

Margaret W. Frey, Ph.D.,

Vincent V. C. Woo Professor in Fiber Science and Apparel Design

<http://www.human.cornell.edu/bio.cfm?netid=mfw24>

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Education:

Cornell University	Chemical Engineering	B.S. 1985
Cornell University	Fiber Science	M.S. 1989
North Carolina State University	Fiber and Polymer Science	Ph.D.1995

Positions Held:

Interim Department Chair, Department of Fiber Science & Apparel Design, College of Human Ecology, Cornell University (12/18-6/19).

Senior Associate Dean for Undergraduate Affairs, College of Human Ecology, Cornell University (January 2015 – present).

Professor, Department of Fiber Science & Apparel Design, Cornell University (July 2015 – present).

Visiting Professor, Northumbria University, Newcastle, UK (9/17-12/17).

Visiting Professor, Regensburg University, Regensburg, DE (6/17-8/17).

Director of Undergraduate Studies, Department of Fiber Science & Apparel Design, Cornell University (February 2014 – August 2015).

Director of Graduate Studies, Department of Fiber Science & Apparel Design, Cornell University (August 2009 – August 2013).

Associate Professor, Department of Fiber Science & Apparel Design, Cornell University (July 2008 – July 2015).

Lois and Mel Tukman Assistant Professor, Department of Fiber Science & Apparel Design, Cornell University (2005-2008).

Assistant Professor, Department of Textiles and Apparel, College of Human Ecology, Cornell University (July 2002-July 2008).

Manager of Material Development, Champlain Cable Corporation, (January 1998 – April 2002).

Materials Specialist, Johnson Filaments, (June 1995 – December 1997).

Technical Specialist, Helene Curtis Industries, (August 1988-August 1990).

Staff Scientist, TRI Princeton, (July 1987-August 1988).

Honors and Awards:

Finalist, Fiber Society Student Paper Competition, E. Hendrick, “pH-indicating electrospun fibers”, The Fiber Society meeting, Oct. 20-22, 2010. Snow Bird, Utah.

First Prize, ACS Division of Cellulose and Renewable Materials Student Paper Competition, Nanocomposite Fibers Electrospun from Biodegradable Polymers”, Chunhui Xiang, ACS National Meeting, March 2008, New Orleans, LA.

First Prize, Fiber Society Student Paper Competition, M. Xiao, “The Role of Salt on Cellulose Dissolution in Ethylene Diamine/Salt Solvent Systems”, October, 2007, Davis, CA.

SUNY Chancellors Award for Excellence in Teaching, M. W. Frey, May 2005.

First Prize, INTC (International Nonwovens Technical Conference) Student Paper Competition, H. Chan, M. W. Frey “Ethylenediamine/Potassium Thiocyanate Cellulose Systems: Dissolution, Rheological Properties and Coagulant Identification”, September, 2004, Toronto, Canada.

Goldfinger award for outstanding dissertation, 1994-1995, M. W. Frey, College of Textiles, North Carolina State University, December, 1995, Raleigh, NC.

Publications (Refereed): Citations: 1873, H index: 24 (1/1/18)

