

Timothy J. Keenan, Ph.D.

CONTACT INFORMATION

Alfred University
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CURRENT APPOINTMENTS

ASSISTANT PROFESSOR OF BIOMATERIALS ENGINEERING

Alfred University
Alfred, NY
August 2018 – Present

Research Interests: Synthetic biomaterials design (hard & soft tissues), Glass microsphere/hollowsphere and fiber development (various applications), Anti-microbial materials/coatings development (medical and consumer products), Additive manufacturing of biomaterials (tissue regeneration/replacement applications), Design/utilization of recyclable materials.

Courses Instructed:

CEMS 468/568: Biomedical Materials

CEMS 214: Structure & Properties of Materials

PREVIOUS APPOINTMENTS

CENTER FOR ADVANCED CERAMIC TECHNOLOGY (CACT) PROJECT MANAGER

Alfred University
Alfred, NY
May 2016 – August 2018

Since joining the Center for Advanced Ceramic Technology (CACT) at Alfred University, this position has evolved to allow me to contribute to both the University and our industry partners in a variety of ways. Along with management of all of the analytical testing services offered by CACT through the University, the responsibilities of this position have grown to include liaising between industry contacts, Alfred University faculty, and the University's accounting and legal departments; negotiation, development, and execution of both analytical and research project statements of work and budgets; business development through manufacturing site visits and conference attendance; and report writing for submission to our funding agency, NYSTAR. Additionally, this role has also evolved to include the management of industrial projects and management of research assistants as a principal investigator (P.I.).

VISITING ASSISTANT PROFESSOR OF MATERIALS SCIENCE & ENGINEERING

Alfred University

Alfred, NY

August 2017 – May 2018

In the role of Visiting Assistant Professor of Materials Science & Engineering, I have been provided the opportunity to contribute to the mission statement of my alma mater, which focuses on providing excellence in both teaching and mentoring of undergraduate and graduate students, in both a classroom, and laboratory setting. In my first year as a visiting assistant professor, I have been tasked with teaching a cross-listed senior/graduate-level course investigating the evolution of biomedical materials, and the knowledge required for scientists and engineers to continue improving materials in medicine. In addition to teaching, this position has afforded me the opportunity to continue conducting research into bone regenerative materials, and my position within the CACT has provided me with even further opportunity to lead both analytical and research projects focused on some of my additional research interests, including *Glass Science* for industrial sealant applications, *Bioactive Glass and Ceramics* for medical bone void filling applications with medical industry partners, and *Biomedical Polymers and Composites* for the controlled release of anti-bacterial and anti-fungal agents.

ADJUNCT PROFESSOR OF MATERIALS SCIENCE & ENGINEERING

Alfred University

Alfred, NY

August 2016 – May 2017

In my one year as an Adjunct Professor of Materials Science & Engineering, I was asked to teach an entry level first-year course based on introducing students to the basic principles and laboratory skills associated with the field of materials science. In addition, I also instructed a second-year core engineering course focused on introducing students to the various levels of material structure, from sub-atomic all the way through macroscopic, and relating the characteristics of these various structural levels to macroscopic properties exhibited by materials, such as thermal, mechanical, electrical, optical, magnetic, and bioactive properties.

POSTDOCTORAL RESEARCH ASSISTANT

Alfred University

Alfred, NY

February 2016 – May 2016

Prior to being hired within the CACT and instructing classes, I spent three months conducting various analytical tests as a postdoctoral research assistant for industrial projects with Dr. Matthew Hall. Analytical tests included particle size analysis (PSA), scanning electron microscopy and energy-dispersive x-ray spectroscopy (SEM/EDS), dilatometry, and inductively-coupled plasma optical emission spectroscopy (ICP-OES).

