

Douglas M. Fox

Curriculum Vitae

PERSONAL INFORMATION

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EDUCATION

Ph.D. in Physical Chemistry, advisor: Professor Leslie Leifer, Michigan Technological University, December 2001.

B.S. in Chemical Engineering, Michigan Technological University, May 1995.

EMPLOYMENT HISTORY

1995-2000	Graduate Teaching Assistant, Chemistry Department, Michigan Technological University, Houghton, MI.
2001	Instructor/Laboratory Advisor, Chemistry Department, Michigan Technological University, Houghton, MI.
2002	Visiting Assistant Professor, Chemistry Department, Michigan Technological University, Houghton, MI.
2002-2004	ASEE/NRL Postdoctoral Fellow, Chemistry Division, Naval Research Laboratory, Washington, DC.
2004-2006	Assistant Research Professor, Chemistry Department, U. S. Naval Academy, Annapolis, MD.
2006-2012	Assistant Professor, Department of Chemistry, American University, Washington DC.
2012-2017	Associate Professor, Department of Chemistry, American University, Washington DC.
2003-present	NIST Guest Researcher, National Institute of Standards and Technology, Gaithersburg, MD.

2017-present Professor, Department of Chemistry, American University, Washington DC.

HONORS AND AWARDS

Outstanding Doctoral Graduate Student, Michigan Technological University, 1998-1999.

Outstanding Teaching Assistant, Michigan Technological University, 1996-1997.

PUBLICATIONS

Refereed Journal Articles & Refereed Book Chapters:

(Undergraduate students are underlined and MS students are double underlined.)

I. Patel, J. W. Woodcock, R. Beams, J. W. Gilman, D. M. Fox, C. Sayes, P. Demokritou, M. Salari, G. M. DeLoid, S. Harper, and J. Shatkin, “Fluorescently Labeled Cellulose Nanofibers for Environmental Health and Safety Studies,” manuscript in preparation.

W. Cho, K. L. Dubrelle, and D. M. Fox, “Reduced Flammability of Crosslinked, Chitosan – Coated Wood,” manuscript in preparation.

D. M. Fox, N. Kaufman, M. Colorado Escobar, E. Knowlton, J. F. Lomax, Y.-C. Li, Y. S. Kim, K. Hoffmann, and R. D. Davis, “Acid induced flocculation of flame retardant coatings derived from natural materials,” manuscript in preparation.

Y. Song, H. Lin J. W. Woodcock, N. Lin, J. Dunkers, C. Simon Jr., D. M. Fox, X. Liao, L. Yang, and M. Y. M. Chiang, “Scaffold Stiffness at Microscale Directs Stem Cell Lineage Specification,” manuscript in preparation.

S. Seethamraju, J. W. Woodcock, R. Beams, S. J. Stranick, D. M. Fox, A. Liddle, and J. W. Gilman, “Sensing Water Diffusion and Polymer Dynamics in Composites Using a Fluorogenic Water Sensing Probe,” manuscript in preparation.

D. M. Fox, W. Cho, A. Do, and R. Lara, “Curing Kinetics of Cellulose Nanomaterial – DGEBA Epoxy Composites,” manuscript in preparation.

J. Goswami, E. Haque, D. M. Fox, J. W. Gilman, G. Holmes, R. J. Moon, and K. Kalaitzidou, “The Effect of Cellulose Nanocrystal Coating on the Glass Fiber – Epoxy Interphase,” manuscript in preparation.

B. Natarajan, Y. Mao, B. Frieberg, J. Obrzut, D. M. Fox, and J. W. Gilman, “A SANS Study of the Effect of Drying Rate and Counterion Hydrophobicity on Cellulose Nanocrystal Assembly,” *Cellulose*, submitted.

43. S. Mohanaraj, P. Wonnenberg, B. Cohen, H. Zhao, M. Hartings, S. Zou, D. M. Fox, A. G. Zestos, “Gold Nanoparticle Modified Carbon Fiber Microelectrodes for Enhanced Neurochemical Detection,” *Journal of Visualized Experiments*, accepted.
42. D. M. Fox, K. Wakeman, T. Ravick, W. Cho, C. Sayes, J. Woodcock, and J. W. Gilman, “Interfaces in Aromatic Polymer – Nanocellulose Composites,” Chapter 7 in *Cellulose to Nanocellulose: Production, Properties and Applications*, T. D. Ngo (editor), Hauppauge, NY: Nova Science Publishers, 2019.
41. L. J. Johnston, Z. J. Jakubek, S. Beck, J. Araki, E. Cranston, C. Danumah, D. M. Fox, L. Haifeng, Z. Mester, A. Moores, K. Murphy, A. Rudie, C. Stephan, “Determination of Sulfur and Sulfate Half-ester Content in Cellulose Nanocrystals: An Interlaboratory Comparison,” *Metrologia*, **2018**, 55, 872 – 882.
40. Roy, D., Kotula, A., Natarajan, B., Gilman, J. W., Fox, D. M., and Migler, K., “Effect of CNCs on Crystallization Kinetics of Poly(ϵ - Caprolactone) as Probed by Rheo-Raman and Optical Microscopy,” *Polymer*, **2018**, 153, 70 – 77.
39. Natarajan, B., Krishnamurthy, A., Emiroglu, C. D., Forster, A., Foster, E. J., Weder, C., Fox, D. M., Obrzut, J., and Gilman, J. W., “Hierarchical Cellulose Nanocrystal Blends for Bioinspired Damage Tolerant Photonic Films,” *Advanced Functional Materials*, **2018**, 28, 1800032 (11pp).
38. Foster, E. J., Moon, R. J., Agarwal, U., Bortner, M., Bras, J., Camarero-Espinosa, S., Chan, K., Clift, M., Cranston, E., Eichorn, S., Fox, D., Hamad, W., Heux, L., Jean, B., Korey, M., Nieh, W., Ong, K., Reid, M., Rennekar, S., Roberts, R., Shatkin, J. A., Simonsen, J., Stinson-Bagby, K., Wanasekara, N., Youngblood, J. “Current characterization methods for cellulose nanomaterials,” *Chemical Society Reviews*, **2018**, 47, 2609-2679.
37. C. Hart, N. Abuladel, M. Bee, M. Channell, A. C. CVitan, M. M. Esson, A. Farag, T. Ibeh, E. N. Kalivas, D.-M. Larco, A. Long, L. Lymperopoulos, Z. Mendel, N. Miles, C. Montanero, J. C. Schwabacher, H. Slucher, J. Vinals, J. M. Heddleston, W. Li, D. M. Fox, M. R. Hartings “Protein-templated gold nanoparticle synthesis: Protein organization, controlled gold sequestration, and unexpected reaction products,” *Dalton Transactions*, **2017**, 46, 16465-16473.
36. D. P. Durkin, M. Gallagher, B. P. Frank, E. Knowlton, P. C. Trulove, D. M. Fox, D. H. Fairbrother, “Phosphate-Functionalized Multi Wall Carbon Nanotubes as Flame Retardants for Polystyrene and Poly (methyl methacrylate),” *J. Therm. Anal. Calorim.*, **2017**, 13, 735-753.
35. B. Natarajan, C. D. Emiroglu, J. Obrzut, D. M. Fox, B. Pazmino, J. F. Douglas, and J. Gilman, “Dielectric Characterization of Confined Water in Chiral Cellulose Nanocrystal Films,” *ACS Appl. Mater. Interfaces*, **2017**, 9, 14222 – 14231.
34. D. M. Fox, M. Devilbiss, N. Kaufman, R. Rodriguez, J. Woodcock, C. S. Davis, J. W. Gilman, J. R. Shields, R. D. Davis, S. Matko, and M. Zammarano, “Epoxy Composites Using Wood Pulp Components as Fillers”, Chapter 11 in *Composites from Renewable and Sustainable Materials*, M. Poletto (Ed). InTech, 199-215, 2016,

<http://www.intechopen.com/books/composites-from-renewable-and-sustainable-materials/epoxy-composites-using-wood-pulp-components-as-fillers>. (invited chapter)