62. Divvela, M.J., et al., Discretized Modeling of Motionless Printing Based on Retarded Bending Motion and Deposition Control of Electrically Driven Jet. 3D Printing and Additive Manufacturing, 2018. 5(3): p. 248-256.
61. Lee, J.H., et al., Effective Suppression of the Polysulfide Shuttle Effect in Lithium–Sulfur Batteries by Implementing rGO–PEDOT: PSS-Coated Separators via Air-Controlled Electrospray. ACS Omega, 2018. 3(12): p. 16465-16471.
60. Najafi, M., J. Chery, and M. Frey, Functionalized Electrospun Poly (Vinyl Alcohol) Nanofibrous Membranes with Poly (Methyl Vinyl Ether-Alt-Maleic Anhydride) for Protein Adsorption. Materials, 2018. 11(6): p. 1002.
59. Shepherd, L. and M. Frey, The Degradation of Cellulose by Radio Frequency Plasma. Fibers, 2018. 6(3): p. 61.
58. Xiao, M., J. Chery, and M.W. Frey, Functionalization of Electrospun Poly (vinyl alcohol)(PVA) Nanofiber Membranes for Selective Chemical Capture. ACS Applied Nano Materials, 2018. 1(2): p. 722-729.
57. Xiao, M., Gonzalez, E., Monterroza, A. M., & Frey, M. (2017). Fabrication of thermo-responsive cotton fabrics using poly(vinylcaprolactam-co-hydroxyethyl acrylamide) copolymer. Carbohydrate Polymers, 174, 626-632. doi: 10.1016/j.carbpol.2017.06.092
56. Xiao, M., Chery, J., Keresztes, I., Zax, D. B., & Frey, M. W. (2017). Direct characterization of cotton fabrics treated with di-epoxide by nuclear magnetic resonance. Carbohydrate Polymers, 174, 377-384. doi: 10.1016/j.carbpol.2017.06.077
55. Gonzalez, E., & Frey, M. W. (2017). Synthesis, characterization and electrospinning of poly(vinyl caprolactam-co-hydroxymethyl acrylamide) to create stimuli-responsive nanofibers. Polymer, 108, 154-162. doi: 10.1016/j.polymer.2016.11.053
54. Shepherd, L. M., Frey, M. W., & Joo, Y. L. (2017). Immersion Electrospinning as a New Method to Direct Fiber Deposition. Macromolecular Materials and Engineering, 302(10). doi: 10.1002/mame.201700148.
53. Guzman J. J. L., Pehlivanar Kara M. O., Frey M. W. and Angenent L. T. (2017). Performance of electro-spun carbon nanofiber electrodes with conductive poly(3,4-ethylenedioxythiophene) coatings in bioelectrochemical systems. Journal of Power Sciences, 356, 331-337. doi: 10.1016/j.jpowsour.2017.03.133.
52. Reyes, C. G. and M. W. Frey (2017). Morphological traits essential to electrospun and grafted nylon-6 nanofiber membranes for capturing submicron simulated exhaled

breath aerosols. *Journal of Applied Polymer Science*, 134(17). doi: 10.1002/app.44759.

51. Larissa M. Shepherd, Edurne González, Esther X. Chen, and Margaret W. Frey, Increasing Stability of Biotin Functionalized Electrospun Fibers for Biosensor Applications, *ACS Applied Materials & Interfaces* 9(2), 1968-1974. doi: 10.1021/acsami.6b14348.

50. Matlock-Colangelo, Lauren, Colangelo, Nicholas W, Fenzl, Christoph, Frey, Margaret W, & Baeumner, Antje J. (2016). Passive Mixing Capabilities of Micro-and Nanofibres When Used in Microfluidic Systems. *Sensors*, 16(8), 1238.

49. Trejo, Nidia K, Reyes, Catherine G, Sanchez, Vanessa, Zhang, Dorothy, & Frey, Margaret W. (2016). Developing composite nanofibre fabrics using electrospinning, ultrasonic sewing, and laser cutting technologies. *International Journal of Fashion Design, Technology and Education*, 9(3), 192-200.

48. Xiang, C., Frey, M.W., (2016) 'Increasing Mechanical Properties of 2-D Structured Electrospun Nylon 6 Non-woven Fiber Mats' *Materials* 2016, 9, 4; doi:10.3390/ www.mdpi.com/journal/materials.

47. Matlock-Colangelo, Lauren, Coon, Barbara, Pitner, Christine L, Frey, Margaret W, & Baeumner, Antje J. (2016). Functionalized electrospun poly (vinyl alcohol) nanofibers for on-chip concentration of E. coli cells. *Analytical and bioanalytical chemistry*, 408(5), 1327-1334.

