

ALAMGIR KARIM

College of Polymer Science and Polymer Engineering (CPSPE)
Goodyear Chair Professor, Department of Polymer Engineering,
Co-Director, Akron Functional Materials Center (AFMC)
University of Akron, Akron, OH 44325
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PROFESSIONAL EXPERTISE:

Polymer Surfaces, Interfaces, Thin Films, Blends Phase Separation,
Nanocomposite Films, Block Copolymers, Polymer-Nanotechnology,
Photovoltaics, Combinatorial Materials Science, Tissue Engineering

EDUCATION:

Ph.D. - June, 1991, Physics, Northwestern University, Evanston, Illinois.
Graduate Research Advisors: Drs. Gian Felcher, Argonne National Laboratory, Pulak
Dutta, Northwestern University and Thomas P. Russell, IBM, Almaden, San Jose.
Thesis topic: "Interdiffusion in Polymer Thin Films by Neutron Reflection"
B. S. - June, 1985, Physics, St. Stephens College, Delhi, India

AWARDS, HONORS, MEMBERSHIPS

Associate Dean of Research, 2013-2015
Institute Director, College of Polymer Science & Polymer Engineering, University of
Akron, 2010-2015
Keck Foundation Award, 2013
Fellow of American Association for the Advancement of Science (AAAS), 2012
Co-Director, Akron Functional Materials Center (AFMC), University of Akron, 2010
Goodyear Chair Professor, University of Akron, 2008-present
King Saud University, Invited Program Evaluation Member, 2014
Panel Evaluation Member: National Science and Engineering Council of Canada
(NSERC), 2010-2014; 2012 NSF-NSEC; 2012 DOE BES-COV Panel
Sub-Committee Member, User Group, Center for Nanoscale Materials Science, Oak
Ridge National Laboratory, Oak Ridge, Tennessee, 2008-2010.
Program Advisory Board Member, University of Connecticut, Institute for Materials
Science (IMS), Polymers Program, 2007-2008
Silver Medal Award, US Department of Commerce, 2007
Fellow of American Physical Society, 2005
Advisory Committee Member, Keck Program, Howard University, Washington
D.C., 2003
Bronze Medal Award, US Department of Commerce, NIST, 2002
Adjunct Faculty, Department of Chemistry, University of Arkansas, Little Rock,
Arkansas, 2002
International Advisory Board Member for "Polymer Nanocomposites", National
Research Council of Canada (NRCC), 2000
Pace-Setter Award, Argonne National Laboratory, 1990
Summer Intern Fellowship, IBM, San Jose, California, 1988
National Talent Scholarship Award, India, 1980
National Mathematics Olympiad Award, India, 1980
Junior Science Talent Scholarship Award, India, 1978

**PROFESSIONAL
EXPERIENCE:**

2010-2105: Associate Dean of Research and Director of Maurice Morton Institute of Polymer Science and Polymer Engineering, CPSPE, Univ. of Akron, OH

2010-Current: Director of Materials, Akron Functional Materials Center (AFMC)

2008-Current: Dept. of Polymer Engg., Univ. of Akron, OH
Goodyear Chair Professor

1993-2008: MSEL, National Institute Of Standards And Technology, MD
2005-2008: Group Leader (ZP-V), Nanostructured Materials, Polymers Division
2003-2005: NNI Nanotechnology Liaison (ZP-V), NIST Directors' Office
2001-2003: Group Leader (ZP-V), Multivariant Measurement Methods Group, Polymers Division
1999-2001: Acting Group Leader (ZP-IV), Polymer Blends and Processing, Polymers Division
1997-1999: Physicist (ZP-IV), Polymer Blends and Processing, Polymers Division
1993-1997: Physicist (ZP-III), Polymer Blends and Processing, Polymers Division

1992-1993: NIST Reactor Division and University Of Maryland, College Park, MD
Research Associate at Reactor Division, NIST with Dr. Sushil Satija on neutron reflectivity from chemically grafted brushes and SANS from sheared block copolymers with Charles Glinka and Frank Bates

1990-1992: University Of Minnesota, MN
Post Doctoral Fellow with Prof Frank Bates and Matt Tirrell, Dept. of Chemical Engineering & Materials Science on block copolymer thin films and tethered polymer brushes

1988: IBM, Almaden Research Center, San Jose, CA
Summer Intern under Dr. Thomas P. Russell on polymer thin film modeling of neutron reflection

1988-1990: Argonne National Laboratory, IL
Graduate research fellowship in Materials Science Division under Dr. Gian Felcher on interdiffusion in polymer thin films by neutron reflection

**INSTITUTE & CENTERS
RELATED EXPERIENCE:**

Associate Dean of Research, College of Polymer Science and Polymer Engineering (CPSPE) & Director of Maurice Morton Institute of Polymer Science and Polymer Engineering (2010-2015):

Organize large number of major CPSPE research activities and engagement with local, national and international polymer based companies from Asia and Europe.

Organizations including off-site meetings and development of facilities within National Polymer Innovation Center (NPIC). Host several national and international delegations for research and collaborations activities with Akron Mayor's office and Ohio State Agencies. Organize internal proposal submission to major funding agencies. My responsibilities have also included supervision of administrative staff (all other than direct Department), and management, operations and repair of substantial shared facilities and equipments in Polymer Engineering Olsen building and Goodyear Polymer Science building that support CPSPE's faculty for their research activities and teaching classes. New faculty hires based laboratory renovations as well as modifications upon faculty requests, in addition to requests for machining, fabrication, electronics and glass blowing shop are all maintained by the Institute. Major centers that are under the MMIPSPE include the Electron microscopy center, NMR center, and Applied Polymer Research Center, all of which require handling significant problems resolution and technical "fire-fighting" issues. Management of fiscal budget based equipment repair, service contract decisions and prioritization of tasks for faculty and student is a routine balancing act for the job.

Present: Director, Materials of AKRON FUNCTIONAL MATERIALS CENTER (AFMC) (www.uakron.edu/afmc) since Nov., 2010:

Co-founder and Co-Director (w/Prof. Matthew Becker) of the Akron Functional Materials Center (AFMC), a multi-tier collaborative research consortium on functional materials development with 14 industry members to date and several pending. AFMC expands on the NCMC model with more IP potential for industry involvement and student research projects. Projects address areas of current interest in energy management, water and sustainability and communications and automation for industry. Organizing bi-annual workshops for center members and co-ordination of research efforts at AFMC has been an extensive but worthwhile task that is attracting attention of industry and academia alike. Resulted in a significant MOU with FDA through ABIA partnership.

