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Drexel University
Department of Chemical and Biological Engineering
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Education

2001 PhD Johns Hopkins University, Chemical Engineering
1995 BS University of Maryland, Baltimore County, Chemical Engineering

Appointments

2003- Assistant Professor, Chemical Engineering, Drexel University, Philadelphia, PA
2001-2003 NRC Postdoctoral Fellow, U.S. Army Research Laboratory, Aberdeen, MD
1996 R&D Chemical Engineer, SCM Chemicals, Baltimore, MD

Honors and Awards

2007 NSF CAREER Award
2005 DuPont Science and Engineering Award
2004 ARO Young Investigator Award
2001 NRC Postdoctoral Award

Research Interests

Fuel Cells, Transport Phenomena in Polymers, Polymer Science

Research Funding

NSF-CAREER, ARO-YIP, ARO-MURI, ARL-MCOE, DTRA/ARO, USDA/DOE, ARO-DURIP, ARO-STTR, DuPont-S&E Award, Kraton Polymers

Synergistic Activities

- Editor, Special Issue on Polymers in Fuel Cells in *J. Polym. Sci. Polym. Phys.*, 2006
- Symposium organizer, Materials Research Society, 2007
- Session chair at national conferences (total sessions chaired: 18)
- Reviewer for 6 funding agencies (total proposals reviewed: >100)
- Reviewer for 21 scientific journals (total manuscripts reviewed: >50)
- Developed, organized, and coordinated dept. graduate recruiting and admissions activities
- Served on 19 PhD and 8 MS committees
- Active participant and advisor for 4 Drexel summer programs that provide education and research experience to high school and undergraduate students

Collaborators within the past 5 years

N.M. Benetatos (FDA), R.A. Cairncross (Drexel), R.H. Colby (Penn. St.) M.B. Giacinti (Univ. of Bologna, Italy), Y. Gogotsi (Drexel), D. Handlin (Kraton), M.A. Hillmyer (Univ. of Minn.), T.E. Long (VaTech), D. Kountz (DuPont), E. Napadensky (ARL), G.R. Palmese (Drexel Univ.), G.F. Payne (Univ. of MD Biotech Inst), K. Rangan (MMI), G.C. Sarti (Univ. of Bologna, Italy) J.M. Sloan (ARL), D. Suleiman (Univ. of Puerto Rico), S. Trenor (Kraton), K.I. Winey (Univ. of Penn.), A.-G. Yeh (DuPont)

Graduate and Postdoctoral Advisors

Doctoral: T.A. Barbari, currently Assoc. Provost at Georgetown Univ.

Postdoctoral: J.M. Sloan, U.S. Army Research Laboratory

Researchers Advising/Advised (8 PhD, 5 MS, 2 postdoc)

Ph.D. Students (Affiliation): D.T. Hallinan Jr., L. Gwee, H. Schaeffer, D.O. Dever, J. Throckmorton, M. Bavarian, B.D. Eirich, N.W. DeLuca (SABIC)

M.S. Students (Affiliation):

D. Shay (DuPont), B.D. Eirich (ExxonMobil), J.D. Snyder (Johns Hopkins), C. Solari (DuPont), S. Raghav (Rohm&Haas)

Postdoctoral Scholars: Y. Ye, H. Chen

Professional Affiliations

American Institute of Chemical Engineers (AIChE), member since 1994

American Chemical Society (ACS), member since 1997

North American Membrane Society (NAMS), member since 2000

Publications (*Peer-Reviewed Archival Manuscripts*)