GRADUATE RESEARCH ASSISTANT

Alfred University

Alfred, NY

August 2010 – February 2016

Throughout my time in graduate school, I was funded by several different industrial partners as a graduate research assistant. The duties of this position included the conducting of various analytical tests, such as SEM/EDS and Optical Microscopy, the generation of bi-weekly reports, visits to manufacturing sites for site tours and conferences, and the generation of final reports upon the conclusion of projects. Additionally, this position afforded me the opportunity to develop materials and processes for corrosion-resistant applications with one specific company, and this work has now been translated into a new product line for that company, and I am listed as a co-inventor on their patent for this process. Throughout my six years as a graduate research assistant, I was fortunate to have the opportunity to work with a small semiconductor company, a large medical vial production company, and a dental materials company.

TEACHING ASSISTANT

Alfred University

Alfred, NY

August 2013 – December 2015

In addition to functioning as a research assistant throughout graduate school, I was also employed as a teaching assistant, helping with both “Computer-Aided Design (CAD)” and “Introduction to Mechanical Engineering”. For the CAD course, duties mainly included assisting students in the computer lab during lessons and grading assignments, while I was actually entrusted with instructing the “Introduction to Mechanical Engineering” course, lecturing two groups of 20 students 2 hours per week, while also designing and instructing the laboratory activities, and grading the assignments and final projects. These were great first experiences within the field of academic instruction, and they helped shape my passion for teaching which I am now exploring even further as an adjunct instructor.

EDUCATION

Ph.D., DOCTORATE OF PHILOSOPHY

Materials Science & Engineering

Alfred University

September 2012 – February 2016

Advisors: Dr. Anthony W. Wren, Dr. Matthew M. Hall

Thesis: “Dextran-Based Hydrogels for *In Situ* Delivery of Gallium-Containing Bioactive Glasses”

M.Sc., MASTERS OF SCIENCE

Materials Science & Engineering

Alfred University

August 2010 – September 2012

Advisor: Dr. Matthew M. Hall

Thesis: “Characterization of Ga₂O₃-Na₂O-CaO-ZnO-SiO₂ Bioactive Glasses”

B.Sc., BACHELORS OF SCIENCE

Biomedical Materials Engineering & Science

Alfred University

August 2006 – May 2010

Advisor: Dr. Matthew M. Hall

Thesis: “Composition-Based Predicting of Bioactive Glasses Through Regression Modeling”

PROFESSIONAL
CERTIFICATIONS

SUPERVISORY SKILLS FOR TECHNICAL MANAGERS (2017)

PROFESSIONAL
AFFILIATIONS

AMERICAN CERAMIC SOCIETY (ACerS)

GRADUATE
COURSES
(INSTRUCTED)

CEMS 568: BIOMEDICAL MATERIALS

- All engineering majors
- Lecture (3 Credits)

UNDERGRADUATE
COURSES
(INSTRUCTED)

CEMS 468: BIOMEDICAL MATERIALS

- All engineering majors (required for BME majors)
- Lecture (3 Credits)

CEMS 216: BONDING & STRUCTURE OF MATERIALS

- All engineering majors (required for all materials majors and minors)
- Lecture (3 Credits)

CEMS 214: STRUCTURE & PROPERTIES OF MATERIALS

- All engineering majors (required for all engineering majors)
- Lecture (3 Credits)

ENGR 115: EXPLORATIONS IN MATERIALS SCIENCE

- All engineering majors
- Lecture + Laboratory (1 Credit)

SCHOLARLY
SERVICE

JOURNAL REVIEWING

- Acta Biomaterialia
- Carbohydrate Polymers
- Journal of Biomaterials Applications
- The Open Dentistry Journal

JOURNAL EDITING

- Cient Periodique – CPQ Cancer (Editor)
- Juniper Online Journal Material Science (Associate Editor)

SCIENTIFIC
SKILLS

LABORATORY PROCESSES

- Glass melting, grinding, cutting, polishing, staining, and annealing
- Polymer synthesis and functionalization
- Hydrogel and glass-hydrogel composite synthesis
- Glass polyalkenoate cement (GPC) synthesis
- Dip-coating
- Cell culture (Fibroblasts, Osteoblasts, Osteosarcoma, Myeloma, Schwann Cells)
- Bacterial and fungal testing (agar diffusion, broth dilution)
- Bone diffusion testing
- Hydrofluoric (HF) acid cleaning