Ex-Director: NIST COMBINATORIAL METHODS CENTER (NCMC), 2000-2003:

Co-founder and Director of the NIST Combinatorial Methods Center (NCMC) www.nist.gov/combi, a highly visible and successful multi-tier consortium on combinatorial methods with 33 industry, academia and national laboratories members overall. Demonstrated application of combinatorial methods to wide range of thin film phenomena – phase separation, dewetting, crystallization, adhesion, block copolymer ordering, nanomechanics with over 50 resulting publications.

**PROFESSIONAL
ACTIVITIES:**

SYMPOSIUM ORGANIZER:

"Fundamentals and Applications of Nanomaterials for Electronics and Photonics"
PacifiChem, Hawaii, Dec. 15-20, 2015
"2nd US-Japan Affiliates Tri-Lateral Symposium of Polymer Science," July 28-30, 2014

“4th International Symposium on Polymer Materials Science, NIST, MD, Oct-28-29, 2010

“Polymers and Energy: Photovoltaic, LED and Batteries,” DPOLY Focus Session, APS, Portland, Oregon, Mar. 15-19, 2010

“Fundamentals and Applications of Nanomaterials for Electronics and Photonics” Pacificchem, Hawaii, 2010.

“Defects in Polymer Nanostructures”, American Chemical Society, National Meeting, Washington D.C., Aug., 2005.

“Combinatorial Approaches to Materials Science”, American Chemical Society, Spring Meeting, Anaheim, Mar.-Apr. 2004.

“Combinatorial and Artificial Intelligence Methods in Materials Science”, Materials Research Society, National Meeting, Boston, Nov. 2003.

“Polymer Surfaces and Thin Films”, Materials Research Society (MRS), National Meeting, Boston, Nov. 2001.

“Nonlithographic and Lithographic Methods for Nanofabrication”, Materials Research Society (MRS), Fall Meeting, Boston, MA Nov. 2000.

“Interfaces, Adhesion and Processing”, Materials Research Society, National Meeting, San Francisco, Apr. 2000.

“Synthesis and Characterization of Grafted Polymers”, American Chemical Society, National Meeting, New Orleans, Aug., 1999.

“Synthetic Design and Characterization of Surfaces and Interfaces”, American Chemical Society, National Meeting, Las Vegas, Sept. 1997.

WORKSHOP ORGANIZER:

4th International Meeting on Polymers Materials Science, Nagoya, Japan, 2012.

1st, 2nd & 3rd Akron Functional Materials Center Workshop, Akron, USA 2011

3rd International Meeting on Polymers Materials Science, Nagoya, Japan, 2008.

2nd International Meeting on Polymers Materials Science, NIST, 2007.

NIST-NIMS Combinatorial Nanomaterials Meeting, NIST 2005.

NSF-NIST Directors' Round Table Collaboration Meeting, NIST, 2004.

NCMC Members Meeting "Combinatorial Informatics", NIST, 2003.

NCMC Members Meeting “Combinatorial Adhesion and Mechanical Properties”, NIST, 2002.

NCMC Members Meeting “Library Design and Calibration”, NIST, 2002.

NCMC Kick-Off Meeting organized by Knowledge Foundation, San Diego 2002.

NIST Combinatorial Methods Center, NCMC Concept Workshop, NIST, 2001.

Technology Vision 2020 Organizer: Combinatorial Materials Science Roadmapping Workshop, 2000.

Combinatorial Materials Science: A National Dialogue, NIST, 2000.

Interactions of Polymers with Fillers and Nanocomposites, NIST, 1998.

PUBLICATIONS

Over 200 manuscripts in professional journals, conference proceedings, book chapters and encyclopedia articles.

H-Index: 52 (from Google Scholar)

Journal Publications:

2015

1. Zhang, R., Lee, B., Bockstaller, M.R., Al-Enizi, A.M., Elzatahry, A., Berry, B.C., Karim, A., Soft-Shear Induced Phase-Separated Nanoparticle String-Structures in Polymer Thin Films, **Faraday Discussions, 2015, Accepted Manuscript**, DOI: 10.1039/C5FD00141B