1. Chen, H.; Snyder, J.D.; Elabd, Y.A. Electrospinning and Solution Behavior of Nafion and Poly(acrylic acid). *Macromolecules* **2008**, *41*, 128-135.
2. Rahmathullah, A.M.; Robinette, E.J.; Chen, H.; Elabd, Y.A.; Palmese G.R. Plasma-Assisted Synthesis of Hollow Nanofibers using Electrospun Sacrificial Templates. *Nucl. Instrum. Meth. B* **2007**, *265*, 23-30.
3. Hallinan, D.T., Jr.; Elabd, Y.A. Diffusion and Sorption of Methanol and Water in Nafion using Time-Resolved FTIR-ATR Spectroscopy. *J. Phys. Chem. B* **2007** *111* (46), 13221-13230. **Featured in Photonics Spectra, Jan 2008**
4. Chen, H.; Elabd, Y.A.; Palmese, G.R. Plasma-Aided Template Synthesis of Inorganic Nanotubes and Nanorods. *J. Mater. Chem.* **2007**, *17*, 1593-1596.
5. Chen, H.; Palmese, G.R.; Elabd, Y.A. Electrosensitive Permeability of Membranes with Oriented Polyelectrolyte Nanodomains. *Macromolecules* **2007**, *40*, 781-782.
6. DeLuca, N.W.; Elabd, Y.A. Direct Methanol Fuel Cell Performance of Nafion[®]/ Poly(vinyl alcohol) Blend Membranes. *J. Power Sources* **2006**, *163*, 386-391.
7. Chen, H.; Palmese, G.R.; Elabd, Y.A. Membranes with Oriented Polyelectrolyte Nanodomains. *Chem. Mater.* **2006**, *18*, 4875-4881.
8. DeLuca, N.W.; Elabd, Y.A. Nafion[®]/Poly(vinyl alcohol) Blends: Effect of Composition and Annealing Temperature on Transport Properties. *J. Membrane Sci.* **2006**, *282*, 217-224.

9. DeLuca, N.W.; Elabd, Y.A. Polymer Electrolyte Membranes for the Direct Methanol Fuel Cell: A Review. *J. Polym. Sci. Pol. Phys.* **2006**, *44*, 2201-2225. **Invited Contribution**
10. Elabd, Y.A.; Napadensky, E.; Walker, C.W.; Winey, K.I. Transport Properties of Sulfonated Poly(styrene-isobutylene-styrene) Triblock Copolymers at High Ion-Exchange Capacities. *Macromolecules* **2006**, *39*, 399-407.
11. Suleiman, D.; Elabd, Y.A.; Napadensky, E.; Sloan, J.M.; Crawford, D.M. Thermogravimetric Characterization of Sulfonated Poly(styrene-isobutylene-styrene) Block Copolymers: Effects of Processing Conditions. *Thermochim. Acta* **2005**, *430* (1-2), 149-154.
12. Wu, L-Q.; Ghodssi, R.; Elabd, Y.A.; Payne, G.F. Biomimetic Pattern Transfer. *Adv. Funct. Mater.* **2005**, *15* (2), 189-195.
13. Elabd, Y.A.; Napadensky, E. Sulfonation and Characterization of Poly(styrene-isobutylene-styrene) Triblock Copolymers at High Ion-Exchange Capacities. *Polymer* **2004**, *45* (9), 3037-3043.
14. Elabd, Y.A.; Beyer, F.L.; Walker, C. W. Triblock Copolymer Ionomer Membranes. Part II: Structure Characterization and its Effects on Transport Properties and Direct Methanol Fuel Cell Performance. *J. Membrane Sci.* **2004**, *231* (1-2), 181-188.
15. Elabd, Y.A.; Baschetti Giacinti, M.; Barbari, T.A. Time-Resolved FTIR-ATR Spectroscopy for the Measurement of Molecular Diffusion in Polymers. *J. Polym. Sci. Pol. Phys.* **2003**, *41* (22), 2794-2807. **Invited Contribution**
16. Elabd, Y.A.; Napadensky, E.; Sloan, J.M.; Crawford, D.M.; Walker, C. W. Triblock Copolymer Ionomer Membranes. Part I: Methanol and Proton Transport. *J. Membrane Sci.* **2003**, *217* (1-2), 227-242.
17. Elabd, Y.A.; Barbari, T.A. Multicomponent Diffusion of Hydrogen Bonding Solutes in a Polymer. *AIChE J.* **2002**, *48* (8), 1610-1620.
18. Elabd, Y.A.; Sloan, J.M.; Beck Tan, N.; Barbari, T.A. The Effect of Penetrant-Polymer Interactions on Molecular Diffusion in Conformational Isomers of a Heterogeneous Polymer. *Macromolecules* **2001**, *34* (18), 6268-6273.
19. Elabd, Y.A.; Barbari, T.A. Acetic Acid Diffusion in Polyisobutylene: Probing Small Molecule Structures. *Ind. Eng. Chem. Res.* **2001**, *40* (14), 3076-3084.
20. Elabd, Y.A.; Barbari, T.A. Separating Solvation from Molecular Diffusion in Polymers. *AIChE J.* **2001**, *47* (6), 1255-1262. **Featured in Chemical Engineering Progress, June 2001**
21. Elabd, Y.A.; Sloan, J.M.; Barbari, T.A. Diffusion of Acetonitrile in Conformational Isomers of an H₁₂MDI Polyurethane. *Polymer* **2000**, *41* (6), 2203-2212.

