holds the position of Distinguished Research Associate the Corporate Strategic Research Labs in Annandale, NJ.

Nikos Hadjichristidis obtained his BSc at the University of Athens, Greece, in 1966, his PhD at the University of Liege, Belgium in 1971, and his DSc at the University of Athens, Greece, in 1978. After postdoctoral research at the University of Liege and at the National Research Council of Canada, he joined the University of Athens in 1973, where he is now the Director of the Industrial Chemistry Laboratory and the Chairman of the Chemistry Department. He has been a Visiting Professor at Exxon Research and Engineering Co, NJ since 1984, where he spends 12 months every year.

The award, which includes a \$5,000 prize, was presented at PMSE's awards reception and was recognized by the Symposium at the 239th ACS meeting (March 2010). For detailed bios of Drs. Lohse and Hadjichristidis, and additional information, please visit: <u>http://pmse.sites.acs.org/cooperativeaward.htm.</u> or contact Prof. Kurt Wiegel, Chairman, PMSE Cooperative Research Award Committee.



PMSE News Team

Prameela Susarla

(Editor) General Electric Company Global Research Center CEB 2577 1 Research Circle Niskayuna, NY 12309 (518) 387-4505 susarla@research.ge.com

Peggy Cebe

(Features) Dept. of Physics & Astronomy Tufts University Science and Technology Center 4 Colby Street, Room 208 Medford, MA 02155 (617) 627-3365 peggy.cebe@tufts.edu Lisa S. Baugh (Books) ExxonMobil Research & Engineering Co. Corporate Strategic Research Laboratories Route 22 East Annandale, NJ 08801 (908) 730-2240 lisa.s.baugh@exxonmobil.com

Patrick Malenfant (Advertising) National Research Council of Canada Institute for Chemical Process and Environmental Technology Building M-12, Room 211B 1200 Montreal Road Ottawa, ON K1A 0R6 (613) 990-0705 patrick.malenfant@nrc-cnrc.gc.ca



ACS-PMSE Dr. P. Susarla GE Global Research Niskayuna, NY 12309 NON-PROFIT ORG. U.S. POSTAGE PAID WYTHEVILLE, VA 24382 PERMIT #172

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