33. D. M. Fox, R. S. Rodriguez, M. N. Devilbiss, J. Woodcock, C. S. Davis, R. Sinko, S. Keten, and J. W. Gilman, "Simultaneously Tailoring Surface Energies and Thermal Stabilities of Cellulose Nanocrystals Using Ion Exchange: Effects on Polymer Composites Properties for Transportation, Infrastructure, and Renewable Energy Applications," *ACS Appl. Mater. Interfaces*, **2016**, 8, 27270 – 27281.
32. M. R. Hartings, D. M. Fox, A. E. Miller, and K. E. Muratore, "A Hybrid Integrated Laboratory and Inquiry-Based Research Experience: Replacing Traditional Laboratory Instruction with a Sustainable Student-Led Research Project," *J. Chem. Educ.*, **2015**, 92, 1016-1023.
31. D. M. Fox, M. Novy, K. Brown, M. Zammarano, R. H. Harris Jr., M. Murariu, E. McCarthy, J. Seppala, and J. W. Gilman, "Flame Retarded Poly(lactic acid) Using POSS-Modified Cellulose. 2. Effects of Intumescent Flame Retardant Formulations on Polymer Degradation and Composite Physical Properties," *Polym. Degrad. Stab.*, **2014**, 106, 54-62. (invited paper)
30. M. Zammarano, S. Matko, W. M. Pitts, D. M. Fox, and R. D. Davis, "Towards a Reference Polyurethane Foam and Bench Scale Test for Assessing Smoldering in Upholstered Furniture," *Polym. Degrad. Stab.*, **2014**, 106, 97-107. (invited paper)
29. M. R. Hartings, N. Benjamin, F. Briere, M. Briscione, O. Choudary, T. L. Fisher, L. Flynn, E. Ghias, M. Harper, N. Khamis, C. Koenigsknecht, K. Lazor, S. Moss, E. Robbins, S. Schultz, S. Yaman, L. M. Haverhals, P. C. Trulove, H. C. De Long, A. E. Miller, D. M. Fox, "Concurrent 0-D and 1-D Biomineralization of Gold from a Solution of Au³⁺ and Bovine Serum Albumin," *Sci. Technol. Adv. Mater.*, **2013**, 14, article #065004 (8 pp).
28. E. D. McCarthy, M. Zammarano, D. M. Fox, R. C. Nieuwendaal, Y. S. Kim, P. H. Maupin, P. C. Trulove, and J. W. Gilman, "Formation of Extended Ionomeric Network by Bulk Polymerization of L,D-lactide with Layered Double Hydroxide," *Polymer*, **2013**, 54, 90-101.
27. D. M. Fox, J. Lee, C. J. Citro, and M. Novy, "Flame Retarded Poly(lactic acid) Using POSS-Modified Cellulose. 1. Thermal and Combustion Properties of Intumescent Composites," *Polym. Degrad. Stab.*, **2013**, 98, 590-596.
26. D. M. Fox, S. Temburni, M. Novy, L. Flynn, M. Zammarano, Y. S. Kim, J. W. Gilman, and R. D. Davis, "Thermal and Burning Properties of Poly(lactic acid) Composites Using Cellulose-Based Intumescent Flame Retardants," in *Fire and Polymers VI: New Advances in Flame Retardant Chemistry and Science*, A. B. Morgan, C. A. Wilkie, and G. L. Nelsen, Eds., ACS Symposium Series, No. 1118, 2012, American Chemical Society, Washington, DC, 2012, Chapter 16, pp. 223-234.
25. M. Zammarano, S. Matko, R. H. Kraemer, R. D. Davis, J. W. Gilman, L. P. Sung, D. M. Fox, and S. N. Mehta, "Smoldering in Flexible Polyurethane Foams: the Effect of Foam Morphology," in *Fire and Polymers VI: New Advances in Flame Retardant Chemistry and*

Science, A. B. Morgan, C. A. Wilkie, and G. L. Nelsen, Eds., ACS Symposium Series, No. 1118, 2012, American Chemical Society, Washington, DC, 2012, Chapter 29, pp. 459-479.

24. L. M. Haverhals, M. P. Foley, E. K. Brown, D. M. Fox, H. C. De Long, and P. C. Trulove, "Natural Fiber Welding: Ionic Liquid Facilitated Biopolymer Mobilization and Reorganization," in *Ionic Liquids: Science and Applications*, A. E. Visser, N. J. Bridges, and R. D. Rogers, Eds., ACS Symposium Series, No. 1117, American Chemical Society, Washington, DC, 2012, Chapter 6, pp. 145-166.

23. D. M. Fox, J. Lee, M. Zammarano, D. Katsoulis, D. V. Eldred, L. Haverhals, P. C. Trulove, H. C. De Long, and J. W. Gilman, "Char – Forming Behavior of Nanofibrillated Cellulose Treated with Glycidyl Phenyl POSS," *Carbohydr. Polym.*, **2012**, 88, 847-858.

22. D. M. Fox, R. H. Harris, Jr., S. Bellayer, J. W. Gilman, M. Y. Gelfer, B. S. Hsaio, P. H. Maupin, P. C. Trulove, and H. C. De Long, "The Pillaring Effect of the 1,2-Dimethyl-3(benzyl ethyl iso-butyl POSS) Imidazolium Cation in Polymer/Montmorillonite Nanocomposites," *Polym.*, **2011**, 52, 5335-5343.

21. M. Zammarano, P. Maupin, L.-P. Sung, J. Gilman, E. McCarthy, Y. Kim, and D. M. Fox, "Revealing the Interface in Polymer Nanocomposites," *ACS Nano*, **2011**, 5, 3391-3399.

20. D. M. Fox, "Alternative Solvents for Green Chemistry. By Francesca M. Kerton", *J. Am. Chem. Soc.*, **2009**, 131, 12016. (invited review)

19. D. M. Fox, J. W. Gilman, A. B. Morgan, J. R. Shields, P. H. Maupin, R. E. Lyon, H. C. De Long, and P. C. Trulove, "Flammability and Thermal Analysis Characterization of Imidazolium Based Ionic Liquids," *Ind. Eng. Chem. Res.*, **2008**, 47, 6327-6332.

18. M. Modesti, S. Besco, A. Lorenzetti, M. Zammarano, V. Causin, C. Marega, J. W. Gilman, D. M. Fox, P. C. Trulove, H. C. De Long, and P. H. Maupin, "Imidazolium Modified Clay Based ABS Nanocomposites: A Comparison Between Melt-Blending and Solution Intercalation Process," *Polym. Adv. Technol.*, **2008**, 19, 1576-1583.

17. R. Haggemueller, S. S. Rahatekar, J. A. Fagan, J. Chun, M. L. Becker, R. R. Naik, T. Krauss, L. Carlson, J. Kadla, P. Trulove, D. Fox, Z. Fang, S. Kelley, and J. W. Gilman, "A Comparison of Quality of Dispersion of Single Wall Carbon Nanotubes Using Different Surfactants and Biomolecules," *Langmuir*, **2008**, 24, 5070-5078.

16. M. Modesti, S. Besco, V. Causin, C. Marega, J. W. Gilman, D. M. Fox, P. C. Trulove, H. C. De Long, and M. Zammarano, "ABS/Clay Nanocomposites Obtained by Solution Technique: Influence of Clays' Organic Modifiers," *Polym. Degrad. Stab.*, **2007**, 92, 2206-2213.

15. R. A. Mantz, D. M. Fox, J. M. Green III, P. A. Fylstra, S. Bellayer, J. W. Gilman, P. C. Trulove, and H. C. De Long, "Dissolution of Biopolymers Using Ionic Liquids," *Z. Naturforsch. A*, **2007**, 62, 275-280.

14. D. M. Fox, P. H. Maupin, S. Bellayer, M. Murariu, R. H. Harris Jr., J. W. Gilman, D. V. Eldred, D. Katsoulis, P. C. Trulove, and H. C. De Long, "Use of a polyhedral oligomeric silsesquioxane (POSS) – imidazolium cation as an organic modifier for montmorillonite," *Langmuir*, **2007**, 23, 7707-7714.
13. P. C. Trulove, W. H. Awad, J. W. Gilman, C. Davis, R. D. Davis, T. E. Sutto, D. M. Fox, P. H. Maupin, and H. C. De Long, "The Application of Trialkylimidazolium Ionic Liquids and Salts to the Preparation of Polymer-Clay Nanocomposites," *Ionic Liquids IV: Not Just Solvents Anymore*, R. D. Rogers and K. R. Seddon, Eds., ACS Symposium Series, No. 975, 2007, Chapter 16, pp. 220-233. (invited paper)
12. W. A. Henderson, V. G. Young, Jr., D. M. Fox, H. C. De Long, and P. C. Trulove, "Alkyl vs. Alkoxy Chains on Ionic Liquid Cations," *Chem. Comm.*, **2006**, 35, 3708-3710.
11. D. M. Phillips, L. F. Drummy, R. R. Naik, H. C. De Long, D. M. Fox, P. C. Trulove, and R. A. Mantz, "Regenerated silk wet spinning from an ionic liquid solution," *J. Mater. Chem.*, **2005**, 15, 4206-4208. (hot article)
10. K. Dahl, G. M. Sando, D. M. Fox, T. E. Sutto, and J. C. Owrutsky, "Vibrational spectroscopy and dynamics of small anions in ionic liquid solutions," *J. Chem. Phys.*, **2005**, 123, Article #084504 (11 pp).
9. D. M. Fox, J. W. Gilman, H. C. De Long, and P. C. Trulove, "TGA decomposition kinetics of 1-butyl-2,3-dimethylimidazolium tetrafluoroborate and the thermal effects of contaminants," *J. Chem. Thermodynamics*, **2005**, 37, 900-905. (invited paper)
8. S. Bellayer, J. W. Gilman, N. Eidelmen, S. Bourbigot, X. Flambard, D. M. Fox, H. C. De Long, and P. C. Trulove, "Preparation of homogeneously dispersed trialkylimidazolium compatibilized multi-walled carbon nanotube / polystyrene nanocomposites via melt extrusion," *Adv. Funct. Mater.*, **2005**, 15, 910-916.
7. D. M. Fox, S. Bellayer, M. Murariu, J. W. Gilman, P. H. Maupin, H. C. De Long, and P. C. Trulove, "Application of Trialkylimidazolium Liquids and Salts to the Preparation of Polymer – Layered Silicate Nanocomposites and Polymer – Carbon Nanotube Nanocomposites," *Ionic Liquids in Polymer Systems: Solvents, Additives, and Novel Applications*, C. S. Brazel and R. D. Rogers, Eds., ACS Symposium Series, No. 913, 2005, Chapter 12, pp. 175-188. (invited paper)
6. D. M. Fox, W. H. Awad, J. W. Gilman, P. H. Maupin, T. E. Sutto, H. C. De Long, and P. C. Trulove, "Thermal and Kinetic Studies of Trialkylimidazolium Salts," *Ionic Liquids IIIA: Fundamentals, Progress, Challenges, and Opportunities*, R. D. Rogers and K. R. Seddon, Eds., ACS Symposium Series, No. 901, 2005, Chapter 15, pp. 193-206. (invited paper)
5. D. M. Phillips, L. F. Drummy, D. G. Conrady, D. M. Fox, R. R. Naik, M. O. Stone, P. C. Trulove, H. C. De Long, R. A. Mantz, "Dissolution and regeneration of *Bombyx Mori* silk fibroin via ionic liquids," *J. Am. Chem. Soc.*, **2004**, 126, 14350-14351.