46. González, E., Shepherd, L.M., Saunders L., Frey, M.W., Surface Functional Poly(lactic Acid) Electrospun Nanofibers for Biosensor Applications, *Materials* 2016, 9, x; doi:10.3390/ <http://www.mdpi.com/1996-1944/9/1/47/pdf>.

45. Trejo, N.K., Frey, M.W. 'A comparative study on electrospun, layer-by-layer, and chemically grafted nanomembranes loaded with iron oxide nanoparticles' *Journal of Applied Polymer Science* 2015, **132 (41)** 42657.

44. Buttaro, L., Drufva, E., Frey, M.W., Phase Separation to Create Hydrophilic yet Non-Water Soluble PLA/PLA-b-PEG Fibers via Electrospinning, *Journal of Applied Polymer Science*, 2014, **131(19)** 41030.

43. Hendrick, E., Frey, M.W., Increasing Surface Hydrophilicity in Poly(Lactic Acid) Electrospun Fibers by Addition of Pla-b-Peg Co-Polymers, *Journal of Engineered Fibers and Fabrics*, 2014, **9(2)**, www.JeffJournal.org

42. Xiang, C., Frey, M.W., Hydrolytic Degradation of Nanocomposite Fibers Electrospun from Poly(Lactic Acid)/Cellulose Nanocrystals in Cellulose Based Composites: New Green Nanomaterials, Hinestroza, J. and Netravali, A. eds. 2014

41. Mukai, M., Woods, L. W., Stump, S., Ebel, J.G., Levitt, A.S., Frey, M.W., Smith, J., Uzal, F.A., Poppenga, R.H. Puschner, B., Detection of diisocyanates in nesting material associated with mortality in pigeon chicks, *J. Vet Diagn Invest*, 2014, DOI: 10.1177/1040638713520543.

40. Reinholt, S. J., Sonnenfeldt, A., Naik, A., Frey, M.W., Baeumner, A.J., Developing new materials for paper-based diagnostics using electrospun nanofibers, *Analytical and Bioanalytical Chemistry* 2013 DOI: 10.1007/s00216-013-7372-5.
39. Pehlivaner Kara, M.O., Frey, M.W., The effects of solvents on the morphology and conductivity of poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) nanofibers, *Journal of Applied Polymer Science*, 2014, **131(11)** 40305.
38. Cho, D.; Naydich, A., Frey, M.W., Joo, Y.L., Further improvement of air filtration efficiency of cellulose filters coated with nanofibers via inclusion of electrostatically active nanoparticles, *Polymer*, 2013 **54**:2364-2372.
37. Xiang, C., Taylor, A.G., Hinestroza, J.P., Frey, M.W., Controlled release of nonionic compounds from poly(lactic acid)/cellulose nanocrystal nanocomposite fibers. *Journal of Applied Polymer Science*, **2013**: 127.(1) p. 79-86.
36. Schrote, K. and M.W. Frey, Effect of irradiation on poly (3, 4-ethylenedioxythiophene): poly (styrenesulfonate) nanofiber conductivity. *Polymer*, 2013. 54: 737-742.
35. Cho, Y.; Cho, D.; Park, J. H.; Frey, M.; Ober, C.; Joo, Y., Preparation and Characterization of Amphiphilic Triblock Terpolymer-Based Nanofibers as Antifouling Biomaterials, *Biomacromolecules*, **2012**, 13(5): p. 1606-1614.
34. Matlock-Colangelo, L.; Cho, D.; Pitner, C. L.; Frey, M. W.; Baeumner, A. J., Functionalized electrospun nanofibers as bioseparators in microfluidic systems. *Lab on a Chip*, **2012**, 12(9): p. 1696-1701.
33. Cho, D.; Lee, S.; Frey, M. W., Characterizing zeta potential of functional nanofibers in a microfluidic device. *Journal of Colloid and Interface Science* **2012**, 372 (1), 252-260.
32. Cho, D., Hoepker N., Frey M.W., Fabrication and characterization of conducting polyvinyl alcohol nanofibers. *Materials Letters*, **2012**. **68(0)**: p. 293-295.
31. Cho, D. W.; Matlock-Colangelo, L.; Xiang, C. H.; Asiello, P. J.; Baeumner, A. J.; Frey, M. W., Electrospun nanofibers for microfluidic analytical systems. *Polymer* **2011**, 52(15): p. 3413-3421.
30. Cho, D.; Bae, W. J.; Joo, Y. L.; Ober, C. K.; Frey, M. W., Properties of PVA/HfO(2) Hybrid Electrospun Fibers and Calcined Inorganic HfO(2) Fibers. *Journal of Physical Chemistry C* **2011**, 115 (13), 5535-5544
29. Buyuktanir, E.A., West J.L., Frey M.W., Optically responsive liquid crystal microfibers for display and nondisplay applications. *Proc. SPIE*, **2011**. 7955: p. 79550P.
28. Reiffel, A., Henderson, P.W., Sohn, A.M., Lekic N., Frey M.W., Spector J.A., Creating Surgically Relevant de novo Tissue Engineered Constructs Using Biocompatible Biodegradable Polymers. *Journal of Surgical Research*, **2011**. 165(2): p. 208.