Publications (*Book Chapters*)

22. Chen, H.; Rahmathullah, A.M.; Palmese, G.R.; Elabd, Y.A. Polymer-Polymer Nanocomposite Membranes as Breathable Barriers with Electro-Sensitive Permeability; In *Nanoscience and Nanotechnology for Chemical and Biological Defense*. Nagarajan, R. Ed.; ACS Symposium Series; Oxford University Press. In press. **Invited Contribution**
23. Hallinan, D.T., Jr.; Elabd, Y.A. Sorption and Diffusion Selectivity of Methanol/Water Mixtures in Nafion[®]. In *Micro-Mini Fuel Cells – Fundamentals and Applications*; Kakac, S., Pramuanjaroenkij, A., Vasiliev, L., Eds; Springer, Netherlands, 2008; pp 189-208. **Invited Contribution**

Publications (*Archival Proceedings, Preprints, and Technical Reports*)

24. Chen, H.; Elabd, Y.A. Ionic Liquid Polymers: Electrospinning and Solution Properties. *ACS PMSE Preprints* **2008**, *99*, 646-647.
25. Chen, H.; Choi, J.-H.; Salas-de la Cruz, D.; Winey, K.I.; Elabd, Y.A. Ionic Liquid Polymers: The Effect of Copolymer Composition on Structure and Ion Conduction. *ACS PMSE Preprints* **2008**, *99*, 21-22.
26. Chen, H.; Palmese, G.R.; Elabd, Y.A. Membranes with Oriented Polyelectrolyte Nanodomains as Breathable Barriers for Protective Clothing. *25th Army Science Conference Proceedings* **2006**, *MP-01*.
27. Napadensky, E.; Elabd, Y.A. *Transport Properties of N-Methylolated Nylon-6/Chitosan Blend Membranes*; Technical report for the U.S. Army Research Laboratory: *ARL-TR-3917*, September 2006.
28. Chen, H.; Palmese, G.R.; Elabd, Y.A. Membranes with Oriented Polyelectrolyte Nanodomains. *ACS PMSE Preprints* **2006**, *95*, 269-270.
29. Hronec, C.; Walker, C.W.; Elabd, Y.A. Catalyst Layer Network Formation and its Effect on Fuel Cell Performance. *ACS Fuel Preprints* **2005**, *50* (2), 478-479.
30. Chen, H.; Palmese, G.R.; Elabd, Y.A. Polyester-Poly(methacrylic acid) Nanocomposite Membranes as Breathable Barriers. *ACS Polymer Preprints* **2005**, *46* (2), 1202-1203.
31. Mohamed Aflal, M.R.; Elabd, Y.A.; Palmese, G.R. Proton Conductive Nanoporous Thermosetting Copolymers. *ACS PMSE Preprints* **2005**, *93*, 564-565.
32. Wu, L-Q.; Ghodssi, R.; Elabd, Y.A.; Payne, G.F. Biomimetic Pattern Transfer from a Hard Material to a Soft Biomaterial. *ACS PMSE Preprints* **2005**, *93*, 246-247.
33. Sloan, J.M.; Napadensky, E.; Crawford D.M.; Elabd, Y.A. Nanostructured Polymer Membranes for Chemical Protective Clothing. *24th Army Science Conference Proceedings* **2004**, *MP-07*.