4. W. H. Awad, J. W. Gilman, M. Nyden, R. H. Harris, Jr., T. E. Sutto, J. H. Callahan, P. C. Trulove, H. C. De Long, and D. M. Fox, "Thermal degradation studies of alkyl-imidazolium salts and their application in nanocomposites," *Thermochim. Acta*, **2004**, 409, 3-11.
3. D. M. Fox, W. H. Awad, J. W. Gilman, P. H. Maupin, H. C. De Long, and P. C. Trulove, "Flammability, thermal stability, and phase change characteristics of several trialkylimidazolium salts," *Green Chem.*, **2003**, 5, 724-727.
2. D. M. Fox and L. Leifer, "Thermodynamic treatment of complex multicomponent electrolyte solutions," *Fluid Phase Equilibria*, **2003**, 213, 1-17.
1. D. M. Fox and L. Leifer, "Thermodynamic studies of ternary systems: I. LiCl-(n-Bu)₄NCl-H₂O at 25°C," *J. Phys. Chem. B*, **2000**, 104, 1058-1068.

Conference Proceedings Papers:

(Undergraduate students are underlined and MS students are double underlined.)

- D. M. Fox, N. Kaufman, H. Khlafan, J. R. Shields, and R. D. Davis, "Plant-Based Flame Retardant Coating for Flexible Polyurethane Foam," in *Proc. Fire and Mater. 2017 Conf.*, Interscience Communications, Ltd., San Francisco, CA, 472-477.
- J. W. Gilman, J. Woodcock, and D. Fox, "Quantifying the Impact of Ionic Liquid Cations on the Properties of Cellulose Nanocrystals," in *Proc. Int. Symp. Molten Salts & Ionic Liquids 20*, L. M. Haverhals, P. C. Trulove, M. T. Carter, E. Biddinger, A. Suroviec, H. C. De Long, W. M. Reichert, A. Bund, A. Ispas, and D. M. Fox, Eds., ECS Transactions, 2016, 75(15), 45-51.
- D. M. Fox, M. Zammarano, M. Novy, L. Haverhals, P. C. Trulove, and H. C. De Long, "Dispersion of Organically Modified Layered Silicates in Melt Blended Poly(lactic acid) Composites: Effects of Cation Head Groups and Oxygenated Alkyl Chains," in *Proc. Int. Symp. Molten Salts & Ionic Liquids 18*, W. M. Reichert, D. M. Fox, R. A. Mantz, M. Mizuhata, P. C. Trulove, H. C. De Long, A. Ispas, and A. Bund, Eds., ECS Transactions, 2012, 50(11), 665-675.
- L. M. Haverhals, M. P. Foley, E. K. Brown, L. M. Nevin, D. M. Fox, H. C. De Long, and P. C. Trulove, "Ionic Liquid-based Solvents for Natural Fiber Welding," in *Proc. Int. Symp. Molten Salts & Ionic Liquids 18*, W. M. Reichert, D. M. Fox, R. A. Mantz, M. Mizuhata, P. C. Trulove, H. C. De Long, A. Ispas, and A. Bund, Eds., ECS Transactions, 2012, 50(11), 603-621.
- M. Zammarano, D. M. Fox, S. Matko, T. Kashiwagi, J. W. Gilman, and R. D. Davis, "Sustainable Flame Retardants: Bio-derived Products as Intumescent Materials," in *Proc. Fire and Mater. 2011 Conf.*, Interscience Communication, Ltd., San Francisco, CA, 2011, 337-341.
- D. M. Fox, J. Lee, J. Jones, M. Zammarano, and J. W. Gilman, "Microencapsulated POSS in Cellulose Using 1-Ethyl-3-Methylimidazolium Acetate," in *Proc. Int. Symp. Molten Salts and Ionic Liquids 17*, D. M. Fox, R. A. Mantz, H. C. De Long, M. Mizuhata, and P. C. Trulove, Eds., ECS Transactions, 2010, 33(7), 99-108.

D. M. Fox, J. Lee, E. Ford, E. Balsley, M. Zammarano, S. Batko, and J. W. Gilman, "POSS modified cellulose for improving flammability characteristics of polystyrene," in *Proc. 10th Int. Conf. Wood Biofiber Plastic Composites*, Forest Products Society, Madison, WI, 2010, 337-342.

D. M. Fox, P. C. Trulove, H. C. De Long, J. W. Gilman, and P. H. Maupin, "Nonaqueous Solvatochromic Behavior of Nile Blue A Perchlorate in Imidazolium – Exchanged Clays and its Implication Toward Exfoliation in Polymeric Composites," in *Proc. Int. Symp. Molten Salts and Ionic Liquids 16*, D. Fox, R. Mantz, R. Hagiwara, S. Dai, P. Trulove, and H. De Long, Eds., ECS Transactions, 2009, 16(49), 141-149.

M. Hanley, J. M. Green III, P. Fylstra, W. A. Henderson, D. M. Fox, H. C. De Long, and P. C. Trulove, "Amino Acid Based Ionic Liquids: Solvents for Improved Biopolymer Dissolution," in *Molten Salts 15: In Memory of Robert Osteryoung*, R. Mantz, H. De Long, R. Hagiwara, G. Stafford, P. Trulove, and D. Fox, Eds., ECS Transactions, 2007, 3(35), 41-48.

D. M. Fox, P. Fylstra, M. Hanley, W. Henderson, P. C. Trulove, S. Bellayer, J. W. Gilman, and H. C. De Long, "The Preparation and Characterization of *Bombyx mori* Silk Nanocomposites Using Ionic Liquids," in *Molten Salts 15: In Memory of Robert Osteryoung*, R. Mantz, H. De Long, R. Hagiwara, G. Stafford, P. Trulove, and D. Fox, Eds., ECS Transactions, 2007, 3(35), 11-20.

J. W. Gilman, D. M. Fox, A. B. Morgan, J. R. Shields, P. H. Maupin, H. C. De Long, and P. C. Trulove, "Characterization of Flammability Properties of Ionic Liquids," in *Molten Salts 15: In Memory of Robert Osteryoung*, R. Mantz, H. De Long, R. Hagiwara, G. Stafford, P. Trulove, and D. Fox, Eds., ECS Transactions, 2007, 3(35), 105-115.