2. Huq, A.F., Modi, A., Kulkarni, M.M., PhD; Smilgies, D.M., Al-Enizi, A.M., Raghavan, D., Karim, A., Vertical orientation of solvent cast nanofilled PS-b-PEO block copolymer thin films at high nanoparticle loading. **Polymer**, **2015**, *In Press*. DOI:10.1016/j.polymer.2015.10.049
3. Ammar, A., Al-Enizi, A.M., AlMaadeed, M.A.A., Karim, A. (2015). Influence of graphene oxide on mechanical, morphological, barrier, and electrical properties of polymer membranes. **Arabian Journal of Chemistry**. **2015**, *In Press*. DOI:10.1016/j.arabjc.2015.07.006
4. Tornow, B., Albrecht, S., Yager, K.G., Singh, G., Karim, A., Neher, D., Brinkmann, M., Ludwigs, S., Highly crystalline films of PCPDTBT with branched side chains by solvent vapor crystallization: influence on opto-electronic properties, **Advanced Materials**, **2015**, 27 (7): 1223
5. Ye, C., Sun, Y., Karim, A., Vogt, B.D., Extending Dynamic Range of Block Copolymer Ordering with Rotational Cold Zone Annealing (RCZA) and Ionic Liquids, **Macromolecules**, **2015**, 48 (20), 7567–7573.
6. Ye, C., Zhang, L., Fu, G., Karim, A., Kyu, T., Briseno, A.L., Vogt, B.D., Controlled Directional Crystallization of Oligothiophenes Using Zone Annealing of Preseeded Thin Films, **ACS Appl. Mater. Interfaces**, **2015**, 7 (41), 23008–23014.
7. Arvind Modi, Sarang M. Bhaway, Bryan D. Vogt, Jack F. Douglas, Abdullah Al-Enizi, Ahmed Elzatahry, Ashutosh Sharma, and Alamgir Karim, Direct Immersion Annealing of Thin Block Copolymer Films, **ACS Appl. Mater. Interfaces (Letter)**, **2015**, 7 (39), 21639–21645.
8. Chang Liu, Kai Wang, Chao Yi, Xiaojun Shi, Pengcheng Du, Adam W. Smith, Alamgir Karim and Xiong Gong, Ultrasensitive solution-processed perovskite hybrid photodetectors, **J. Mater. Chem. C**, **2015**, 3, 6600-6606.
7. Yager, K.G., Forrey, C., Singh, G., Satija, S.K., Page, K.A., Patton, D.L., Douglas, J.F., Jones, R.L., Karim, A., Thermally-induced transition of lamellae orientation in block-copolymer films on ‘neutral’ nanoparticle-coated substrates, **Soft Matter**, **2015**, 11, 5154-5167.
9. Shimelis T. Hailu, Saamil Samant, Christopher Grabowski, Michael Durstock, Alamgir Karim, and Dharmaraj Raghavan, Synthesis of highly dispersed, block copolymer-grafted TiO₂ nanoparticles within neat block copolymer films, **COVER, Journal of Polymer Science Part A: Polymer Chemistry**, **2015**, 53 (3) 468.
10. Samant, S., Hailu, S.T., Al-Enizi, A.M., Karim, A., Raghavan, D., Orientation control in nanoparticle filled block copolymer cold zone annealed films, **COVER, Journal of Polymer Science Part B: Polymer Physics Edition**, **2015**, 53, 604–614.
11. Deb, N., Dasari, R.R., Moudgil, K., Hernandez, J.L., Marder, S.R., Sun, Y., Karim, A., Bucknall, D.G., Thermo-cross-linkable fullerene for long-term stability of photovoltaic devices, **Journal of Materials Chemistry A** **10/2015**; DOI:10.1039/C5TA05824D
12. Wang, K., Liu, C., Du, P., Chen, L., Zhu, J., Karim, A., Gong, X., Efficiencies of perovskite hybrid solar cells influenced by film thickness and morphology of CH₃NH₃PbI_{3-x}Cl_x layer, **Organic Electronics** **06/2015**; 21. DOI:10.1016/j.orgel.2015.02.023
13. Zhang, X., Douglas, J.F., Satija, S., Karim, A., Enhanced Vertical Ordering of Block Copolymer Films by Tuning Molecular Mass, **RSC Advances** **03/2015**; 5(41). DOI:10.1039/C5RA02047F.
14. Roy, S., Bandyopadhyay, D., Karim, A., Mukherjee, R., Interplay of Substrate Surface Energy and Nanoparticle Concentration in Suppressing Polymer Thin Film Dewetting, **Macromolecules** **01/2015**; 48(2):373-382.
15. Danielle Grolman · Chelsea Davis · Jeffrey Gilman · Alamgir Karim, What do we still need to understand to commercialize cellulose nanomaterials? **Green Materials**, **07/2015**, 3 (3),:1-21. DOI:10.1680/gmat.15.00013

2014

16. Zheng, J., Chen, Y., Karim, A., Becker, M.L., Dopamine-Based Copper-Free Click Kit for Efficient Surface Functionalization, **ACS Macro Letters** **10/2014**; 3(10):1084-1087.
17. Zhang, X., Yager, K.Y., Douglas, J.F., Karim, A., Suppression of Target Pattern in Domain Aligned Cold-Zone Annealed Block Copolymer Films with Immobilized Film Spanning Nanoparticles, **Soft Matter**, **2014**, 10 (20), 3656.
18. K. Wang, C. Yi, X. Hu, C. Liu, Y. Sun, J. Hou, Y. Li, J. Zheng, S. Chuang, A. Karim, and X. Gong, Enhanced performance of polymer solar cells using PEDOT:PSS doped with Fe₃O₄ magnetic nanoparticles aligned by an external magnetostatic field as an anode buffer layer, **ACS Applied Materials & Interfaces**, **2014**, 6: 13201-13208.
19. Bhaway, S., Kisslinger, K., Zhang, L., Yager, K.G., Schmitt, A.L., Mahanthappa, M.K., Karim, A., Vogt, B.D., Mesoporous Carbon-Vanadium Oxide Films by Resol-Assisted, Triblock Copolymer-Templated Cooperative Self-Assembly, **ACS Applied Mater & Interfaces**, **2014**, 6(21) 19288.

20. H. Yuan, G. Singh, D Raghavan, A.M. Al-Enizi, A. Elzatahry, A. Karim, Dispersion Morphology and Correlation to Moduli using Buckling Metrology in Clay-Biopolymer Nanocomposite Thin Films, **ACS Applied Materials & Interfaces**, **2014**, 6 (16), 13378.
21. Li, B., Ren, H., Yuan, H. Karim, A., Gong, X., Room-Temperature Solution-Processed MoO_x Thin Film as a Hole Extraction Layer to Substitute PEDOT:PSS in Polymer Solar Cells, **ACS Photonics**, **2014**, 1, 87.
22. P. Pitliya, Y. Sun; J. C. Garza; C. Liu, X. Gong, A. Karim, D. Raghavan, Synthesis and characterization of novel fulleropyrrolidine in P3HT blended bulk heterojunction Solar Cells, **Polymer**, **2014**, 55(7), 1769–1781.

2013

23. Zhang, R., Singh, G., Dang, A., Dai, L., Bockstaller, M., Akgun, B., Satija, S., Karim, A., Nanoparticle-Driven Orientation Transition and Soft-Shear Alignment in Diblock Copolymer Films via Dynamic Thermal Gradient Field, **Macromolecular Rapid Communications**, **2013**, 34 (20) 1642.
24. Berry, B.C., Singh, G., Kim, H.-C., Karim, A., Highly Aligned Block Copolymer Thin Films by Synergistic Coupling of Static Graphoepitaxy and Dynamic Thermal Annealing Fields, **ACS Macro Letters**, **2013**, 2, 346.
25. Xue, J., Singh, G., Qiang, Z., Yager, K., Karim, A., Vogt, B.D., Facile Control of Long Range Orientation in Mesoporous Carbon Films with Thermal Zone Annealing Velocity, **Nanoscale**, **2013**, 5, 12440.
26. Singh, G.; Batra, S.; Zhang, R.; Yuan, H.; Yager, K. G.; Berry, B.; Cakmak, M.; Karim, A. Large-Scale Roll-to-Roll Fabrication of Vertically Oriented Block Copolymer Thin Films, **ACS Nano**, **2013**, 7, 5291.
27. Kai Wang, He Ren, Hangxing Wang, Chao Yi, Li Huang, Haoli Zhang, Alamgir Karim, and Xiong Gong, Solution-Processed Fe₃O₄ Magnetic Nanoparticle Thin Film Aligned by an External Magnetostatic Field as a Hole Extraction Layer for Polymer Solar Cells, **ACS Appl. Mater. & Interface**, **2013**, 5, 10325-10330.
28. H. X. Wang, X. F. Yu, C. Yi, H. Ren, C. Liu, Y. Yang, S. Xiao, A. Karim, S. D. Cheng, and X. Gong, Fine-tuning of fluorinated thieno[3,4-b] thiophene copolymer for efficient polymer solar cells, **J. Phys. Chem. C**, **2013**, 117(9), 4358-4363.
29. 2-D Gold Nanoparticle Arrays from Thermally Directed Self-Assembly of Peptide-Derivatized Block Copolymers, Rao, T., Singh, G., Xie, S., Karim, A., Becker, M.L., **Soft Matter**, **2013**, 9, 33, 8023-8032.

