Kathleen S. Toohey

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EDUCATION

Ph.D. Theoretical & Applied Mechanics, May 2007
Advisor: Nancy R. Sottos, Thesis "Microvascular Networks for Continuous Self-Healing Materials"
University of Illinois at Urbana-Champaign, IL

M.S. Mechanical Engineering, August 2002
Advisor: Thierry Blanchet, Thesis "Effect of the Aging Environment on the Oxidation, Crosslinking and Material Properties of Irradiated UHMWPE"
Rensselaer Polytechnic Institute, Troy, NY

B.S. Mechanical Engineering, *magna cum laude* May 2000
Rensselaer Polytechnic Institute, Troy, NY

RESEARCH EXPERIENCE

Post-doctoral Research Associate September 2007 - present
Advisor: Dr. Michael F. Insana, Topic: Hydrogel Modeling and Characterization
Bioengineering, University of Illinois

- Developed analytical models to describe the viscoelastic behavior of hydrogels.
- Conducted rheological tests on hydrogels to quantify material behavior.
- Developed an indentation test protocol to determine a material modulus comparable to rheometer measurements.
- Worked with graduate students to give assistance with research projects.

Post-doctoral Research Associate May - August 2007
Advisor: Dr. Nancy R. Sottos, Topic: Microvascular Self-Healing Materials
Beckman Institute, University of Illinois

- Explored manufacturing techniques for creating multiple microvascular networks in a single substrate.
- Conducted heal tests on multi-network self-healing coatings using two-part epoxy healing chemistries.
- Improved the delivery and mixing of two-part healing chemistry to cracks in coatings.

Research Assistant August 2003 - May 2007
Advisor: Dr. Nancy R. Sottos, Topic: Self-Healing Materials Systems
TAM Department, University of Illinois

- Created a new type of fracture specimen to demonstrate the healing capabilities of a microvascular-based self-healing system.
- Designed and manufactured bend test specimens with coatings to study continuous self-healing.
- Developed a test method using an acoustic emission sensor for the detection of cracks in a coating.
- Expanded the microvascular specimen to include multiple, independent networks in a single specimen.
- Conducted fractography studies of the healed coatings to verify healing and to study the healing process in the crack plane.

Research Assistant May 2001 - June 2002
Advisor: Dr. Terry Blanchet, Topic: Biomaterial Characterization
MANE Department, Rensselaer Polytechnic Institute

- Conducted uniaxial tension tests on irradiated UHMWPE to characterize material properties.
- Utilized FT-IR microscopy to determine amount of oxidation.
- Tested polymer samples in Xylene to quantify gel content and cross-linking.
- Assisted with *in situ* pin-on-disk tests of UHMWPE on CoCr countersurfaces to analyze wear rates.

TEACHING EXPERIENCE

Instructor, Biomaterials January 2009 - present
Bioengineering Department, University of Illinois

- Organized lectures and created syllabus for senior level course.
- Worked with department faculty and staff to meet ABET requirements.
- Wrote homework assignments and quizzes throughout the semester.
- Designed a final project to apply lessons to real engineering problems.

Instructor, Mechanics of Materials May - August 2003
TAM Department, University of Illinois

- Created daily lesson plans and syllabus for a summer course.
- Graded homeworks, quizzes and exams and assigned final grades.
- Held office hours and final review session to assist students with homework problems and studying.
- Maintained course website with current schedule and homework and quiz solutions.

Teaching Assistant, Mechanical Systems Laboratory August 2000 - December 2001
MANE Department, Rensselaer Polytechnic Institute

- Lectured and guided class through experiments including tensile testing, beam bending, and friction and wear tests on desk-top Instron machines.
- Assisted in grading of exams and lab reports throughout semester.
- Held office hours to further assist students with class work.
- Prepared supplies and equipment before class and conducted a preliminary trial of the weekly experiments.

Master Teaching Fellow May - August 2001
Graduate School, Rensselaer Polytechnic Institute

- Lead small group sessions to train incoming graduate teaching assistants.
- Assisted with planning, preparation and organization of large group events.

UNIVERSITY SERVICE

Graduate Mentor, College of Engineering, University of Illinois 2008
Mentored undergraduates, both freshmen and upperclass, in the Bioengineering program.

State Science Fair Judge, Junior Academy of the Sciences 2007
Volunteered to judge 7th and 8th grade projects in Behavioral Sciences.

Graduate Mentor, College of Engineering, University of Illinois 2006
Served as graduate student mentor to undergraduates in Engineering Mechanics degree program.

Graduate Student Advisory Committee, TAM Department, University of Illinois 2003 - 2006
Represented graduate students' concerns to department faculty.

Undergraduate Research Adviser, TAM Department, University of Illinois 2004 - 2006
Guided students in Research Experience for Undergraduates summer program and for semesterly research projects.

Guest Lecturer, TAM Department, University of Illinois, Behavior of Materials Class 2004

WYSE session leader, TAM Department, University of Illinois 2003 - 2004
Taught high school students about materials behavior and lead basic experiments.

Physics Van member, College of Engineering, University of Illinois 2003
Led and assisted with demonstrations of basic physics principals to grade school students.

Engineering Advocates member, College of Engineering, University of Illinois 2003
Directed girl scout troops in hand-on activities in various engineering disciplines.

Design Your Future Day, School of Engineering, Rensselaer Polytechnic Institute 1998 - 2002
Organized and helped run event to introduce high school girls to engineering and science fields.

PEER-REVIEWED PUBLICATIONS

Hansen, C.J., Wu, W., **Toohey, K.S.**, Sottos, N.R., White, S.R., and Lewis, J.A., Self-healing materials with interpenetrating microvascular networks, submitted to *Advanced Materials* (2009).