D. M. Phillips, R. A. Mantz, H. C. De Long, L. F. Drummy, D. G. Conrady, M. O. Stone, R. R. Naik, D. M. Fox, and P. C. Trulove, "Processing of *Bombyx mori* Silk Using Ionic Liquids," in *Proc. Int. Symp. Molten Salts XIV*, R. A. Mantz, P. C. Trulove, H. C. De Long, G. R. Stafford, R. Hagiwara, and D. A. Costa, Eds., 2004 ECS Proceedings Volume, 2006, 617-624. (invited paper)

D. M. Fox, P. H. Maupin, S. Bellayer, M. Murariu, J. W. Gilman, P. C. Trulove, and H. C. De Long, "The Use of 1,2-Dimethyl-3-(Benzyl Ethyl Iso-butyl-POSS)imidazolium Chloride as an Organic Modifier in Polymer – Layered Silicate Nanocomposites," in *Proc. Int. Symp. Molten Salts XIV*, R. A. Mantz, P. C. Trulove, H. C. De Long, G. R. Stafford, R. Hagiwara, and D. A. Costa, Eds., 2004 ECS Proceedings Volume, 2006, 607-616. (invited paper)

S. Bellayer, J. W. Gilman, N. Eidelman, S. Bourgibot, X. Flambard, D. M. Fox, H. C. De Long, and P. C. Trulove, "Preparation of Homogeneously Dispersed Trialkyl Imidazolium Compatibilized Muti Walled Carbon Nanotube/Polystyrene Nanocomposites Via Melt Extrusion," in *Proc. Int. Symp. Molten Salts XIV*, R. A. Mantz, P. C. Trulove, H. C. De Long, G. R. Stafford, R. Hagiwara, and D. A. Costa, Eds., 2004 ECS Proceedings Volume, 2006, 600-606. (invited paper)

D. M. Fox, J. W. Gilman, H. C. De Long, and P. C. Trulove, "Decomposition Kinetics of 1-Butyl-2,3-dimethylimidazolium Tetrafluoroborate and the Thermal Effects of Contaminants," in

Proc. Int. Symp. Molten Salts XIV, R. A. Mantz, P. C. Trulove, H. C. De Long, G. R. Stafford, R. Hagiwara, and D. A. Costa, Eds., 2004 ECS Proceedings Volume, 2006, 435-443. (invited paper)

H. C. De Long, T. E. Sutto, D. M. Fox, and P. C. Trulove, "Intercalation Power Structures in Ionic Liquids," in *Proceedings of the International Symposium on Ionic Liquids in Honour of Marcelle Gaune-Escard*, H. A. Øye and A. Jagtøyen, Eds., The Norwegian University of Science and Technology, Trondheim, Norway, 2003, 355-. (invited paper)

P. C. Trulove, W. H. Awad, J. W. Gilman, R. D. Davis, T. E. Sutto, D. M. Fox, P. H. Maupin, and H. C. De Long, "Application of Imidazolium based Ionic Liquids for the Preparation of Polymer-Clay Nanocomposites," in *Proceedings of the International Symposium on Ionic Liquids in Honour of Marcelle Gaune-Escard*, H. A. Øye and A. Jagtøyen, Eds., The Norwegian University of Science and Technology, Trondheim, Norway, 2003, 345-354. (invited paper)

Patents and Disclosures

M. Zammarano, D. M. Fox, P. G. Grutzmacher, and R. D. Davis, "Coatings for Flame Retarding Polymers Using Simple Biological Based Compounds," Disclosure submitted Jan. 21, 2013. Provisional patent filed Sept. 9, 2013. Non-provisional patent filed July 21, 2014. Patent issued July 27, 2017, US 9,688,867 B2.

D. M. Fox, "Thermally stable, dispersible cellulose nanocrystals and other anionic carbohydrates with variable surface energies," Disclosure submitted Apr. 10, 2014. Provisional patent filed Aug. 6, 2015. Non-provisional patent filed Aug. 5, 2016. Serial No. 15/229,738.

D. M. Fox and M. Zammarano, "Thermoplastic Chitosan as a Thermoformable Flame Retardant Coating," Disclosure submitted Nov. 2, 2015. Provisional patent filed July 2017.

Lectures: (Speakers are listed as first author; Students are underlined)

D. M. Fox, "Labelling Strategies for CNF Environmental and Health Safety Studies," 2019 P³Nano Grantees and Partners Workshop, Madison, WI, 12 – 13 March 2019.

D. M. Fox, "Biomacromolecules as Flame Retardants for Wood-Based Construction," 2018 NIST Disaster Resilience Symposium, Gaithersburg, MD, 13 August 2018.

D. M. Fox, "Melt-Blended Cellulose Nanocrystal – Thermoplastic Composites," 2018 TAPPI Int. Conf. Nanotechnol. Renewable Mater., Madison, WI, 11 – 14 June 2018.

A. Bhattarai, K. Wakeman, and D. M. Fox, "Carbohydrate Based Fire Retardant Coatings for Wood," 2018 TAPPI Int. Conf. Nanotechnol. Renewable Mater., Madison, WI, 11 – 14 June 2018. (undergraduate student poster)

A. Do and D. M. Fox, “Curing Kinetics of Cellulose Nanomaterial – Epoxy Composites,” 2018 TAPPI Int. Conf. Nanotechnol. Renewable Mater., Madison, WI, 11 – 14 June 2018. (undergraduate student poster)

D. M. Fox, “Labelling Strategies for CNF Health and Environmental Safety Studies,” 2018 P³Nano Grantees and Partners Workshop, Madison, WI, 17 – 18 January 2018.

D. M. Fox, “Biomacromolecular Flame Retardants: Efficacy After Natural Weathering,” NIST WUI Fire Day, Gaithersburg, MD, 17 January, 2018. (webinar)

D. M. Fox, “Water Absorption in CNC – Epoxy Composites,” 2017 Fall CHiMaD Use Case Meeting, Gaithersburg, MD (NIST), 21 September 2017.

D. M. Fox, “Using Biopolymers to Mitigate Fire Hazards,” NSF Fire Center Workshop, Cleveland, OH, 19 – 20 July, 2017.

D. M. Fox, K. Wakeman, J. Woodcock, R. Beams, C. Davis, B. Natarajan, J. Ozbrut, J. W. Gilman, Z. Wei, E. Luijten, R. Sinko, and S. Keten, “Water Absorption in CNC – Epoxy Composites,” 2017 TAPPI Int. Conf. Nanotechnol. Renewable Mater., Montreal, QC, Canada, 05 – 08 June 2017.

D. M. Fox, A. Faustino, N. Kaufman, K. Wakeman, J. Woodcock, J. W. Gilman, J. R. Shields, and M. Zammarano, “Natural Products as Intumescent Flame Retardants for Polymers,” AMI Flame Retardants in Plastics 2017, Pittsburgh, PA, 25 – 26 April 2017.

D. M. Fox, N. Kaufman, H. Khalfan, J. R. Shields, and R. D. Davis, “Plant-Based Flame Retardant Coating for Flexible Polyurethane Foam,” Fire and Materials 2017 Conference, San Francisco, CA, 06 – 09 February 2017.

D. M. Fox, “Chemical Composition of CNCs: Effects on Surface Properties and Composite Interfaces,” 2017 Spring CHiMaD Use Case Meeting, Washington, DC (Amer. Univ.), 23 – 24 January 2017.

D. M. Fox, “Surface Modification of Cellulose Nanomaterials,” 2017 P³Nano Grantees and Partners Workshop, Madison, WI, 09 – 10 November 2016. (invited speaker)

D. M. Fox, “Cellulose – Polymer Composites: Modifications to Improve Dispersion in Polymer Matrixes,” 2016 Fall CHiMaD Use Case Meeting, Gaithersburg, MD (NIST), 24 – 25 October 2016.

D. M. Fox, N. Kaufman, M. Colorado Escobar, L. Brody, M. Bible, E. Knowlton, Y. S. Kim, J. R. Shields, J. F. Lomax, and R. D. Davis, “Flame Retardant Coatings Based on Natural Materials,” 252nd National ACS Conference, Philadelphia, PA, 21 – 25 August 2016.

D. M. Fox, “Cellulose – Polymer Composites: Mechanical Strength, Barrier, and Flammability Properties,” 2016 NIST Workshop on Materials Flammability, Gaithersburg, MD, 18 – 19 August 2016. (invited speaker)

D. M. Fox, M. Colorado Escobar, M. Devilbiss, N. Kaufman, H. Khalfan, R. Rodriguez, Y. S. Kim, M. Zammarano, R. D. Davis, J. Woodcock, and J. W. Gilman, “Plant Based Flame Retardants: Modifications to Improve Dispersion in Polymer Matrixes,” 2016 TAPPI Int. Conf. Nanotechnol. Renewable Mater., Grenoble, France, 13 – 16 June 2016.

D. M. Fox, “CNC with Tuned Surface Energies & Thermal Stabilities,” 2015 Fall CHiMaD Use Case Meeting, Evanston, IL (Northwestern Univ.), 4 – 5 October 2015.

D. M. Fox, N. Kaufman, M. Colorado Escobar, J. F. Lomax, Y.-C. Li, Y. S. Kim, M. Zammarano, and R. D. Davis, “Flame Retardants from Natural Products: Flame Retardant Coatings Based on Carbohydrates, Nanoclay, and Borate Salts,” 2015 TAPPI Int. Conf. Nanotechnol. Renewable Mater., Atlanta, GA, 22 – 25 June 2015.

N. Kaufman, M. Colorado Escobar, M. Bible, D. M. Fox, Y. S. Kim, M. Zammarano, and R. D. Davis, “Acid Induced Flocculation of Flame Retardant Coatings Based on Alginate and Nanoclay,” 2015 TAPPI Int. Conf. Nanotechnol. Renewable Mater., Atlanta, GA, 22 – 25 June 2015. (undergraduate student poster)

M. R. Skorski, D. M. Fox, A. E. Miller, and M. R. Hartings, “Doping Poly(Acrylonitrile-co-Butadiene-co-Styrene) with Titanium Dioxide Nanoparticles to Create Novel Chemical Sensors,” 227th National ECS Meeting, Chicago, IL, 24 – 28 May 2015. (undergraduate student poster)

D. M. Fox, J. Lee, M. Novy, S. Temburni, K. Brown, Y. S. Kim, T. Kashiwaga, J. W. Gilman, and M. Zammarano, “Lignocellulosic Materials as Flame Retardants: Cellulose – Polystyrene Composites,” 25th Annual Conference on Recent Advances in Flame Retardancy of Polymeric Materials, Stamford, CT, 19 – 21 May 2014.