2012

30. Marszalek, J.E., Simon Jr., C., Thodeti, C., Adapala, R.K., Murthy, A., Karim, A., 2.5D constructs for characterizing phase separated polymer blend surface morphology in tissue engineering scaffolds, **Journal of Biomedical Materials Research**, **2012**, 101A, 5, 1502–1510.
31. Dynamic Thermal Field Induced Gradient Soft-Shear for Highly Oriented Block Copolymer Thin Films, Singh, G., Yager, K., Berry, B., Kim, H.C., Karim, A., **ACS Nano**, **2012**, 6(11), 10335.
32. Singh, G., Yager, K., Smilgies, D., Kulkarni, Bucknall, D., Karim, A., Tuning Molecular Relaxation for Vertical Orientation in Cylindrical Block Copolymer Films via Sharp Dynamic Zone Annealing, **Macromolecules**, **2012**, 45, 7107
33. Diblock Copolymer Lamellae on Fractal Surface, Ranjan, A., Kulkarni, M., Karim, A., Sharma, A., **J. Chem. Phys.**, **2012**, 136 (9), 094903.
34. Directed Assembly of Block Copolymer Films: Effects of Rough Substrates and Thermal Fields, Ch. 10 pg. 257 **Soft Matter Gradient Surfaces: Methods and Applications**, Jan Genzer, Editor, ISBN: 978-0-470-52265-3 by Manish M. Kulkarni, Alamgir Karim, and Kevin G. Yager. February (2012).
35. Kang, H.G., Clarke, M.L., Lacerda, S.H.D.P., Karim, A., Pease, L.F., Hwang, J., Multimodal optical studies of single and clustered colloidal quantum dots for the long-term optical property evaluation of quantum dot-based molecular imaging phantoms, **Biomedical Optics Express**, **2012**, 3 (6), 1312.

2011

36. Influence of C₆₀ Nanoparticles on the Stability and Morphology of Miscible Polymer Blend Films, Bandyopadhyay, D., Douglas, J.F., Karim, A., **Macromolecules** 44 (20): 8136 (2011).
37. Using Block Copolymer Self-Assembly to Imprint the Crystallization of Polymer Dendrites, Kim, S., Douglas, J.F., Soles, C.L., Karim, A., Briber, R.M., **Soft Matter** 7 (19): 8969 (2011).
38. Imaging Magnetic Flux Lines with Iron Oxide Nanoparticles Using a “Fossilized Liquid Assembly, Schmidt, R., Benkoski, J., Cavicchi, K., Karim, A., **Soft Matter** 7 (12): 5756 (2011).

2010

39. SPR imaging study of DNA wrapped single wall carbon nanotube (ssDNA-SWCNT) adsorption on a model biological (collagen) substrate, Park, J.J., Fagan, J.A., Huh, J.Y., Migler, K.B., Karim, A., Raghavan, D., **Soft Matter** 6 (21): 5581 (2010).
40. Thermally Reversible Surface Morphology Transition in Thin Diblock Copolymer Films, Zhang, X.H., Yager, K.G., Fredin, N.J., Ro, H.W., Jones, R.L., Karim, A., Douglas, J.F., **ACS Nano** 4 (7): 3653 (2010).
41. Observation of a characteristic length scale in the healing of glassy polymer interfaces, Yuan, G.C., Li, C., Satija, S.K., Karim, A., Douglas, J.F., Han, C.C., **Soft Matter** 6 (10): 2153 (2010).
42. Surface Effects on the Thin Film Morphology of Block Copolymers with Bulk Order-Order Transitions, Sohn, K.E., Kojio, K., Berry, B.C., Karim, A., Coffin, R.C., Bazan, G.C., Kramer, E.J., Sprung, M., Wang, J., **Macromolecules** 43 (7): 3406 (2010).
43. Characterization of Non-Equilibrium Nanoparticle Adsorption on a Model Biological Substrate, Park, J.J., Weiger, M.C., Lacerda, S.H.D.P., Pristinski, D., Becker, M.L., Douglas, J.F., Raghavan, D., Karim, A., **Langmuir** 26 (7): 4822 (2010).
44. Quantification of the binding affinity of a specific hydroxyapatite binding peptide, Weiger, M.C., Park, J.J., Roy, M.D., Stafford, C.M., Karim, A., Becker, M.L., **Biomaterials** 31 (11): 2955 (2010).
45. Interaction of Gold Nanoparticles with Common Human Blood Proteins, Lacerda, S.H.D.P., Park, J.J., Meuse, C., Pristinski D., Becker, M.L., Karim, A., Douglas, J.F. **ACS Nano** 4 (1): 365 (2010).
46. Solvent Retention in Thin Spin-Coated Polystyrene and Poly(methyl methacrylate) Homopolymer Films Studied By Neutron Reflectometry, Zhang, X.H., Yager, K.G., Kang, S.H., Fredin, N.J., Akgun, B., Satija, S., Douglas, J.F., Karim, A., Jones, R.L., **Macromolecules**, 43 (2): 1117 (2010).
47. Evolution of block-copolymer order through a moving thermal zone, Yager, K.G., Fredin, N.J., Zhang, X.H., Berry, B.C., Karim, A., Jones, R.L., **Soft Matter** 6 (1): 92 (2010).