34. Napadensky, E.; Sloan, J.M.; Elabd, Y.A. Breathability and Selectivity of Selected Materials for Protective Clothing. *ACS PMSE Preprints* **2004**, *91*, 752-753.
35. Elabd, Y.A.; Walker, C.W. Proton Conducting Block Copolymers and their Application to the Direct Methanol Fuel Cell. *41st Proceedings of the Power Sources Conference* **2004**, *16.4*, 262-265.
36. Elabd, Y.A.; Napadensky, E.; Walker, C.W. Proton Conducting Block Copolymers: Sulfonation, Characterization and Application to the Direct Methanol Fuel Cell, *ACS Polymer Preprints* **2004**, *45* (1), 18-19.
37. Napadensky, E.; Elabd, Y.A. *Breathability and Selectivity of Selected Materials for Protective Clothing*; Technical report for the U.S. Army Research Laboratory: *ARL-TR-3235*, July 2004.
38. Harris, J.; Elabd, Y.A.; Napadensky, E.; Moy, P. *Thermal Processing and Composite Laminate Formation of Ionic Block Copolymers for Protective Clothing*; Technical report for the U.S. Army Research Laboratory: *ARL-TR-2892*, December 2002.
39. Elabd, Y.A.; Napadensky, E.; Sloan, J.M.; Crawford, D.M.; Walker, C.W. Transport Properties of Triblock Copolymer Ionomer Membranes for Fuel Cells. *23rd Army Science Conference Proceedings* **2002**, *AO-02*.
40. Crawford, D.M.; Elabd, Y.; Sloan, J.M.; Napadensky, E.; Kendrick, C.; Zukas, W. X. Mechanical Properties and Water Vapor Transport Properties of Sulfonated Block Copolymers. *ACS Polymer Preprints* **2002**, *43* (1), 430-431.
41. Sloan, J.M.; Elabd, Y.A.; Napadensky, E. Sulfonated Block Copolymer Ionomers for Use in Direct Methanol Fuel Cells. *60th Proceedings of the Society of Plastic Engineers Annual Technical Conference* **2002**, *3*, 3939-3941.
42. Crawford, D.M.; Napadensky, E.; Elabd, Y.A.; Sloan, J.M.; Mountz, D.; Mauritz, K.A. DMA Characterization of Modified Polystyrene-Polyisobutylene-Polystyrene Triblock Copolymers. *29th Proceedings of the NATAS Annual Conference on Thermal Analysis and Applications* **2001**, 240-245.
43. Payne, G.F.; Elabd, Y.A.; Lenhart, J.L.; Rameriz, D.M. Enzymatic Modification of Chitosan by Tyrosinase. *ACS PMSE Preprints* **1996**, *74*, 36.

Publications (Patents)

44. Elabd, Y.A.; Gogotsi, Y.; Eirich, B.; Shay, D. Electrocatalysts for Fuel Cells. World Patent, filed September 28, 2008, international application number PCT/US08/77804, pending approval.

45. Elabd, Y.A.; Palmese G.R. Filled Nanoporous Polymer Membrane Composites for Protective Clothing and Methods for Making Them. World Patent, filed May 24, 2007, international application number PCT/US07/69658, pending approval. **Featured in Homeland Security Daily Wire, February 2008.**
46. Elabd, Y.A.; Napadensky, E.; Sloan, J.M.; Crawford, D.M. Highly Sulfonated Block Copolymer Hydrogels and Uses Thereof. U.S. Patent 7,307,127, December 11, 2007.