Toohey, K.S., Hansen, C.J., Sottos, N.R., Lewis, J.A., and White, S.R., Delivery of two-part self-healing chemistry via microvascular networks, printed online *Advanced Functional Materials*, DOI 10.1002/adfm.200801824 (2009).

Orescanin, M., **Toohey, K.S.**, and Insana, M.F., Material Properties From Acoustic Radiation Force Step Response, accepted to *Journal of the Acoustic Society of America* (2009).

Toohey, K.S., Sottos, N.R., and White, S.R., Development of a protocol to assess self-healing with microvascular networks, printed online *Experimental Mechanics*, DOI 10.1007/s11340-008-9176-7 (2008).

Toohey, K.S., Sottos, N.R., Lewis, J.A., Moore, J.S. and White, S.R., Self-healing materials with microvascular networks, *Nature Materials* 6(8): 581-585 (2007).

Toohey, K.S., Blanchet, T.A., and Heckelman, D.D., Effect of Accelerated Aging Conditions on Resultant Depth-Dependent Oxidation and Wear Resistance of UHMWPE Joint Replacement Bearing Materials, *Wear* 255: 1076-1084 (2003).

CONFERENCE PROCEEDINGS, ABSTRACTS AND OTHER PUBLICATIONS

Toohey, K.S., Orescanin M., Insana, M.F., Determining materials properties from an oscillating sphere in viscoelastic media, *Abstract Proceedings of the Society of Engineering Science 45th Annual Technical Meeting*, Champaign, IL, October 12-15 (2008).

Orescanin M., **Toohey, K.S.**, Insana, M.F., Bio-Material Evaluation Using Ultrasound Radiation Force, *Abstract Proceedings of the Society of Engineering Science 45th Annual Technical Meeting*, Champaign, IL, October 12-15 (2008).

Hansen C.J., **Toohey, K.S.**, Wu, W., Lewis, J.A., Self-Healing Materials with Interpenetrating Microvascular Networks, *Abstract Proceedings of the Society of Engineering Science 45th Annual Technical Meeting*, Champaign, IL, October 12-15 (2008).

Toohey, K.S., Microvascular Networks for Continuous Self-Healing Materials, PhD Dissertation, Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, Urbana, IL (2007).

Toohey, K.S., White S.R., Lewis J.A., Sottos N.R., Continuous self-healing polymers, *Proceedings of the First International Conference on Self-Healing Materials*, Noordwijk, The Netherlands, April 18-20 (2007).

Toohey, K.S., White, S.R., and Sottos, N.R., Self-Healing Polymer Coatings, *Proceedings of the Society for Experimental Mechanics Annual Meeting on Experimental and Applied Mechanics*, CD-ROM, Portland, OR, June 6-9 (2005).

Shipton L.A., **Toohey, K.S.**, White S.R., Sottos N.R., Analysis of Fluid and Thermal Flow throughout a Three-Dimensional Microvascular Network due to Disproportional Heating, *TAM Report* No. 1056 (2004).

White, S.R., Sottos N.R., and **Toohey, K.S.**, Autonomic Healing of Polymer Coatings, *Proceedings of the European Conference on Coatings*, CD-ROM Berlin, Germany, June 7-9 (2004).

Toohey, K.S., Effect of the Aging Environment on the Oxidation, Crosslinking and Material Properties of Irradiated UHMWPE, M.S. Thesis, Department of Mechanical, Aerospace and Nuclear Engineering, Rensselaer Polytechnic Institute, Troy, NY (2002).

POPULAR PRESS

Following publication of "Self-Healing Materials with Microvascular Networks" in Nature Materials on June 10, 2007, press coverage appeared in: *News Bureau, University of Illinois at Urbana-Champaign, Technology Review, HULIQ.com, Chemistry World, DailyIndia.com, Innovations Report, Science Daily, ScientistLive.com, Science Friday, MedIndia, CCNews, CBC News, Mobile Magazine, New Kerala, Medical News Today, Exduco, News-Medical, Wired, The New York Times, The Independent, Mathaba News Agency, Montreal Gazette, Chemical & Engineering News, Medical News Today, The Engineer, St. Louis Dispatch, The News-Gazette.*

TECHNICAL TALKS

"Determining Materials Properties from an Oscillating Sphere in Viscoelastic Media" Society for Engineering Science Annual Technical Meeting, October 12-15 2008.

"Microvascular Networks for Continuous Self-Healing Coatings" First International Conference on Self-Healing, April 18-20, 2007.

"Microvascular Networks for Self-Healing" ASME International Mechanical Engineering Congress & Exposition, November 5-10, 2006.

"Self-Healing Materials with Microvascular Networks" Beckman Institute Graduate Student Seminar Series, September 6, 2006.

"Self-Healing Polymer Coatings" Society for Experimental Mechanics Annual Meeting, June 6-9, 2005.

"Self-Healing Polymer Coatings" Department of Theoretical and Applied Mechanics Seminar, November 11, 2004.

HONORS

TAM Merit Award, Theoretical & Applied Mechanics, University of Illinois	2006
Beckman Institute Graduate Fellow, Beckman Institute, University of Illinois	2005 - 2006
Mavis Scholarship, College of Engineering, University of Illinois	2005
J.O. Smith Teaching Award, Theoretical & Applied Mechanics, University of Illinois	2005
SURGE Fellowship, College of Engineering, University of Illinois	2002 - 2006
Carver Fellowship, College of Engineering, University of Illinois	2002
Rensselaer Founders Award, Rensselaer Polytechnic Institute	2001
Nancy Fitzroy Fellowship, Rensselaer Polytechnic Institute	2000