2009

48. Effect of Fluorosurfactant on Capillary Instabilities in Nanoimprinted Polymer Patterns, Alvine, K.J., Ding, Y.F., Douglas, J.F., Ro, H.W., Okerberg, B.C., Karim, A., Lavery, K.A., Gibson, S.L., Soles, C.L., **Journal of Polymer Science Part B-Polymer Physics** 47 (24): 2591 (2009).
49. Interfacial fluctuations in an ideal block copolymer resist, Bosse, A.W., Lin, E.K., Jones, R.L., Karim, A., **Soft Matter**, 5 (21): 4266 (2009).
50. Target Patterns Induced by Fixed Nanoparticles in Block Copolymer Films, Zhang, X.H., Lacerda, S.H.D.P., Yager, K.G., Berry, B.C., Douglas, J.F., Jones, R.L., Karim, A., **ACS Nano**, 3 (8): 2115 (2009).
51. Capillary instability in nanoimprinted polymer films, Alvine, K.J., Ding, Y.F., Douglas, J.F., Ro, H.W., Okerberg, B.C., Karim, A., Soles, C.L., **Soft Matter** 5 (15): 2913 (2009).
52. Dielectric Spectroscopy Investigation of Relaxation in C-60-Polyisoprene Nanocomposites, Ding, Y.F., Pawlus, S., Sokolov, A.P., Douglas, J.F., Karim, A., Soles, C.L. **Macromolecules** 42 (8): 3201 (2009).
53. Direct observation of interfacial C-60 cluster formation in polystyrene-C-60 nanocomposite films, Han, J.T., Lee, G.W., Kim, S., Lee, H.J., Douglas, J.F., Karim, A., **Nanotechnology** 20 (10) Article Number: 105705 (2009).
54. Competition between crystallization and dewetting fronts in thin polymer films, Okerberg, B.C., Berry, B.C., Garvey, T.R., Douglas, J.F., Karim, A., Soles, C.L., **Soft Matter** 5 (3): 562 (2009).
55. Disordered nanoparticle interfaces for directed self-assembly, Yager, K.G., Berry, B.C., Page, K., Patton, D., Karim, A., Amis, E.J., **Soft Matter** 5 (3): 622 (2009).
56. Langmuir Adsorption Study of the Interaction of CdSe/ZnS Quantum Dots with Model Substrates: Influence of Substrate Surface Chemistry and pH, Park, J.J., Lacerda, S.H.D.P., Stanley, S.K., Vogel, B.M., Kim, S., Douglas, J.F., Raghavan, D., Karim, A., **Langmuir** 25 (1): 443 (2009).

2008

57. Nanoscale thermal-mechanical probe determination of 'softening transitions' in thin polymer films, Zhou, J., Berry, B., Douglas, J.F., Karim A., Snyder, C.R., Soles, C., **Nanotechnology** 19 (49) 495703 (2008).
58. Surface Morphology Diagram for Cylinder-Forming Block Copolymer Thin Films, Zhang, X.H., Berry, B.C., Yager, K.G., Kim, S., Jones, R.L., Satija, S., Pickel, D.L., Douglas, J.F., Karim, A. **ACS Nano** 2(11): 2331 (2008).

59. Self-Assembly of Polymer-Coated Ferromagnetic Nanoparticles into Mesoscopic Polymer Chains, Benkoski, J.J., Bowles, S.E., Jones, R.L., Douglas, J.F., Pyun, J., Karim, A. **Journal Of Polymer Science Part B-Polymer Physics** 46 (20): 2267 (2008)
60. Nanoimprint lithography and the role of viscoelasticity in the generation of residual stress in model polystyrene patterns, Ding, Y.F., Ro, H.W., Alvine, K.J., Okerberg, B.C., Zhou, J., Douglas, J.F., Karim, A., Soles, C.L. **Advanced Functional Materials** 18 (12): 1854 (2008).
61. Self-sealing of nanoporous low dielectric constant patterns fabricated by nanoimprint lithography, Ro, H.W., Peng, H., Niihara, K.I., Lee, H.J., Lin, E.K., Karim, A. Gidley, D.W., Jinai H., Yoon D.Y. and Soles C.L., **Advanced Materials** 20 (10): 1934 (2008).

2007

62. Versatile platform for creating gradient combinatorial libraries via modulated light exposure, Berry, B.C., Stafford, C.M., Pandya, M., Karim, A., Fasolka, M.F., **Rev. of Scientific Instruments** 78 (7): 072202 (2007).
63. Crystallization of poly(ethylene oxide) patterned by nanoimprint lithography, Okerberg, B.C., Soles, C.L., Douglas, J.F., Ro, H.W., Karim, A., Hines D.R., **Macromolecules** 40 (9): 2968 (2007).
64. Quantum mazes: Luminescent labyrinthine semiconductor nanocrystals having a narrow emission spectrum, S.H.D.P. Lacerda, J.F. Douglas, S.D. Hudson, M. Roy, J.M. Johnson, M. L. Becker, A. Karim, **ACS Nano**, 1 (4), 337 (2007).
65. Relaxation Behavior of Polymer Structures Fabricated by Nanoimprint Lithography, Y. Ding, H.W. Ro, T.A. Germer, J.F. Douglas, B.C. Okerberg, A. Karim, and C.L. Soles, **ACS Nano**, 1(2), 84 (2007).
66. The Direct Patterning of Nanoporous Interlayer Dielectric Insulator Films by Nanoimprint Lithography, H.W. Ro, R.L. Jones, H. Peng, D.R. Hines, H.-J. Lee 1, E.K. Lin, A. Karim, D.Y. Yoon, D.W. Gidley, C. L. Soles, **Advanced Materials** 19 (19): 2919 (2007).
67. Polymer viscoelasticity and residual stress effects on nanoimprint lithography, Ding, Y.F., Ro, H.W., Douglas, J.F., Karim, A., Soles, C.L., **Advanced Materials** 19 (10): 1377 (2007).
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12. AFM Studies of Confined Dewetting on Gradient Patterned Surfaces, A. Karim, A. Sehgal, and E.J. Amis, *Polymer Preprints*, 2000, 41(2), 1440.
13. Polymer Blend Phase Separation on Patterned Substrates, B.D. Ermi, G. Nisato, J.F. Douglas, A. Karim, ACS-Polymer Preprints, 39, 1163 (1998).
14. Neutron Reflectivity of Polymer Blends, R. Braiewa, R.A. Weiss, A. Karim, J.F. Ankner ACS-PMSE, 79, 301 (1998).
15. Influence of Dimensionality on the Phase Separation Kinetics of Blend Films, A. Karim, L.P. Sung, J.F. Douglas, B. Ermi, *Physics News* (1996).