27. Rebovich, M.E., Vynias D., Frey M.W., Formation and functions of high-surface-area fabrics. *International Journal of Fashion Design, Technology and Education*, **2010**. **3**(3): p. 129 - 134.
26. Li, L.L., Frey M.W., Preparation and characterization of cellulose nitrate-acetate mixed ester fibers. *Polymer*, **2010**. **51**(16): p. 3774-3783.
25. Li, L., Frey, M.W., Browning, K.J., Biodegradability Study on Cotton and Polyester Fabrics. *Journal of Engineered Fibers and Fabrics*, **2010**. **5**(4): p. 42-53.
24. Buyuktanir, E.A., M.W. Frey, and J.L. West, Self-assembled, optically responsive nematic liquid crystal/polymer core-shell fibers: Formation and characterization. *Polymer*, **2010**. **51**(21): p. 4823-4830.
23. Sohn, A.M., Henderson, P. W. , Koppius, A.; Reiffel, A. J., Bonassar, L., Frey, M.W.; Spector, J. A., Endothelialization of Sacrificial Polymer-Derived Vascular Channels: Advancement towards the Creation of Surgically Relevant Tissue Replacements. *Plastic and Reconstructive Surgery*, **2010**. **126**: p. 58.
22. Xiao, M. and M.W. Frey, *Study of cellulose/ethylene diamine/salt systems*. *Cellulose*, **2009**. **16**(3): p. 381-391.
21. Xiang, C.H., Y.L. Joo, and M.W. Frey, *Nanocomposite Fibers Electrospun from Poly(lactic acid)/Cellulose Nanocrystals*. *Journal of Biobased Materials and Bioenergy*, **2009**. **3**(2): p. 147-155.
20. Xiao, M. and M.W. Frey, *Rheological Studies of the Interactions in Cellulose/Ethylene Diamine/Salt Systems*. *Journal of Polymer Science Part B- Polymer Physics*, **2008**. **46**(21): p. 2326-2334.
19. Frey, M.W., *Electrospinning cellulose and cellulose derivatives*. *Polymer Reviews*, **2008**. **48**(2): p. 378-391.
18. Xiao, M. and M.W. Frey, *The role of salt on cellulose dissolution in ethylene diamine/salt solvent systems*. *Cellulose*, **2007**. **14**(3): p. 225-234.
17. Xiang, C.H., Frey, M.W. , Taylor A. G., Rebovich M. E., *Selective chemical absorbance in electrosupun nonwovens*. *Journal of Applied Polymer Science*, **2007**. **106**(4): p. 2363-2370.
16. Li, D., Frey M.W., Vynias, D., Baeumner A. J., *Availability of biotin incorporated in electrospun PLA fibers for streptavidin binding*. *Polymer*, **2007**. **48**(21): p. 6340-6347.
15. Frey, M.W. and L. Li, *Electrospinning and Porosity Measurements of Nylon-6/Poly(ethylene oxide) Blended Nonwovens*. *Journal of Engineered Fibers and Fabrics*, **2007**. **2**(1): p. 31-37.
14. Frey, M.W., Li, D., Tsong, T., Baeumner, A.J., Joo Y.L., *Incorporation of biotin into PLA nanofibers via suspension and dissolution in the electrospinning dope*. *Journal of Biobased Materials and Bioenergy*, **2007**. **1**(2): p. 220-228.
13. Li, L., M.W. Frey, and T.B. Green, *Modification of air filter media with nylon-6 nanofibers*. *Journal of Engineered Fibers and Fabrics*, **2006**. **1**(1): p. 1-22.