INSTRUMENTATION AND INTERPRETATION

- Scanning electron microscopy (SEM) and Energy-Dispersive X-ray Spectroscopy (EDS)
- Inductively-Coupled Plasma Optical Emission Spectroscopy (ICP-OES)
- Particle Size Analysis (PSA)
- Accelerated Surface Area and Porosimetry Analysis (ASAP)
- Powder X-ray Diffraction (XRD)
- Dynamic Light Scattering (DLS)
- Thermal Analysis (TGA-DTA-DSC)
- Raman Spectroscopy
- Magic-Angle Spinning Nuclear Magnetic Resonance (MAS-NMR)
- X-ray Photoelectron Spectroscopy (XPS)
- Dilatometry
- Laser Profilometry
- Cell Viability Analysis
- 96-well Plate Readers
- Bacterial Counters
- Freeze Driers
- Glove Boxes
- Acetylene Torches
- Compression, Tension Testing (Instron)
- S.O.P. Authorship

COMPUTER SKILLS

- Advanced knowledge of Origin Pro, including statistical analysis (ANOVA)
- Advanced Knowledge of Microsoft Office
- Advanced knowledge of GIMP Image Processing Software
- Advanced knowledge of EndNote
- Experience in Adobe Creative Cloud
- Experience in SolidWorks

RESEARCH PUBLICATIONS (PUBLISHED)

1. **Keenan T.J.** and Wren A.W., “Chapter: Ionic Dissolution from Bioceramic-Based Medical Materials” in *Glass-Ceramics: Properties, Applications and Technology* (ISBN: 978-1-53614-338-6), Nova Science Publishers, Inc., New York, NY, USA, p. 155-218 (2018).
2. S.S. Chon, L. Piraino, S. Mokhtari, E.A. Krull, A. Coughlan, Y. Gong, N.P. Mellott, **T. J. Keenan**, A.W. Wren, “Synthesis, Characterization & Solubility Analysis of Amorphous SiO₂-CaO-Na₂O-P₂O₅ Scaffolds for Hard Tissue Repair”, *Journal of Non-Crystalline Solids*, 490, p.1-12 (2018).
3. L.M. Placek, **T.J. Keenan**, A. Coughlan, A.W. Wren, “Investigating the Effect of Glass Ion Release on the Cytocompatibility, Antibacterial Efficacy and Antioxidant Activity of Y₂O₃/CeO₂ Doped SiO₂-SrO-Na₂O Glasses”, *Biomedical Glasses*, 4, p. 32-44 (2018).
4. **Keenan T.J.**, Placek L.M., Hall M.M., and Wren A.W., “Anti-Bacterial and Anti-Fungal Potential of Ga-Bioactive Glass and Ga-Bioactive Glass/Polymeric Hydrogel Composites” *Journal of Biomedical Materials Research Part B: Applied Biomaterials*, 105(5), p.1102-1113 (2017).
5. **Keenan T.J.**, Placek L.M., Coughlan A., Hall M.M., Wren A.W., “Structural Characterization and Anti-Cancerous Potential of Ga-Bioactive Glass/Polymeric Hydrogel Composites” *Carbohydrate Polymers*, 153, p. 482-491 (2016).
6. **Keenan T.J.**, Placek L.M., Keenan N.L., Hall M.M., and Wren A.W., “Synthesis, Characterization, and *in vitro* Cytocompatibility of Ga-Bioactive Glass/Polymeric Hydrogel Composites” *Journal of Biomaterials Applications*, 31(4), p.553-67 (2016).
7. **Keenan T.J.**, Placek L.M., McGinnity T.L., Towler M.R., Hall M.M., and Wren A.W., “Relating Ion Release and pH to *in vitro* Cell Viability for Gallium-Inclusive Bioactive Glasses”, *Journal of Materials Science*, 51(2), p. 1107-1120 (2016).
8. Placek L.M., **Keenan T.J.**, Laffir F., Coughlan A., and Wren A.W., “Characterization of Y₂O₃ and CeO₂ Doped SiO₂-SrO-Na₂O Glasses”, *Journal of Biomedical Glasses*, 1, p.159-172 (2015).
9. Placek L.M., **Keenan T.J.**, Li Y., Yatongchai C., Pradhan D., Boyd D., Mellott N.P., and Wren A.W., “Investigating the Effect of TiO₂ on the Structure and Biocompatibility of Bioactive Glass”, *Journal of Biomedical Materials Research Part B: Applied Biomaterials* (2015).
10. Wren A.W., Hassanzadeh P., Placek L.M., **Keenan T.J.**, Coughlan A., Boutelle L.R., and Towler M.R., “Silver Nanoparticle Coated Bioactive Glasses – Composites with Dex/CMC Hydrogels: Characterization, Solubility, and In Vitro Biological Studies”, *Macromolecular Bioscience*, 15(3), p.1146-1158 (2015).
11. Alhalawani A.M.F., Rodriguez O., Curran D.J., Co R., Kiernan S., Arshad S., **Keenan T.J.**, Wren A.W., Crasto G., Peel S.A.F., and Towler M.R., “A Glass Polyalkenoate Cement Carrier for Bone Morphogenetic Proteins”, *Journal of Materials Science: Materials in Medicine*, 26(3), p. 1-9 (2015).
12. Wren A.W., **Keenan T.**, Coughlan A., Laffir F.R., Boyd D., Towler M.R., and Hall M.M., “Characterisation of Ga₂O₃-Na₂O-CaO-ZnO-SiO₂ Bioactive Glasses”, *Journal of Materials Science*, 48(11), p.3999-4007 (2013).
13. Kucko N.W., **Keenan T.**, Coughlan A., and Hall M.M., “Fill Volume as an Indicator of Surface Heterogeneity in Glass Vials For Parenteral Packaging”, *Journal of Pharmaceutical Sciences*, 102(6), p.1690-1695 (2013).

