

Zeynep Ilke Kalcioglu

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EDUCATION

Massachusetts Institute of Technology (MIT)

Cambridge, MA

Candidate for Ph.D., Materials Science and Engineering, GPA: 4.7/5

September 2012

Thesis : Mechanical Behavior of Tissue Simulant Gels and Soft Tissues Under Extreme Loading Conditions

Thesis advisor: Krystyn J. Van Vliet

Sabanci University

Istanbul, Turkey

Bachelor of Science, Materials Science and Engineering, GPA: 3.92/4

June 2006

EXPERIENCE

Massachusetts Institute of Technology

Cambridge, MA

Research Assistant, Department of Materials Science and Engineering

September 2006-Present

Investigated and characterized the multiscale mechanical properties of polymer nanocomposites, elastomers, hydrogels, soft tissues and tissue surrogate materials under low and/or high loading rates.

- Worked in collaboration with U.S Army Research Laboratories in designing tissue surrogate gels to recapitulate soft tissue responses under extreme loading conditions. Studied structure-property relationships and enabled optimization of tissue-surrogates that best represent and model soft tissue mechanical responses.
- Synthesized hydrogels and investigated the elastic and transport (diffusivity) properties via indentation.
- Conducted high-throughput mechanical experiments on polymer libraries consisting of over 400 different polymers and hydrogels and identified the effect of elastic properties of bulk material substrata on cell differentiation and motility in collaboration with Langer and Griffith Labs at MIT.
- Identified a correlation between the applied voltage and change in stiffness of stimuli responsive polymeric nanocomposites via instrumented indentation in collaboration with Hammond Lab at MIT.
- Developed a fluid cell for a commercial instrumented indenter for testing the mechanical properties of materials in fully hydrated environments in collaboration with Micro Materials Ltd, UK.
- Worked with DuPont in the initiation of a study for designing scratch resistant nanocomposites that resulted in a publication and trained a PostDoc on the operation of equipments.
- Collaborated with Schlumberger in designing swellable elastomeric composites for oil industry and investigated the correlation between structure and mechanical properties at the micro and nano-scale.
- Supervised projects of 2 undergraduate students and trained 2 undergraduate/2 graduate students/ 2 PostDocs on the operation of equipments.

Sabanci University

Istanbul, Turkey

Undergraduate Researcher, Department of Materials Science and Engineering

September 2005-July 2006

- Processed fibers of indium doped zinc oxide, investigated grain growth of the fibers; characterized the structure under SEM.

Max Planck für Festkörperforschung

Stuttgart, GERMANY

Student Intern

June 2005-September 2005

- Acquired Raman maps of carbon nanotubes which were partly covered in gold layers using a confocal laser microscope and a Raman spectrometer. Investigated the enhancement of the Raman signal under the gold electrolytes.

Zeynep Ilke Kalcioğlu

SKILLS

Analytical: Instrumented Indenter, AFM, Instron, Rheometer, DSC/TGA, Profilometer, SEM, Raman Spectroscopy, Confocal Microscope

Computer: MatLab, Mathematica, MS Office, Igor, Origin

Language: English (fluent), Turkish (native), Spanish (basic), German (basic)

PRESENTATIONS

- “Multiscale Poroelastic Characterization of Hydrated Hydrogels via Indentation” **Kalcioğlu Z.I.**, Mahmoodian R., Hu Y., Suo Z., and Van Vliet K.J., 2011 MRS, Talk
- “Dynamic Impact Indentation of Soft Tissues and Tissue Surrogate Gels at Small Length Scales” **Kalcioğlu Z.I.**, Qu M., Strawhecker K.E., VanLandingham M.R., and Van Vliet, K.J., 2011 SES, Talk
- “Analysis of Hydrated Biological Tissues and Tissue Surrogate Gels Under Concentrated Impact Loading” **Kalcioğlu Z.I.**, Qu M., Strawhecker K.E., VanLandingham M.R., and Van Vliet, K.J., 2010 Society of Rheology, Talk
- “The Microscale Mechanical Characterization of Swollen PEG Hydrogels via Instrumented Indentation” **Kalcioğlu Z.I.**, Peyton S., Lauffenburger D.L., Griffith L.G., and Van Vliet, K.J., 2009 Materials Research Society, Talk
- “Multiscale Characterization of Relaxation Times of Tissue Surrogate Gels and Hydrated Soft Tissues” **Kalcioğlu Z.I.**, Qu M., Strawhecker K.E., VanLandingham M.R., and Van Vliet, K.J., 2010 27th Army Science Conference, Poster
- “Probing Mechanical Properties of Fully Hydrated, Electrochemically Stimulated Polymer Nanocomposites via Instrumented Nanoindentation” **Kalcioğlu Z.I.**, Schmidt, D.J., Cebeci, F.C., Ortiz, C., Hammond, P.T., and Van Vliet, K.J., 2009 ECI, Poster

PUBLICATIONS

- **Kalcioğlu Z.I.**, Mahmoodian R., Mrozek R., VanLandingham M.R., Lehnart J., and Van Vliet, K.J., “Tunable mechanical behavior of synthetic organogels as tissue simulants compared to biological tissue”, (in preparation).
- **Kalcioğlu Z.I.**, Mahmoodian R., Hu. Y., Suo Z., and Van Vliet K.J. “Multiscale poroelastic characterization of hydrated hydrogels via indentation”, *Soft Matter* 8 3393 (2012).
- **Kalcioğlu Z.I.**, Qu M., Strawhecker K.E., Shazly T., Edelman E., VanLandingham M.R., Smith J.F., and Van Vliet, K.J., “Dynamic impact indentation of hydrated biological tissues and tissue surrogate gels”, *Phil. Mag.* 91 1339 (2011).
- Peyton, S., **Kalcioğlu, Z.I.**, Runkle, A., Van Vliet, K.J., Lauffenburger, D.A. and Griffith, L.J., “Marrow-derived stem cell motility in 3D synthetic scaffold is governed by geometry along with adhesivity and stiffness,” *Biotech. and Bioeng.*, 108 1181 (2011).
- Mei, Y., Saha, K., Bogatyrev, S.R., Yang, J., Hook, A.L., **Kalcioğlu, Z.I.**, Cho, S., Mitalipova, M., Pyzocha, N., Rojas, F., Van Vliet, K.J., Davies, M.C., Alexander, M.R., Langer, R., Jaenisch, R. and Anderson, D.G. “Combinatorial development of biomaterials for clonal growth of human pluripotent stem cells,” *Nature Materials* 9 768 (2010).
- Shazly, T.M., Baker, A.B., Naber, J.R., **Kalcioğlu, Z.I.**, Van Vliet, K.J., and Edelman, E.R., “Augmentation of postswelling surgical sealant potential of adhesive hydrogels,” *J. Biomed. Mat. Res. A* 95A 1159 (2010).
- Schmidt, D.J., Cebeci, F.C., **Kalcioğlu, Z.I.**, Wyman, S.G., Ortiz, C., Van Vliet, K.J., and Hammond, P.T., “Electrochemically controlled swelling and mechanical properties of a polymer nanocomposite,” *ACS Nano*. 3 2207 (2009).
- Constantinides, G., **Kalcioğlu, Z.I.**, McFarland, M., Smith, J.F., and Van Vliet, K.J., “Probing mechanical properties of fully hydrated gels and biological tissues,” *J. Biomechanics*. 41 3285 (2008).