



Engineering & Scientific Consulting

Abigail M. Oelker, Ph.D.

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Professional Profile

Dr. Oelker utilizes expertise in chemicals and materials characterization to provide clients in a variety of industries with product development and failure analysis solutions. Trained as a chemical engineer and chemist, Dr. Oelker specializes in the design and evaluation of polymeric materials and small molecule additives. She has experience with materials selection, reformulation, and failure analysis of polymer films, emulsifiers and emulsion polymers, medical devices, high-performance textiles, dyes, carpets, coatings, reflective insulation, and injectable hydrogels. In addition, she has practical experience with failure analysis, leachate testing, and selection of adhesives including hot melt, pressure-sensitive, reactive, and contact/drying types in service of clients in the medical device, textile, and wearable electronics industries.

Dr. Oelker has hands-on experience with small molecule and polymer synthesis, modification, and purification as well as hydrogel design, cross-linking, and characterization. She is skilled in molecular characterization techniques such as nuclear magnetic resonance (NMR) spectroscopy, Fourier transform infrared (FTIR) spectroscopy, fluorometry, dynamic light scattering (DLS), ultraviolet-visible (UV-Vis) spectroscopy, circular dichroism (CD) spectroscopy, and gel permeation chromatography (GPC). In addition, she has an extensive background in materials characterization techniques including microscopy (optical, confocal), rheology, nanoindentation, differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and profilometry.

Prior to joining Exponent, Dr. Oelker was a postdoctoral associate in the department of chemical engineering at MIT where she developed polypeptide hydrogel substrates with independently tunable stiffness, permeability, and ligand presentation for the study of disease mechanisms and *in vitro* therapeutic testing. This research built upon her graduate work at Boston University, where she synthesized and characterized a variety of polymers for use as surgical adhesives and implants.

Academic Credentials & Professional Honors

Ph.D., Chemistry, Boston University, 2009

B.S., Chemical Engineering, Lehigh University, 2003

Postdoctoral Associate, Department of Chemical Engineering, Massachusetts Institute of Technology (MIT),

Professional Affiliations

Materials Research Society

American Institute of Chemical Engineers

Publications

Oelker AM, Morey SM, Griffith LG, Hammond PT. Helix versus coil polypeptide macromers: gel networks with decoupled stiffness and permeability. *Soft Matter* 2012; 8:10887.

Oelker AM, Berlin JA, Wathier M, Grinstaff MW. Synthesis and characterization of dendron cross-linked PEG hydrogels as corneal adhesives. *Biomacromolecules* 2011; 12:1658.

Oelker AM, Grinstaff MW. Synthesis, characterization, and in vitro evaluation of a hydrogel-based corneal onlay. 2011; 11:37.

Oelker AM, Grinstaff MW. Ophthalmic adhesives: a materials chemistry perspective. *Journal of Materials Chemistry* 2008; 18:2521.

Spirko JA, Neiman ML, Oelker AM, Klier K. Electronic structure and reactivity of defect MoS₂ II. Bonding and activation of hydrogen on surface defect sites and clusters. *Surface Science* 2004; 572:191.

Spirko JA, Neiman ML, Oelker AM, Klier K. Electronic structure and reactivity of defect MoS₂: I. Relative stabilities of clusters and edges, and electronic surface states. *Surface Science* 2003; 542:192.

Presentations

Oelker AM, Griffith LG, Hammond PT. "Click"-grafted polypeptide macromers: Components of a hydrogel toolkit for modeling cell-matrix interactions. Oral presentation, Materials Research Society Annual Meeting, San Francisco, CA, 2012.

Oelker AM, Griffith LG, Hammond PT. Synthetic polypeptide macromers with tunable secondary structure: components of a hydrogel toolkit for modeling cell-matrix interactions. Oral presentation, AIChE Annual Meeting, Minneapolis, MN, 2011.

Oelker AM, Griffith LG, Hammond PT. "Click"-grafted polypeptides: Structural macromers with tunable conformation. Poster presentation, American Chemical Society National Meeting, Boston, MA, 2011.

Oelker AM, Griffith LG, Hammond PT. Synthetic polypeptide macromers: Components of a hydrogel toolkit for modeling cell-matrix interactions. Oral presentation, Emergent Behaviors of Integrated Cellular Systems: Multi-Institutional Trainee Research Symposium, Cambridge, MA, 2011.

Oelker AM, Griffith LG, Hammond PT. "Click" grafted polypeptides: Structural macromers with tunable conformation. Poster presentation, American Chemical Society National Meeting, Anaheim, CA, 2011.

Oelker AM, Griffith LG, Hammond PT. Structural polypeptide macromers with tunable secondary structure as components of a modular synthetic ECM. Poster presentation, Materials Research Society National Meeting, Boston, MA, 2010.

Oelker AM, Wathier M, Grinstaff MW. Hybrid poly(2-hydroxyethyl methacrylate) and dendritic polymer hydrogels as scaffolds for corneal tissue engineering. Oral presentation, American Chemical Society National Meeting, Philadelphia, PA, 2008.

Oelker AM, Grinstaff MW. Epithelialization of collagen-modified poly(2-hydroxyethyl methacrylate)

hydrogels for corneal implants. Poster presentation, Association for Research in Vision and Ophthalmology Annual Meeting, Fort Lauderdale, FL, 2008.

Oelker AM, Grinstaff MW. Characterization of collagen-modified poly(2-hydroxyethyl methacrylate) hydrogels for use as corneal implants. Poster presentation, American Chemical Society National Meeting, Boston, MA, 2007.

Oelker AM, Grinstaff MW. Characterization of poly(2-Hydroxyethyl Methacrylate) hydrogels for corneal grafts. Oral presentation, Society for Biomaterials National Meeting, Chicago, IL, 2007.

Oelker AM, Wathier M, Grinstaff MW. Evaluation of lysine dendrons for self-crosslinking hydrogels. Poster presentation, American Chemical Society National Meeting, Philadelphia, PA, 2004.