D. M. Fox, “Use of Natural Materials in Intumescent Flame Retarded Polymer Composites,” 2013 NIST EL-FRD Seminar Series, Gaithersburg, MD, 2 December 2013.

D. M. Fox, K. Brown, M. Novy, L. Flynn, M. Zammarano, E. D. McCarthy, Y. S. Kim, R. H. Harris Jr., and J. W. Gilman, “Poly(lactic acid) Composites Using Cellulose and POSS as Flame Retardants,” 14th European Meeting on Fire Retardancy and Protection of Materials (FRPM 13), Lille, France, 30 June – 4 July 2013.

D. M. Fox, M. Novy, S. Temburni, E. D. McCarthy, Y. S. Kim, J. W. Gilman, and M. Zammarano, “Improved Viscoelastic Behavior of Poly(lactic acid) Composites Containing Cellulose-Based Intumescent Flame Retardants,” 17th Annual ACS Green Chemistry and Engineering Conference, North Bethesda, MD, 18 – 20 June 2013.

D. M. Fox, “Lignocellulosic Materials as Flame Retardants: Strategies to Improve Efficacy and Monitor Dispersion,” U. S. Patent and Trade Office, Washington, DC, 8 May 2013.

D. M. Fox, M. Zammarano, M. Novy, L. M. Haverhals, P. C. Trulove, and H. C. De Long, “Effects of Surfactant Cation Type and Oxygen Groups on Dispersion of Montmorillonite in PLA Composites,” 222nd National ECS Meeting, Honolulu, HI, 7 – 12 October 2012.

D. M. Fox, J. Lee, C. Citro, L. Flynn, M. Novy, S. Temburni, M. Zammarano, and J. W. Gilman, "Polymer Property Enhancements of Poly(Lactic Acid) using POSS-Modified Cellulose Based Intumescent Flame Retardants," 243rd National ACS Conference, San Diego, CA, 25 – 29 March 2012. (invited presentation)

L. Flynn, J. Lee, S. Temburni, M. Zammarano, and D. M. Fox, "Cationic Nanofibrillated Cellulose as a Flame Retardant for Poly(Lactic Acid)," 243rd National ACS Conference, San Diego, CA, 25 – 29 March 2012. (undergraduate student poster)

M. Novy, C. Citro, and D. M. Fox, "Viscoelastic Behavior of Flame Retarded Poly(lactic acid) Containing POSS-Modified Cellulose and APP Hydrolysis Inhibition of POSS," 243rd National ACS Conference, San Diego, CA, 25 – 29 March 2012. (undergraduate student poster)

S. Temburni, L. Flynn, M. Novy, M. Zammarano, and D. M. Fox, "Modification of Cellulose Using N-(3-Chloro-2-hydroxypropyltrimethyl) Ammonium Chloride and Phosphoric Acid for Flame Retardant Applications in Poly(lactic acid)," 243rd National ACS Conference, San Diego, CA, 25 – 29 March 2012. (graduate student poster)

D. M. Fox, C. Citro, J. Lee, L. Flynn, and M. Zammarano, "Modified Cellulosic Materials as Intumescent Flame Retardants for Poly(lactic acid)," 15th Annual ACS Green Chemistry and Engineering Conference, Washington, DC, 21 – 23 June 2011.

D. M. Fox, J. Lee, J. Jones, M. Zammarano, and J. W. Gilman, "Microencapsulated POSS in Cellulose Using 1-Ethyl-3-Methylimidazolium Acetate," 218th National ECS Meeting, Las Vegas, NV, 10 – 15 October 2010.

D. M. Fox, "POSS Modified Cellulose for Reduced Polymer Flammability," 2010 NIST BFRL-FRD Seminar Series, Gaithersburg, MD, 3 August 2010.

E. Balsley, E. Ford, J. Lee, M. Zammarano, J. W. Gilman, and D. M. Fox, "Polystyrene and Poly(lactic acid) Nanocomposites Using Hydrophobically Modified Cellulose," 238th National ACS Conference, Washington, DC, August 2009. (MS student presentation)

J. Lee, E. Balsley, E. Ford, W. M. Reichert, M. Zammarano, J. W. Gilman, and D. M. Fox, "Hydrophobically Modified Cellulose Using 1,2-Epoxy-3-phenoxypropane and GlycidylPhenyl-POSS," 238th National ACS Conference, Washington, DC, August 2009. (undergraduate student presentation)

D. M. Fox, J. Lee, E. Ford, E. Balsley, M. Zammarano, S. Batko, and J. W. Gilman, "POSS – Modified Cellulose Nanofibrils," Cellulose Nanocomposites Symposium, 10th International Conference on Wood and Biofiber Plastic Composites, Forest Products Society, Madison, WI, 11 – 13 May 2009.

D. M. Fox, "POSS Surface Functionalization of Cellulose Nanofibrils," 2009 Annual NIST Fire Conference, Gaithersburg, MD, 28 – 30 April 2009.

D. M. Fox, P. C. Trulove, H. C. De Long, and P. H. Maupin, "Nonaqueous Solvochromatic Behavior of Nile Blue A Perchlorate in Imidazolium – Exchanged Clays and its Implication Toward Exfoliation in Polymeric Composites," 214th National ECS Meeting, Honolulu, HI, 12 – 17 October 2008.

D. M. Fox, L. Gonzales, S. Vempati, and S. Reuter, "1-Butyl-2,3-Dimethylimidazolium Dicyanamide via Metathesis Reactions: Influence of Counter-Cation Impurities on the Properties of the Ionic Liquid," 214th National ECS Meeting, Honolulu, HI, 12 – 17 October 2008.

D. M. Fox, P. A. Fylstra, W. A. Henderson, J. W. Gilman, P. C. Trulove, and H. C. De Long, "The Preparation and Characterization of Bombyx Mori Silk Nanocomposites Using Ionic Liquids," 210th National ECS Meeting, Cancun, Mexico, 29 October – 3 November 2006.

D. M. Fox, J. M. Green III, S. Bellayer, J. W. Gilman, D. M. Phillips, R. A. Mantz, P. C. Trulove, and H. C. De Long, "The Preparation of *Bombyx Mori* Silk Nanocomposites Using Room Temperature Ionic Liquids," 231st National ACS Meeting, Atlanta, GA, 26-30 March 2006. (poster presentation)

D. M. Fox, J. W. Gilman, H. C. De Long, and P. C. Trulove, "Decomposition Kinetics of 1-Butyl-2,3-Dimethylimidazolium Tetrafluoroborate and the Effects of Impurities Using TGA," 206th National ECS Meeting, Honolulu, HI, 3-8 October 2004.

D. M. Fox, P. H. Maupin, S. Bellayer, M. Murariu, J. W. Gilman, P. C. Trulove, and H. C. De Long, "The Use of 1,2-Dimethyl-3-(Benzyl Ethyl Iso-butyl-POSS)imidazolium Chloride as an Organic Modifier in Polymer – Layered Silicate Nanocomposites," 206th National ECS Meeting, Honolulu, HI, 3-8 October 2004.

D. M. Fox, S. Bellayer, W. H. Awad, M. Murariu, R. D. Davis, J. W. Gilman, P. H. Maupin, H. C. De Long, and P. C. Trulove, "The Use of Imidazolium Based Ionic Liquids for the Preparation of Polymer - Layered Silicate and Polymer - Carbon Nanotube Nanocomposites," EUCHEM 2004 Molten Salts Conference, Piechowice, Poland, 20 - 25 June 2004. (invited presentation)

D. M. Fox, S. Bellayer, W. H. Awad, M. Murariu, R. D. Davis, J. W. Gilman, P. H. Maupin, H. C. De Long, and P. C. Trulove, "The Use of Imidazolium Based Ionic Liquids for the Preparation of Polymer – Layered Silicate Nanocomposites and Polymer – Carbon Nanotube Nanocomposites," Symposium on *Ionic Liquids in Polymer Systems*, 227th National ACS Meeting, Anaheim, CA, 28 March – 01 April 2004. (invited presentation)

D. M. Fox, W. H. Awad, J. W. Gilman, P. H. Maupin, T. E. Sutto, H. C. De Long, and P. C. Trulove, "Thermal and Kinetic Studies of Trialkylimidazolium Salts," Symposium on *Ionic Liquids III: Fundamentals, Progress, Challenges, and Opportunities*, 226th National ACS Meeting, New York, NY, September 2003.