16. Atomic Force Microscopy Investigations of Phase Separation in Ultrathin Films, B.D. Ermi, A. Karim, J.F. Douglas, L.P. Sung, ACS-PMSE, Las Vegas, Spring (1997).
17. Frustrated Coalescence in Reactive Blends, A. Karim, J.F. Douglas, C.C. Han, ACS PMSE, Orlando, Fall (1996).
18. Phase Behavior Of Thin Polymer Blend Films, A. Karim, S.K. Satija, C.C. Han, T.M. Slawewski, S.K. Kumar, T.P. Russell, ACS PMSE 71, 280 (1994).
19. Surface Segregation in Polymer Melts R.J. Composto, T.L. Mansfield, R.S. Stein, G.P. Felcher, A. Karim, ACS Polymer Preprints, No. 2 (1990).
20. Polymer-Surface Interactions in Nanofilled Polymers, Karim, A. and Douglas, J. F., SAMPE Proceedings, Detroit MI (1999).
21. Mobility of Polymers in Nanometer Slits: Kinetics of Polymer Melt Intercalation in Layered Silicates, Giannelis, E.P., Chen, H., Demeter, J., Manias, E., Hadjichristidis, N., Karim, A., ACS Polymer Preprint, (1999).
22. Interactions of Polymers with Fillers and Nanocomposites, Karim, A., NISTIR 6312, Workshop report, June 18-19 (1998).
23. Influence of Generation Number on the Formation of Dendrimer Monolayers, A. Karim, J.F. Douglas, B.D. Ermi, B. Bauer, ACS-PMSE, Las Vegas, Spring (1997).
24. Models of Influence of Excluded Volume on the Formation of Polymer Layers, J.F. Douglas, R. Lipman, A. Karim, S. Granick, ACS- PMSE, Las Vegas, Spring (1997).
25. Phase Separation in Thin Film Polymer Blends with and without Block Copolymer Additives, L. Sung, A. Karim, J.F. Douglas, C.C. Han, ACS-PMSE, 74, 106 (1996).
26. Kinetics of Mixing at Polymer-Polymer Interface Capable of Forming Intermolecular Complexes, Y. Feng, R.A. Weiss, A. Karim, C.C. Han, J.F. Ankner, D.G. Peiffer, ACS New Orleans, Polymer Preprints, Spring (1996).
27. Concentration Profiles Of End Anchored Polymer Brushes Under Variable Solvent Quality, S.K. Satija, A.Karim, J.F. Douglas, L.J. Fetters ACS PMSE 71, 277 (1994).
28. Neutron Reflection Studies of Swelling of Chemically End-Grafted Polymer Chains, A. Karim, S.K. Satija, P.D. Gallagher, J. F. Douglas, L.J. Fetters Mat. Res. Soc. Symp. Proc. 376 (1994).
29. Neutron Reflection Studies of Swelling of Chemically End-Grafted Polymer Chains, A. Karim, S.K. Satija, P.D. Gallagher, J. F. Douglas, L.J. Fetters Mat. Res. Soc. Symp. Proc. 376 (1994).
30. Chemical Grafting of Silane End-functionalized Polymer on Silicon Surfaces, A. Karim, S.K Satija, W. Orts, J. F. Ankner, C. F. Majkrzak, and L.J. Fetters, Proc. Materials Research Society, San Francisco, Spring (1993).
31. Diffusion Studies in Polymer Bilayers by Neutron Reflection, A. Karim, G.P. Felcher, T.P. Russell, ACS Polymer Preprints 31, No. 2, (1990).
32. Surface Enrichment and Evaporation in a Polymer Mixture of Long and Short Chains, R. J. Composto, R. S. Stein, G.P. Felcher, A. Mansour and A. Karim, in Polymer Based Molecular Composites, edited by D.W. Schaefer and J.E. Mark, MRS Symposia Proceedings No. 171 (Materials Research Society, Boston, 1989).
33. On the Scale of Diffusion Lengths Observable by Neutron Reflection: Application to Polymers, A.Karim, A. Mansour, G.P. Felcher and T.P. Russell, in Polymer Based Molecular Composites, edited by D.W. Schaefer and J.E. Mark, MRS Symposia Proceedings No. 171 (Materials Research Society, Boston, 1989).

BOOKS, ENCYCLOPEDIA ARTICLES:

1. "Combinatorial Methods and their Application to Mapping Wetting-Dewetting Transition Lines on Gradient Surface Energy Substrates", D. Raghavan, K. M. Ashley, A. Seghal, J. F. Douglas, and A. Karim, in Combinatorial Materials Science edited by Balaji Narasimhan, Surya K. Mallapragada, Marc D. Porter (John Wiley & Sons Ltd, ISBN: 9780471728337 Online ISBN: 9780470140475, 2007).
2. "Combinatorial Methods for Materials Research and Development-Polymeric Materials", J.D. Hewes, D. Kaiser, A. Karim, and Amis. E.J., Encyclopedia of Chemical Technology, (Kirk-Othmer Online, Wiley Interscience), 2003.
3. "Image Analysis for High-Throughput Materials Science", Alamgir Karim, J. Carson Meredith, Amit Sehgal, Alfred J. Crosby and Eric J. Amis in Section III-Microscopic And Surface Analysis; Book-High Throughput Analysis: A Tool for Combinatorial Materials Science, Kluwer Academic/Plenum Publishers, 2003.
4. "Combinatorial Methods for Polymer Science", J.C. Meredith, A.P. Smith, A.J. Crosby, E.J. Amis, and A. Karim, in Encyclopedia of Polymer Science and Technology, (John Wiley & Sons, New York), Online-Edition, 2003.