12. Li, L., Bellan, L.M., Craighead, H.C., Frey, M.W., *Formation and properties of nylon-6 and nylon-6/montmorillonite composite nanofibers*. *Polymer*, **2006**. **47**(17): p. 6208-6217.
11. Li, D.P., M.W. Frey, and Y.L. Joo, *Characterization of nanofibrous membranes with capillary flow porometry*. *Journal of Membrane Science*, **2006**. **286**(1-2): p. 104-114.
10. Li, D.P., M.W. Frey, and A.J. Baeumner, *Electrospun polylactic acid nanofiber membranes as substrates for biosensor assemblies*. *Journal of Membrane Science*, **2006**. **279**(1-2): p. 354-363.
9. Kim, C.W., Frey, M.W., Marquez, M., Joo, Y.L., *Preparation of submicron-scale, electrospun cellulose fibers via direct dissolution*. *Journal of Polymer Science Part B-Polymer Physics*, **2005**. **43**(13): p. 1673-1683.
8. Frey, M.W., H. Chan, and K. Carranco, *Rheology of cellulose/KSCN/ethylenediamine solutions and coagulation into filaments and films*. *Journal of Polymer Science Part B-Polymer Physics*, **2005**. **43**(15): p. 2013-2022.
7. Frey, M.W. and M.H. Theil, *Calculated phase diagrams for cellulose/ammonia/ammonium thiocyanate solutions in comparison to experimental results*. *Cellulose*, **2004**. **11**(1): p. 53-63.
6. Cuculo J. A., N. Aminuddin and M.W. Frey "Solvent Spun Cellulose Fibers", J. A in *Structure Formation in Polymeric Fibers*, 296-328, D.R. Salem Ed., Hanser Publishers: Munich (**2000**).
5. Frey, M.W., J.A. Cuculo, and R.J. Spontak, *Morphological characteristics of the lyotropic and gel phases in the cellulose/NH₃/NH₄SCN system*. *Journal of Polymer Science Part B-Polymer Physics*, **1996**. **34**(12): p. 2049-2058.
4. Frey, M.W., J.A. Cuculo, and S.A. Khan, *Rheology and gelation of cellulose/ammonia/ammonium thiocyanate solutions*. *Journal of Polymer Science Part B-Polymer Physics*, **1996**. **34**(14): p. 2375-2381.
3. Frey, M.W., Cuculo, J.A., Ciferri, A., Theil, M.H., *A Review of Lattice Theory for Lyotropic Liquid-Crystalline Polymers, Spinodal Decomposition, and Gel Formation*. *Journal of Macromolecular Science-Reviews in Macromolecular Chemistry and Physics*, **1995**. **C35**(2): p. 287-325.