D. M. Fox, W. H. Awad, R. D. Davis, J. W. Gilman, P. H. Maupin, T. E. Sutto, P. C. Trulove, and H. C. De Long, "Thermal Properties of Several Trialkylimidazolium Salts," Saskatchewan Green Chemistry Conference, Regina, SK, Canada, May 2003.

D. M. Fox and L. Leifer, "Thermodynamic Studies of Ternary Systems: III. $\text{Me}_4\text{NCl} - \text{Bu}_4\text{NCl} - \text{H}_2\text{O}$ at 25°C ", Paper 276, Symposium on *Equilibrium Thermodynamics and Statistical Mechanics*, 222nd National ACS Meeting, Chicago, IL, August 2001. (poster presentation)

D. M. Fox and L. Leifer, "Thermodynamics of Studies of Ternary Systems: II. $\text{LiCl} - \text{Bu}_4\text{NCl} - \text{H}_2\text{O}$ at 25°C and High Total Ionic Strengths", Paper P7-MON-3, Symposium on *Other Aspects of Thermodynamics*, 16th IUPAC Conference on Chemical Thermodynamics, Halifax, Nova Scotia, August 2000. (poster presentation)

Work in Progress:

D. M. Fox, A. Bhattarai, K. Wakeman, J. R. Shields, M. Zammarano, W. Cho, "Biomacromolecules as Flame Retardants for Wood-Based Construction Materials with Improved Weatherability," supported by the NIST – DR Grant Program.

D. M. Fox, A. Faustino, and K. Wakeman, "Natural Intumescent Flame Retardants."

D. M. Fox, D. Brager, I. Patel, J. Woodcock, and J. W. Gilman, "Environmental Health & Safety of Cellulose nanomaterials," supported by the P³Nano Grant.

D. M. Fox, "Thermodynamics, Kinetics, and Solvent Effects of Metathesis Reactions."

D. M. Fox, M. Ashraf, "Physical and Chemical Properties of Enantiomeric Solvent Mixtures."

RESEARCH

Grants Received:

I. Internal Grants

International Travel Award AY2016-17, funding of \$1,500 for TAPPI Conference in Grenoble, France from Dean of Academic Affairs, 16 March 2016.

Faculty Research Support Grant AY2016-17, "Chitosan Depolymerization Using a New Chemical Method," funding of \$6,800 for May 1, 2016 – April 30, 2017 from American University College of Arts and Sciences, 11 January 2016.

Spring 2014 Faculty Mellon Fund Competition, "Epoxy Composites Reinforced with Chitosan and Chitosan Derivatives," funding of \$3700 for AY14-15 from American University College of Arts and Sciences, 29 April 2014.

Spring 2011 Faculty Mellon Fund Competition, “Ion Exchange Equilibria and Kinetics of Lignosulfonates,” funding of \$1450 for Summer Semester 2011 from American University College of Arts and Sciences, 18 April 2011.

American University Equipment Grants for the Sciences, separate proposals requesting funds for a Potentiostat/Galvanostat/Frequency Analyzer (\$31,418 - funded), Atomic Absorption Spectrometer & Ion Chromatograph (\$121,000 – not funded), October 31, 2009, Offices of the Dean of the College of Arts and Sciences and the Provost, American University.

American University Equipment Grants for the Sciences, separate proposals requesting funds for a Differential Scanning Calorimeter (\$78,820 - funded), Atomic Absorption Spectrometer & Ion Chromatograph (\$99,360 – not funded), Flashpoint Tester (\$8,370 – not funded), and Dielectric Cell (\$4,940 – not funded), December 12, 2008, Offices of the Dean of the College of Arts and Sciences and the Provost, American University.

Summer 2008 Dean’s Undergraduate Research Award and funding of \$3000 from Dean’s Discretionary Fund, “Transport and Interfacial Properties of an Ionic Liquid Polymer Gel Electrolyte,” project supervisor for Sriram Vempati, from American University College of Arts and Sciences, 29 April 2008.

Fall 2007 Faculty Mellon Fund Competition, “Empowering Students with Alternative Energy Technology,” funding of \$1950 for Spring Semester 2008 from American University College of Arts and Sciences, 8 November 2007.

Faculty Research Award AY 2007-08, “Thermodynamic and Transport Properties of Room Temperature Ionic Liquid – Electrolyte Solutions,” funding of \$7,500 for May 1, 2007 – April 30, 2008 from American University College of Arts and Sciences, 15 March 2007.

Fall 2006 Faculty Mellon Fund Competition, “Enhancing Student Experiences in the Chemistry Department Laboratories,” funding of \$2000 for Spring Semester 2007 from American University College of Arts and Sciences, 17 October 2006.

II. External Grants

PI on “Nanocellulose Labeling to Track Migration from Paper,” FiberLean, funding of \$4,505 for 2018.

PI on “Improving Interfaces of Cellulose Nanomaterials Through Ion Exchange,” NIST MSE-MML, funding of \$149,900 for 2018 – 2021. Research conducted at NIST.

PI on “Biomacromolecules as Flame Retardants for Wood-Based Construction Materials with Improved Weatherability,” NIST Disaster Resilience Grants Program, funding of \$128,000 for 2017 – 2018. Research conducted at NIST.

PI on “Fluorescent Cellulose Nanomaterial Development Project,” P³Nano, funding of \$104,675 awarded for 2016 – 2017. Extension with funding of \$109,337 awarded for 2018 – 2019. Additional funding of \$52,858 awarded for 2018 – 2019. Research conducted at NIST.

Co-PI on “MRI: Acquisition of an Analytical Transmission Electron Microscope (TEM) to Enhance Research and Teaching at American University,” NSF Major Research Instrumentation, funding of \$438,550 for equipment (TEM) awarded for 2016 – 2019.

PI on “Durable, Intumescent Flame-Retardant Coatings Derived from Natural Materials,” NIST – EL Extramural Fire Research Grants Program, part of the 2014 Measurement, Science, and Engineering Research Grants Program, funding of \$299,689 awarded for 2014 – 2017. Research conducted at NIST.

PI on “Bio-based Materials as Flame Retardants for Polymer Composites and Foams,” Intergovernmental Personnel Act of 1970 (IPA), National Institute for Standards and Technology, funding of \$57,825 awarded for 2013 – 2014. Research conducted at NIST.

PI on “Lignocellulosic Materials as Intumescent Flame Retardants for Bio-based Polymer Composites”, NIST – BFRL Extramural Fire Research Grants Program, part of the 2011 Measurement, Science, and Engineering Research Grants Program, funding of \$410,580 awarded for 2011 – 2014. Research conducted at the National Institute for Standards and Technology.

PI for Symposium Organizational Grants for Molten Salts and Ionic Liquids 17, funding of \$25,000 from the Air Force Office of Scientific Research and \$5,000 from the Army Research Office. Funds transferred directly to the Electrochemical Society for costs associated with the MSIL 17 Symposium to be held at the ECS 2010 National Meeting in Las Vegas, NV, October 10 – 15, 2010.

PI for Air Force Office of Scientific Research, “POSS-Modified Cellulose for Improved Biopolymer Performance,” Defense University Research Instrumentation Program (AFOSR – DURIP), funding of \$300,000 awarded for July 2010 – June 2011.

PI on “Reduced Polymer Flammability Using POSS-Modified Cellulose”, NIST – BFRL Extramural Fire Research Grants Program, part of the 2008 Measurement, Science, and Engineering Research Grants Program, funding of \$271,838 awarded for 2008 - 2011. One year no-cost extension granted through August 2012. Research conducted at the National Institute for Standards and Technology.

PI for Symposium Organizational Grants for Molten Salts and Ionic Liquids 16, funding of \$20,000 from the Air Force Office of Scientific Research and \$5,000 from the Army Research Office. Funds transferred directly to the Electrochemical Society for costs associated with the MSIL 16 Symposium to be held at the ECS 2008 Joint International Meeting in Honolulu, HI, October 12 – 17, 2008.

Co-PI with Dr. Richard Colton (NRL, PI) on “Examination of Non-enzymatic Synthesis of Peptides and Polypeptides in Ionic Liquids,” funding of \$42,000 for CY03 from Air Force Office of Scientific Research. Funds transferred to the Naval Research Laboratory. Work carried out at the Naval Research Laboratory.

Proposals Submitted:

“Flammability of Weathered Polysaccharide Based Coatings for Wooden Structures,” NIST Disaster Resilience Grant, funding of \$499,942 for 2019 – 2022 requested. Submitted August 2018.

Proposals in Preparation:

Co-PI with Prof. Christie Sayes (Baylor University, PI) on “Remodeling toxicokinetic testing of carbonaceous materials through safety-by-design principles”, NIEHS - NIH Research Project Grant, funding of \$338,127 requested for AU portion of project. Work to be carried out at NIST. Re-submission expected June 2019.

EDITORIAL ACTIVITIES

Guest Editor, Themed issue on Sustainable Flame Retarded Materials, *Green Materials*, 2018 – 2019.

Co-organizer and co-editor for the 2016 ECS – 20th International Symposium on Molten Salts and Ionic Liquids.

