

Krishna C. R. Kolan

Post-doctoral Fellow

Department of Mechanical and Aerospace Engineering

Missouri University of Science and Technology

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EDUCATION

Missouri University of Science and Technology

Rolla, MO

Ph.D., Mechanical Engineering

2015

M.S., Mechanical Engineering

2011

Dissertation: “Selective laser sintering of bioactive glass scaffolds and their biological assessment for bone repair”

Advisor: Dr. Ming C. Leu

Jawaharlal Nehru Technology University

Hyderabad, India

B.Tech., Mechanical Engineering

2006

RESEARCH INTERESTS

- Biofabrication and Additive Manufacturing (AM) for biomedical applications
- Bioceramics and tissue engineering
- Advanced manufacturing and materials processing
- AM of ultra-high temperature ceramics and composites

PROFESSIONAL EXPERIENCE

Postdoctoral Fellow

2015 – present

Innovative Additive Manufacturing Lab, Missouri S&T, Rolla, MO

Advisor: Ming C. Leu

- Developed a solvent-based 3D bioprinting technique to fabricate highly bioactive polymer bioglass composite scaffolds for bone repair
- Bioprinting of stem cell-laden hydrogel and polymer glass composite scaffolds for 3D bone models and highly vascular tissue engineering applications

Graduate Research Assistant

2008 – 2015

Innovative Additive Manufacturing Lab, Missouri S&T, Rolla, MO

Advisor: Ming C. Leu

- Developed a technique to manufacture strong and highly porous bioactive glass implants using the selective laser sintering process
- Investigated the effects of porosity, pore shape, and processing conditions on mechanical properties of the scaffolds
- Studied the effects of scaffold pore shape on the growth and proliferation of bone cells
- Evaluated the 3D printed borate glass scaffolds for bone repair in a rat calvarial defect
- Proposed a new Ti fiber reinforced bioactive glass composite system and fabricated scaffolds with improved toughness for a load-bearing bone
- Investigated the fabrication of complex 3D parts with zirconium diboride ceramic using the selective laser sintering process

Project Engineer**2006 – 2007**

Vehicle Engineering, Wipro Technologies, Hyderabad, India

- Lead and coordinated small project teams in modeling assemblies and sub-assemblies for finite element analysis for a major automobile client based in France
- Implemented pilot projects in modeling exhaust lines and trims for safety analysis
- Worked on redesigning and modeling the interiors of a four seater, six seater, and light commercial vehicles for CFD analysis

Production Intern**Summer 2005**

Coca-Cola Beverages Pvt. Ltd., Hyderabad, India

- Optimized the lubricant consumption in one of the production lines of the bottling plant
- Increased the filler efficiency by reducing the number of bottle rejections in the line

TEACHING AND MENTORING EXPERIENCE**Graduate Teaching Assistant****2008 – 2013**

Mechanical Engineering, Missouri S&T, Rolla, MO

Courses taught:

CE-2211	Materials Testing Laboratory (sections of >20 students)	Fall 2008, 2009, Spring 2010
ME-5763	Principles and Practice of CAD (class of >35 students)	Fall of 2010, 2012, 2013
ME-4840	Mechanical Instrumentation (section of >10 students)	Spring 2011

- Trained students to use materials testing equipment (UTMs, hardness testing, torsion testing, pressure vessels, and data acquisition)
- Lectured on-campus and distance student sections and taught the basics of CAD software
- Trained students in using CAD software (Siemens NX, Solidworks, and PTC Creo)
- Prepared software tutorials, lab handouts, designed and graded student projects