Publications (Non-Refereed):

2. H. S. Whang, N. Aminuddin, M. Frey, S. M. Hudson*, and J. A. Cuculo, *Conversion of cellulose, chitin and chitosan to filaments with simple salt solutions*, In *Biodegradable and Sustainable Fibers*, R.S. Blackburn, Ed. Woodhead Publishing, London, 2005.
1. C.Jordan, B. Crawford and M. Frey*, "Investigation of Textile Finishing – A scientific discovery experiment for children of all ages" *Journal of Textiles and Apparel, Technology and Management*, **4**(3) (online journal) http://www.tx.ncsu.edu/jtatm/volume4issue3/tex_finishing.htm, 2005.

Courses Taught:

FSAD 1110: Success in Fiber Science & Apparel Design
FSAD 1350: Fibers, Fabrics and Finishes
FSAD 1360: Fibers, Fabrics and Finishes Laboratory
FSAD 2370: Structural Fabric Design
FSAD 6390: Mechanics of Fibrous Structures
FSAD 6660: Fiber Formation Theory and Practice

Service:**At Cornell University:**

Faculty Fellow: Atkinson Center for a Sustainable Future, Cornell University
Faculty Fellow: Balch Residence Hall, Cornell University
Faculty Fellow: Cornell Institute for Fashion and Fiber Innovation (CIFI)
Graduate School General Committee Member, 2010-2015
College of Human Ecology Committee on Academic Status, 2002-2005
College of Human Ecology Educational Policy Committee, 2014 –
College Ad-hoc committee for tenure review, 2013
Alumni affairs speaker, 2010, 2012
Reunion speaker, 2005, 2010
Freshman reading project discussion leader, 2003-2008, 2012-2013
Cornell Center for Materials Research, Member 2003 -
Cornell Center for Materials Research (CCMR) POP Symposium Organizer, 2008

Beyond Cornell University:

Scientific Advisory Board (SAB) member for the Department of Textile Engineering,
Chemistry and Science (TECS) at NC State University
ACS Cellulose and Renewable Materials Division,
Councilor, 2012
Treasurer, 2010-2012
Nominations Chair 2008-2010
Member-at-large 2007-2010
Symposia organizer, 2008-2010
Session chair, 2008-2010
Fiber Society
Program co-Chair, 75th anniversary meeting, Ithaca, NY 2016
Graduate Student Paper Competition Judge 2010-2013 (chair 2013)
Symposium organizer 2004, 2015
Session chair 2004-2014
National Textile Center student paper competition judge 2009
Tenure/promotion package review:
North Carolina State University
Drexel University
Review for Journals:
ACS Applied Materials and Interfaces
Biomacromolecules
Biomaterials and Bioenergy
Cellulose

Journal of Engineered Fibers and Fabrics
Journal of Applied Polymer Science
Journal of Membrane Science
Journal of Polymer Science; B: Polymer Physics
Polymer

Patents:

- A. J. Baeumner, M. W. Frey, D. Cho, "Biofunctional nanofibers for analyte separation in microchannels", PCT/US2012/030429, 12/27/2012.
- C.Xiang, M.W. Frey, A.G. Taylor, M.P. Hoffmann, J. Gardner, "Controlled Release Agricultural Chemical Delivery System" PCT/US09/59076, WO2010039865 A2, 9/2009.
- E. A. Buyuktanir, M. W. Frey, J. L. West, "Method of making stimuli responsive liquid crystal-polymer composite fibers", US 8257639 B2, 9/4/2012.
- E. Hendrick, E.Herz, M.W.Frey, U. Wiesner, "Polymeric Materials Incorporating Core-shell Silica Nanoparticles" US20110263037 A1, 10/27/2011.
- A.J. Bauemner, M.W.Frey, P. Kakad, D.Li, "Electrospun Nanofiber-Based Biosensor Assemblies" US7485591 B2. 2/3/2009.
- M.W. Frey and Y.L. Joo, "Method for Formation of Cellulose Micro and Nano Fibers via electrospinning", US application # 10/834,041, filed April 29, 2004.
- M.W. Frey, L. Li, T. Green, "Cellulosic/Polyamide Composite", US 7618702 B2, 11/17/2009.