PATENTS

1. U.S. Provisional Patent Application No. 62/412,299, “Devitrification Resistant Compositions”, Filed on: 10/25/2016 by Conax Technologies LLC. Co-Inventors: **T.J. Keenan**, L.M. Placek, and M. M. Hall.
2. U.S. Provisional Patent Application No. 62/364,711, “Devitrification Resistant Coating Compositions”, Filed on: 7/20/2016 by Conax Technologies LLC. Co-Inventors: **T.J. Keenan**, L.M. Placek, and M.M. Hall.

LICENSING AGREEMENTS

1. Licensing Agreement No. 2835669.1. Entered on 1/31/2017 between Alfred University, 2 Pine St, Alfred, NY 14802 and Conax Technologies LLC, 2300 Walden Ave, Buffalo, NY 14225.

CONFERENCE PROCEEDINGS

1. **Keenan T.J.**, Hall M.M., Wren A.W., “Ga-Containing Bioactive Glass/Dextran-CMC Hydrogel Composites: Ion Release and Cell Viability”, *41st Annual Northeast Bioengineering Conference (NEBEC)*, IEEE (2015).
2. **Keenan T.J.**, Wren A.W., and Hall M.M., “Dextran-Based Hydrogels for *in-situ* Delivery of Gallium-Containing Bioactive Glasses”, *40th Annual Northeast Bioengineering Conference (NEBEC)*, IEEE (2014).
3. **Keenan T.J.**, Wren A.W., Coughlan A., Towler M.R., and Hall M.M., "Relating pH and Ion Release from Ga₂O₃-Na₂O-CaO-ZnO-SiO₂ Bioactive Glasses", *39th Annual Northeast Bioengineering Conference (NEBEC)*, IEEE (2013).
4. **Keenan T.J.**, Wren A.W., Coughlan A., Hall M.M., and Towler M.R., “The Structural Characterization of Ga₂O₃-Na₂O-CaO-ZnO-SiO₂ Bioactive Glasses”, *38th Annual Northeast Bioengineering Conference (NEBEC)*, IEEE (2012).

RESEARCH PUBLICATIONS (PENDING)

- 1.