Co-organizer and co-editor for the 2015 ECS – Electrochemistry at Primarily Undergraduate Institutions Symposium.

Co-organizer and co-editor for the 2012 ECS – 18th International Symposium on Molten Salts and Ionic Liquids.

Lead organizer and lead editor for the 2010 ECS – 17th International Symposium on Molten Salts and Ionic Liquids.

Lead editor and co-organizer for the 2008 ECS – 16th International Symposium on Molten Salts and Ionic Liquids. “Molten Salts and Ionic Liquids 16,” D. Fox, R. Mantz, R. Hagiwara, S. Dai, P. Trulove, and H. De Long, Eds., The Electrochemical Society: Pennington, NJ, *ECS Transactions*, 16(49), 2009, 599 pp.

Co-editor of *Molten Salts 15: In Memory of Robert Osteryoung*, R. Mantz, H. De Long, R. Hagiwara, G. Stafford, P. Trulove, and D. Fox, Eds., *ECS Transactions*, 3(35), 2007.

Book reviewer for JACS “Book Reviews” section (see publications list) and University Science Books.

Manuscript reviewer for Journal of the American Chemical Society, Journal of the Electrochemical Society, Applied Clay Science, ACS Applied Materials & Interfaces, Journal of Chemical Thermodynamics, Journal of Polymer Science, Industrial & Engineering Chemistry, Journal of Waste Management, Journal of Materials Science, Polymer Degradation and Stability, Fire and Materials, Advanced Functional Materials, and Macromolecules.

Panelist for National Science Foundation – Major Research Instrumentation Program (NSF-MRI), 2013.

Proposal reviewer for DOE, NIST small grants, CUNY small grants programs, and NSF.

MEDIA APPEARANCES, INTERVIEWS, & PUBLIC TESTIMONIES

Presentation on NIST Disaster Resilience Grant project, “Biomacromolecules as Flame Retardants for Wood-Based Construction Materials with Improved Weatherability,” NIST website, www.nist.gov/news-events/events/2018/08/disaster-resilience-symposium/presentation-gallery, September 2018.

Article on use of modified cellulose in epoxies, Kenneth Carter, “Big Help in a Small Package: Research with plant fibers could make future turbines lighter and greener,” Wind Systems Magazine, Media Solutions, Inc., <http://www.windsystemsmag.com/article/detail/1411/big-help-in-a-small-package>, Feb. 24, 2017.

Article on cellulose modification, Rebecca Basu, “Nanocellulose in medicine and green manufacturing,” EurekAlert!, AAAS, https://www.eurekalert.org/pub_releases/2016-11/au-nim110716.php, Nov. 7, 2016.

Article on use of polydopamine as a flame retardant, Daniel Akst, “A Surprising Natural Flame Stopper,” Wall Street Journal, <http://www.wsj.com/articles/a-surprising-natural-flame-stopper-1445007374>, Oct. 16, 2015.

Article on sustainable research, ACS-CGI, “Novel Applications of Natural Materials for More Sustainable Buildings,” Green Chemistry: The Nexus Blog, <https://communities.acs.org/community/science/sustainability/green-chemistry-nexus-blog/blog/2015/04/21/novel-applications-of-natural-materials-for-more-sustainable-buildings>, Apr. 21, 2015.

Web video clips on the benefits, safety, and future of flame retardants, North American Flame Retardant Alliance website, <http://flameretardants.americanchemistry.com/videos-on-flame-retardants/videos-leading-researchers-discuss-flame-retardants.html>, Spring 2014.

TEACHING RESPONSIBILITIES

Courses taught at AU:

CHEM110 – General Chemistry I

CHEM210 – General Chemistry II

CHEM410 – Biophysical Chemistry

CHEM411 – Biophysical Chemistry Laboratory

CHEM490 – Independent Study Project in Chemistry
CHEM462/662 – Topics in Environmental Chemistry
CHEM510 – Advanced Physical Chemistry
CHEM511 – Advanced Physical Chemistry Laboratory
CHEM560 – Biochemistry I
CHEM571/572 – Experimental Biological Chemistry I & II
CHEM581/582 – Experimental Chemistry I & II
CHEM605 – Separation Science
CHEM606 – Trace Analysis
CORE105 – Food Energy Water Nexus
GNED250 – Food Energy Water Nexus
PHYS440 – Experimental Physics

Internships, Co-ops, and Independent Studies Supervised:

Independent Study Projects

AY2018-19

Jasmine Nazaire, “Fluorescently Labeled Chitosan”
Raquel Lara, “Curing Kinetics of Cellulose – Epoxy Composites”
Emilio Cano, “Fluorescently Labeled Nanocellulose”

AY2017-18

Hussain Khalfan, “Chitosan – Latex Coatings”
Ashish Bhattarai, “Carbohydrate Nanocrystal – Latex Coatings”
Anh Do, “Cure Kinetics of Cellulose Nanocrystal – Epoxy Composites”
Massie Hussaini, “Cellulose Nanocrystal – ABS Composites for 3-D Printing”
Tess Ravick, “Exchanged Cellulose Nanocrystals for Improved Epoxy Interfaces”

AY2016-17

- Dominique Brager, “Exchanged Cellulose Nanocrystals for PLA Composites”
- J. I. Cruz, “Epoxy Cure Kinetics Filled with Carboxylated Cellulose Nanofibers”
- Katrina Wakeman, “Chitosan Based Fire Retardant Coatings & Composites”
- Ashish Bhattarai, “Cross-linked Gluten Coatings for Flexible Polyurethane Foam”
- Noy Kaufman, “Cellulose Nanocrystal Nanoparticles & Nanocomposites”
- Cosette Taggart, “Antimicrobial Behavior of Oligochitosan”

AY2015-16

- Noy Kaufman, “Lignosulfonate Flame Retarded Epoxies,” and “Cellulose Nanocrystal Nanocomposites”
- Rebecca Rodriguez, “Thermodynamics of Surfactant Loaded Cation Exchange Resins.”
- Anh Do, “Gluten – Lignosulfonate Coatings.”
- Melvin Colorado – Escobar, “Extrusion of Plasticized Chitosan.”
- Hussain Khalfan, “Lignosulfonate Coatings for Flexible Polyurethane Foams.”
- Leo Brody, “Plasticization of Wheat Gluten – Lignosulfonate Coatings.”

AY2014-15

- Noy Kaufman, “Carbohydrate – Borate Flame Retardant Coatings.”
- MacKenzie Devilbiss, “Hydrophobic Surface Modification of Cellulose Nanocrystals.”
- Melvin Colorado – Escobar, “Banana Phosphate Flame Retardant.”
- Rebecca Rodriguez, “Thermodynamics of Surfactant Loaded Cation Exchange Resins.”

AY2012-13

- Melissa Novy, “Preparation and Characterization of Flame Retarded Bio-Epoxies.”
- Thomas Robinson, “Cation Induced Aggregation of Au-BSA Nanocolloids.”

AY2011-12

Laura Flynn, "Reduced Flammability of Poly(lactic acid) Using Modified Lignocellulosics."

Srilatha Temburni, "Phosphorylation of Cellulose Nanofibrils in PLA Composites."

Amina Bendoukha, "Comparison of Techniques for Trace Ion Concentration Determination."

AY2010-11

Jieun Lee, "Preparation of Modified Cellulose Using Ionic Liquids"

Laura Flynn, "Cationic Cellulose Synthesis for Improved Flame Resistance"

David Wong, "Conductivities of Ionic Liquid – Polymer Gel Electrolytes"

Chris Citro, "Thermal Properties of Cellulose – Poly(lactic acid) Composites"

Amina Bendoukha, "Thermodynamics of Ion Exchanged Sodium Lignosulfonate"

Babak Kamyab, "Polymer Composites Using Cellulose Encapsulated POSS"

AY2009-10

Jieun Lee, "Preparation of Modified Cellulose Using Ionic Liquids"

Kira Tokarz, "Heat Capacities of Ethyl Lactate – Ethyl Acetate Mixtures Using DSC"

Stephen Kos, "Temperature Dependence of the Solvatochromic Behavior of Ethyl Lactate – Ethyl Acetate Mixtures"

Bill Lustig, "The Chemistry of Colors: Inorganic Complexes"

Jennifer Jones, "POSS – Glucoside Block Co-Polymers as Surfactants for Cellulose – PLA Composites"

AY2008-09

Seth Reuter, "Physical Properties of Ethyl Lactate Mixtures."

Laetitia N'dri, "Biodiesel Synthesis Using Clay- and Polymer- Bound Catalysts"

Erica Ford, "Characterization of Flame Retardant – Polystyrene Nanocomposites"

Jieun Lee, "Preparation of Modified Cellulose for the Preparation of Polystyrene Nanocomposites"

Eric Balsley, “Ionic Liquid – Polymer Gel Electrolytes: Conductivity Effects of Polymer Hydrophobicity and Molecular Weight”

AY2007-08

Leah Gonzales, “Physicochemical Properties of Environmentally Benign Solutions.”