5. "Combinatorial Mapping of Polymer Blends Phase Behavior", A. Karim, A. Sehgal, J.C. Meredith, and E.J. Amis, in *Experimental Design for Combinatorial and High Throughput Materials Science*, edited by J. Cawse, GE Global Research (John Wiley & Sons Ltd, 2002).
6. "Combinatorial Polymer Science: Synthesis and Characterization", J.C. Meredith, A.P. Smith, A. Karim, and E.J. Amis, Chapter 2, *Combinatorial Materials Development*, American Chemical Society Symposium series 814, 2002.
7. "Polymer Interfaces and Thin Films", *Materials Research Society Symposium proceedings*, v710, 2002.
8. "Self-assembly by Phase Separation in Polymer Thin Films", Karim, A., Douglas, J. F., Sung, L. P., and Ermi, B. D. *Encyclopedia of Materials Science and Technology*, ed.: 2002.
9. "Polymer Brushes: Structure and Dynamics" Douglas, J. F., Karim, A., Kent, M. S., and Satija, S. K., *Encyclopedia of Materials: Science and Technology*, ed.: Elsevier; 2002; 7218-7223.
10. "Dispersion and Nucleating Effects of Clay Fillers in Nanocomposite Polymer Films", Chapter 14, *Polymer Nanocomposites*, American Chemical Society Symposium series 804, 2001.
11. "Nonlithographic and Lithographic Methods of Nanofabrication – From Ultralarge-Scale Integration to Photonics to Molecular Electronics", *Materials Research Society Symposium proceedings*, v636, 2001; "Interface, Adhesion and Processing in Polymer System", *Materials Research Society symposium proceedings*, v629, 2000.
12. "Polymer Surfaces, Interfaces and Thin Films", *Series on Directions in Condensed Matter Physics*, World Scientific Publishing Co., Inc. 2000.

RESEARCH STAFF SUPERVISED AT NIST

Nanomaterials Group

J. Douglas, R. Jones, K. Page, A. Bosse, B. Berry, C. Soles

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Polymer Blends and Processing

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Graduate Students at NIST

Ken-ichi Niihara, Karen Ashley, Koray Yurekli, Glen Merfeld, Charles Laub, Kenneth Strawhecker, Naoya Torikai, Yi Feng, Tania Slawecki

High School Interns at NIST

A. Kannan, M. Pandya, S. Chang, J. Jou, S. Hong, S. Wozniak, S. Kim, O. Karim, D. Ku.

FINANCIAL SUPPORT FOR RESEARCH

1. Characterization Methodology for Polymer Nanocomposites, Advanced Technology Program (Intramural-ATP), NIST, PI, \$200k (1998 - 2000).
2. Combinatorial Assay of Biofunctional Polymer Materials (Intramural-ATP), NIST, Co-PI, \$410k (1999-2001)
3. Auto Image Processing Tools for High-Throughput Measurements of Polymer Coatings, Advanced Technology Program (Intramural-ATP), NIST, PI, \$80k (2001).
4. Combinatorial Characterization of Polymer Mechanical Properties, MSEL Director's Reserve Competetion, NIST, PI, \$150k (2001).
5. High-Throughput Screening of Molecular Transport through Films, Membranes and Nanostructures, (Intramural-ATP), NIST, PI, \$144k (2001-2002).
6. High-Throughput Method for Formulation, Characterization and Screening of Low Flammability Polymer Blend, (Intramural-ATP), NIST, PI, \$135k (2001-2002).
7. Chemical Sensor Microscopy for Nanotechnology, Advanced Technology Program (Intramural-ATP), NIST, PI, \$115k (2002).
11. Polymer Thin Films: A Testbed for Combinatorial Methods, NIST Director's Competence Program Award, NIST, (2001-2006), \$300k/Yr.
12. Mechanical Properties of Nanoscale Thin Films, MSEL Director's Reserve Competetion, NIST, PI, \$150k (2003).
13. Metrology for Simultaneous Thermal and Relaxation Property Measurements for Reliability of Active Nanodevices, MSEL Director's Reserve Competetion, NIST, PI, \$600k (2005-2006).
14. SAXS for Gold Reference Material Nanoparticle Characterization, Statement of Work Agreement with NIH-National Cancer Lab., \$200k, 2006.
15. Metrology for the "Fate" of Nanoparticles in Biosystems, Co-PI, NIST Director's Competence Program Award, NIST, (2006-current), \$400k/Yr.

INVITED SEMINARS (2004 – to date)

1. Evolution of Orientational Order in Template Directed Block Copolymer Films, ACS Meeting, New Orleans, April 2008.
2. Orientation of Block Copolymers with Nanoparticles, ACS Meeting, New Orleans, April 2008.
3. Nanoparticle Surfaces for Directed Self-Assembly of Polymer Films, Nanotechnology in Coatings: Emerging Applications, Orlando, FL, Mar, 08.
4. Fate of Nanoparticles in Biosystems, GE, CRD, Niskayuna, NY, Mar, 08.
5. Template Directed Assembly of Block Copolymer Films, APS, New Orleans, Mar, 08.
6. Orientational Order in Template Assembly of Block Copolymer Films, POLYChar-16, Lucknow, India, Feb, 08.
7. Advanced Characterization Methods for Polyolefins, Polyolefin 2008, SPE-Antech, Houston, TX, Feb, 08.
8. Guided Self-Assembly of Block Copolymer Films, Oak Ridge National Laboratory, Oak Ridge, TN, Feb, 08.
9. Nanopatterns from Block Copolymer Self-Assembly, IBM Workshop on Self-Assembly, San Jose, CA, Jan, 08.
10. Scattering for 3D Nanostructures Characterization, GM, Honeyoye Falls, Schnectady, NY, Jan, 08.
11. 3D Characterization of Nanostructures Materials, GM, Warren, MI, Nov, 07.
12. Opportunities in Neutron and Nanoscience: Polymers Materials Science, CNMS, Oak Ridge National Laboratory, Oak Ridge, TN, Nov. 07.
13. Template Directed Assembly of Block Copolymer Films, Hitachi Corp., San Jose, CA, Sep, 07.
14. Directed Assembly of Block Copolymers from Curved Interfaces, ACS Fall Meeting, Boston, MA, Aug, 07.
15. Nanoparticle Self-Assembly at Liquid Interfaces, SUNY, Binghamton, NY, Aug, 07.
16. Characterization of Nanoparticles for Biosystems, NIOSH, Morgantown, WVA, Aug, 07.
17. Unconventional Processes for Nanostructured and Microstructured Polymer Systems, ACS Spring Meeting, Chicago, IL, Mar, 07.
18. Facile Imaging of Self-Assembly of Nanoparticles Self-Assembly, ACS Spring Meeting, Chicago, IL, Mar, 07.
19. Characterization Methods for Nanostructured Materials, IIT Kanpur, Chem. Engg. Dept., Kanpur, India, Feb, 07.