Laetitia N’dri, “Biodiesel Synthesis: Comparison of Catalysts.” (aka “Biodiesel Synthesis Using Cation Exchanged Clay Catalysts”)

Brian Kelleher, “Optimization of a Homemade Electromagnet.”

Sriram Vempati, “Transport and Interfacial Properties of an Ionic Liquid Polymer Gel Electrolyte.”

AY2006-07

Joseph Balinas, “Solvent Effects on the Spectral Characteristics of Dyes and Dyed Clays.”

Samantha Shterengarts, “Effects of Hydrophobic Additives on Bioplastic Properties.” (aka “Preparation and Characterization of Biofiber – Gelatin Nanocomposites Using Hydrophobic Plasticizers.”)

Supervision of Theses & Dissertations:

Edward DiLoreto, PhD Candidate (Georgia Tech), Committee Member (in progress)

Rachel Gill, MS Candidate (in progress)

Anneliese Faustino, MS Candidate, Thesis Advisor (2018)

Khyra Neal, MS candidate, Thesis Advisor (2016)

Mobeen Ashraf, MS Candidate, Thesis Advisor (2015)

Karlana Brown, MS Candidate, Thesis Advisor (2014)

Puja Mody, MS Candidate, Committee Member (2014)

Megan Channell, MS Candidate, Committee Member (2014)

Srilatha Temburni, MS Candidate, Thesis Advisor (2012)

Juliana Fritz, MS Candidate, Committee Member (2012)

Victor Schultz, MS Candidate, Committee Member (2011)

Dina Lloyd, MS Candidate, Committee Member (2011)

Rostislav Kuskovsky, MS Candidate, Committee Member (2011)

Jake Chae, PhD Candidate, Committee Member (2009)

Alyssa Ashley, MS Candidate, Committee Member (2008)

CURRICULUM DEVELOPMENT

Spring 2018, CHEM-606 – Developed Trace Analysis course for MS Certificate in Clinical Biochemistry.

Fall 2017, GNED-150 – Developed Complex Problems course on “Food Energy Water Nexus,” for new General Education Program.

Fall 2015, CHEM605 – Revised the course (renamed to Separation Science) to make it more practical, research-based, and interdisciplinary.

Fall 2010-2011, CHEM471,472,571,572 – Co-developed new laboratory courses to replace current advanced chemistry labs.

Spring 2010, CHEM360/660 – Developed a course on the “Chemistry of the Environmental Cycles” for the Topics in Environmental Chemistry Course.

Fall 2006, CHEM511 – Designed 8 new laboratory experiments to increase hands-on experience of quantum chemistry effects for students taking the course.

Fall 2007 & Fall 2008, CHEM602 – Developed two new lectures for the graduate Research Method Design course: “Laboratory Safety and Experimental Design” and “Styles and Formatting.”

Spring 2006-2010, CHEM411 – Designed 11 new laboratory experiments to provide students with hands-on experience with topics relevant to biochemical and environmental applications of physical chemistry.

Spring 2006, PHYS440 – Integrated 7 new laboratory experiments with 3 existing ones to provide students with hands-on experience relevant to advanced physics concepts.

In Progress, Developing a course on the “Science of Art” for the Honors Program.

In Progress, Developing “Chromatographic Methods and Techniques” as a collaborative science Master’s Level course.

DEPARTMENT AND UNIVERSITY SERVICE

Departmental Manager for the Chemistry Department's University Curriculum Assessment Plan, S09 - present.

Science Rank & Tenure Committee, F12 – present. Committee Chair, F18 – present.

Writing Across the Curriculum Faculty Participant, S14 – present.

Faculty Research Advisory Panel, F14 – present.

Faculty Senate Committee on Learning Assessment, CAS Representative, X16 – present & Chair, F17 - present.

New Science Building Committee, X15 – present.

Development of MS Certificate in Clinical Biochemistry, X16 – S17.

Chemistry Department Graduate Program Coordinator, F11 – X16.

Chemistry Department Course Articulation Coordinator, F12 – F16.

Environmental & Biochemical Health PhD Program Exploratory Committee, X15 – X16.

Judge for CAS Student Commencement Speaker, S16.

Panelist at the Science Hours Extended Program (SHEP): Applying to Graduate School, S15, F15.

Guest Lecture for CHEM250: Criminalistics, “Fire Investigations: Using Chemistry to Understand, Control, and Investigate Fire,” October 20, 2015.

Chair of Chemistry Department Faculty Search Committees, F07 – S14.

Pro bono lectures for CHEM602 on “Laboratory Safety and Measurement Techniques” and “Styles and Formatting” every fall semester, F08 – S14.

Panelist at the 25th Anniversary Ann Ferren Teaching Conference, “Connecting Learning Outcomes and Assessments: Learn How,” (01/10/14).

Acting Chair of the Department of Chemistry, X11, X12, X13, X14, X15, X16, X17.

Department of Chemistry Marshall, Spring Commencement, S13, S16.

Honors Awards Selection Committee, S13.

ENVS Faculty Search Committee, F13 – S14.

Ad-hoc committee on the development of advanced chemistry laboratories focusing on research based approach to experimental chemistry, F10 – S12.

Research Grants Reporting Project, S11 – X11.

Beeghly Renovation Committee, F06 – S07.

Environmental Science PhD Program Exploratory Committee, F06 – S08.

Environmental Issues Project Team, F06 – S10.

Environmental Science Undergraduate Curriculum Committee, F07 – S08.

Chemistry Department Representative for Educational Policy Committee, F07 – S09.

Faculty advisor for Habitat for Humanity student group, F07 – S09.

Faculty profile in CAS Connections, September 2007 issue.

Pro bono lecture for CHEM602 on Laboratory Safety and Measurement Techniques (09/04/07).

Guest Lectures for Environmental Science Courses, “Green Chemistry” and “Bioplastics”, F07 & S08.

Chemistry Department Representative at AU Recruiters seminar (01/11/07) and AU Science Graduate Open House (02/19/07).

Guest Speaker and Panelist at AU’s on-campus conference, Focus the Nation on Climate Change, “Alternative Energy: The Winds of Change,” (01/31/08).

Initiated development of new Chemistry Department Brochure, S07 – F08.

Chair of Undergraduate Chemistry Textbook Adoption Committee, S08, S09, & S11.

Interview with Communications graduate students on “The fate of plastics in the environment”, (04/02/08).

Guest Speaker at 2nd Year Faculty Luncheon, “Recommendations for Securing External Funding,” (10/08/08).

Faculty interviews for recently awarded research grant in CAS Connections (November 2008 issue) & Catalyst (Spring 2009 issue).

Panelist at the 20th Anniversary Ann Ferren Teaching Conference, “Show Me the Money! – Strategies for Effective Grant Writing,” (01/09/09).

Judge for poster sessions at 19th Robin Mattius Student Research Conference, April 4, 2009.

PROFESSIONAL SERVICE

Professional Organization Memberships:

American Chemical Society

Clay Minerals Society

Sigma Xi

TAPPI

Professional Activities:

Organized Center for Hierarchical Materials Design (CHiMaD), Polymer Matrix Materials Use Case semi-annual meeting, American University, 23 – 24 January 2017.

Group leader for the Composites sub-committee, TAPPI, Nanotechnology Division, Research Committee, June 2016 – present.

Lead organizer for the 2017 ECS - Electrochemistry for Education Symposium, 232nd National ECS Meeting, National Harbor, MD, October 2017.

Co-organizer for the 2015 ECS – Electrochemistry at Primarily Undergraduate Institutions Symposium, 227th National ECS Meeting, Chicago, IL, May 2015.

Co-organizer for “18th International Symposium on Molten Salts and Ionic Liquids,” held at the PRiME 2012 Joint International Meeting of the ECS, October 2012.

Lead organizer for “17th International Symposium on Molten Salts and Ionic Liquids,” 218th National ECS Meeting, Las Vegas, NV, 10 – 15 October 2010.

Co-organizer for “16th International Symposium on Molten Salts and Ionic Liquids,” held at the PRiME 2008 Joint International Meeting of the ECS, 12 October – 17 October, 2008.

Chairman of “Symposium Session I5: Molten Salts & Ionic Liquids 16,” 214th National ECS Meeting, Honolulu, HI, 12 – 17 October 2008.

Chairman of “Symposium Session I1: Physical and Electrochemistry General Session”, 210th National ECS Meeting, Cancun, Mexico, 29 October – 3 November 2006.

Chairman of “Symposium Session I4: Molten Salt 15, In Memory of Robert Osteryoung”, 210th National ECS Meeting, Cancun, Mexico, 29 October – 3 November 2006.

COMMUNITY AND CIVIC ACTIVITIES

Laboratory project supervisor for high school students, AY2017-19.

Experiment design for Westbrook Elementary School Science Day, Fall 2014.

Laboratory project supervisor for middle school student, Jimmy Park, Spring 2009.

Participant in Annual Environmental Science Department Hike at Great Falls National Park, August 31, 2008.

Interview with High School students as a part of National Council for Science and the Environment, EnvironMentors Program, December 2006.