20. Fossilized Liquid Assembly for Self-Assembly of Nanoparticles, 1st International Joint Symposium on Polymer Materials, Science, KIT, Kyoto, Japan, Dec, 06.
21. Interfacial Assembly of Nanoparticles at Liquid Interfaces, Texas A&M, Chemistry Dept., Nov, 06.
22. Controlling Orientation and Assembly of Block Copolymer Thin Films, IMAPS, San Diego, CA, Oct, 06.
23. Kinetics of Slumping of Nanoimprinted Structures, IMAPS, San Diego, CA, Oct, 06.
24. Nanoparticle Self-Assembly at Liquid Interfaces, ACS 19th Rocky Mtn Regional Mtg., Tuscon, AZ, Oct, 06.
25. Manipulating Defects and Order in Nanostructured Thin Films, Intertech Pira Meeting on Functional Nanomaterials, Charlotte, NC, Sep, 06.
26. Block Copolymer Thin Films Ordering on Chemical Gradient Surfaces, IBM Seminar Series on Nanostructured Materials, May, 06.
27. Solvent Vapor Control of Block Copolymer Films, Polymer Physics (PP2006), Suzhou, China, June. 06.
28. Controlling Orientation and Defects in Block Copolymer Films through Surface Interactions, Chinese Academy of Sciences, Beijing, China, May. 06.
29. Convergence of Industry, Government and Academic Research for Applied Polymer Science, Center for Interfacial Engineering, CUNY, NY, April, 06.
30. Surface Energy Effects on Block Copolymer Thin Films Ordering, ACS Pacifichem, Honolulu, Hawaii, Dec, 05.
31. Nanoscale Materials Research in Polymers Division, Air Products, Allentown, PA, May, 05.
32. Nanotechnology at NIST, Combinatorial Materials Science Workshop, Tsukuba, Japan, Dec 04.

SERVICE TO EXTERNAL COMMUNITY

SYMPOSIUM ORGANIZER:

1. "Fundamentals and Applications of Nanomaterials for Electronics and Photonics" Pacifichem, Hawaii, 2010 (Winter).
2. "Defects in Polymer Nanostructures", American Chemical Society, National Meeting, Washington D.C., Aug., 2005.
3. "Combinatorial Approaches to Materials", American Chemical Society, Spring Meeting, Anaheim, Mar.-Apr. 2004.
4. "Combinatorial and Artificial Intelligence Methods in Materials Science", Materials Research Society, National Meeting, Boston, Nov. 2003.
5. "Polymer Surfaces and Thin Films", Materials Research Society, National Meeting, Boston, Nov. 2001.
6. "Nonlithographic and Lithographic Methods for Nanofabrication-From Ultralarge-Scale Integration to Photonics to Molecular Electronics", Materials Research Society, Fall Meeting, Boston, MA Nov. 2000.
7. "Interfaces, Adhesion and Processing", Materials Research Society, National Meeting, San Francisco, Apr. 2000.
8. "Synthesis and Characterization of Grafted Polymers", American Chemical Society, National Meeting, New Orleans, Aug., 1999.
9. "Synthetic Design and Characterization of Surfaces and Interfaces", American Chemical Society, National Meeting, Las Vegas, Sept. 1997.

[4 of above symposia at MRS and ACS meetings supported by funded proposals to NSF-DMR and ACS-PRF.]

WORKSHOP ORGANIZER:

1. Taught APS short course on "Combinatorial Methods for Polymer Thin Films Science", New Orleans, Mar', 2008.
 1. 3rd International Meeting on Polymers Materials Science, Nagoya, Japan, 2008 (Fall).
 2. 2nd International Meeting on Polymers Materials Science, NIST, 2007.
 3. NIST-NIMS Combinatorial Nanomaterials Meeting, NIST 2005.
 4. NSF-NIST Directors' Round Table Collaboration Meeting, NIST, 2004.
 5. NCMC Members Meeting "Combinatorial Informatics", NIST, 2003.
 6. NCMC Members Meeting "Combinatorial Adhesion and Mechanical Properties", NIST, 2002.
 7. NCMC Members Meeting "Library Design and Calibration", NIST, 2002.

8. NCMC Kick-Off Meeting organized by Knowledge Foundation, San Diego 2002.
9. NIST Combinatorial Methods Center, NCMC Concept Workshop, NIST, 2001.
10. Technology Vision 2020 Organizer: Combinatorial Materials Science Roadmapping Workshop, 2000.
11. Combinatorial Materials Science: A National Dialogue, NIST, 2000.
12. Interactions of Polymers with Fillers and Nanocomposites, NIST, 1998.

NIST COMBINATORIAL METHODS CENTER (NCMC), 2000-2004:

Co-founder of the NIST Combinatorial Methods Center (NCMC) www.nist.gov/combi, a highly visible and successful multi-tier consortium on combinatorial methods with industry, academia and national laboratories. Director of NCMC, 2000-2004 with 20 member companies (membership ea. @ 10k/yr). Demonstrated application of combinatorial methods to wide range of thin film phenomena – phase separation, dewetting, crystallization, adhesion, block copolymer ordering, nanomechanics.

TEACHING

Thesis Advisor:

U. Latif, Advisor and PhD. thesis dissertation committee member, Dept. of Chemistry, CUNY, Staten Island, NY, 2002-2006.

S. Rathore, Advisor and PhD. thesis dissertation committee member, Dept. of Chemistry, CUNY, Staten Island, NY, 2002-2006.

K. Ashley, Advisor and PhD. thesis dissertation committee member, Howard University, 2003-2005.

T. Elias, Advisor and Masters thesis dissertation committee, Howard University, Chemistry Department, Washington D.C. 2002.

T. Slawewski, Advisor and PhD. thesis dissertation committee member, Pennsylvania State University, PA 1993.

Northwestern University:

Teaching Assistant (2 years) Physics and Astronomy curriculum at Northwestern University from Fall 1985 to Spring 1987.

Summer Teaching for physics for enrolled summer students, May-July, 1986

Teaching Assistant Undergraduate Laboratory Courses (Electricity and Magnetism, Mechanics).

Best Reviews for teaching from students evaluation in Laboratory courses as well as for Summer TA.

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