Research Mentor**2011 – present**

Innovative Additive Manufacturing Lab, Missouri S&T, Rolla, MO

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|------------------------------------|---|----------------|
| • Dr. Yong Liu (visiting scholar) | Software development for bioprinting | 2017 – present |
| • Jakeb Baldridge (senior – ChemE) | Bioprinting of stem cell-laden hydrogels | 2016 – present |
| • Jacob Boehm (senior – ME) | NC program compensation and verification | 2016 – present |
| • Caroline Murphy (grad – ME) | Bioprinting of polymer bioglass composite | 2015 – 2016 |
| • Albin Thomas (grad – ME) | Ti fiber reinforced bioglass scaffolds | 2012 – 2014 |
| • Taylor Comte (junior – BME) | Evaluation of borate glass scaffolds | Summer 2012 |
| • Kevin Wu (sophomore – ME) | SLS fabrication of bioglass scaffolds | Summer 2011 |

HONORS & AWARDS

- 2014 Best paper award – 25th International Solid Freeform Fabrication Symposium, Austin, TX
- 2014 Graduate teaching award – Mechanical Engineering, Missouri S&T (for Fall 2013)
- 2013 Best poster award – Intelligent systems center, Missouri S&T
- 2012 Travel grant award – ASME ISFA conference, St. Louis, MO
- 2011 Travel grant award – NSF CMMI conference, Atlanta, GA
- 2010 Best paper award – Intelligent systems center, Missouri S&T
- 2008 Chair scholarship – Mechanical Engineering, Missouri S&T
- 2004 Academic excellence award (sophomore year) – Vignan University (Rank: 1/420)

PUBLICATIONS

Google Scholar Profile: https://scholar.google.com/citations?user=_VUvU-sAAAAJ&hl=en

Journal papers

1. **Kolan K**, Leu M, Hilmas G, 2017. Effect of porosity and pore geometry of laser sintered bioactive glass scaffolds on mechanical properties. *under preparation*.
2. **Kolan K**, Thomas A, Huang Y-W, Leu M, 2017. In vitro assessment of titanium fiber reinforced 13-93 bioactive glass scaffolds for bone repair. *under preparation*.
3. **Kolan K**, Liu Y, Baldrige J, Murphy C, Semon J, Day D, Leu M, 2017. 3D bioprinting of cellularized scaffold made with polymer and bioactive borate glass. *under preparation*.
4. Murphy C, **Kolan K**, Li W, Semon J, Day D, Leu M, 2017. 3D bioprinting of stem cells and polymer/bioactive glass composite scaffolds for bone tissue engineering. *International Journal of Bioprinting* 3(1), pp. 1-11. (co-authored)
5. Thomas A, **Kolan K**, Leu M, Hilmas G, 2017. Freeform extrusion fabrication of titanium fiber reinforced 13-93 bioactive glass scaffolds, *Journal of the Mechanical Behavior of Biomedical Materials* 69, pp. 153-162.
6. **Kolan K**, Thomas A, Leu M, Hilmas G, 2015. In vitro assessment of laser sintered bioactive glass scaffolds with different pore geometries, *Rapid Prototyping Journal* 21(2), pp. 152–158.
7. **Kolan K**, Leu M, Hilmas G, Velez M, 2012. Effect of material, process parameters, and simulated body fluids on mechanical properties of 13-93 bioactive glass porous constructs made by selective laser sintering, *Journal of the Mechanical Behavior of Biomedical Materials* 13, pp. 14-24.
8. **Kolan K**, Leu M, Hilmas G, Brown R, Velez M, 2011. Fabrication of 13-93 bioactive glass scaffolds for bone tissue engineering using indirect selective laser sintering, *Biofabrication* 3 (2), 025004.

Conference Proceedings (peer reviewed)

1. **Kolan K**, Liu Y, Baldrige J, Murphy C, Semon J, Day D, Leu M, 2017. 3D bioprinting of solvent dissolved biopolymer glass composite and stem cell-laden hydrogel for tissue engineering. 3rd CIRP Conference on BioManufacturing, Chicago, IL. *Under review*.
2. Murphy C, **Kolan K**, Long M, Li W, Leu M, Semon J, Day D, 2016. 3D printing of a polymer bioactive glass composite for bone repair. 27th Annual International Solid Freeform Fabrication Symposium – An Additive Manufacturing Conference, Austin, TX, pp 1718-1731.
3. Thomas A, **Kolan K**, Leu M, Hilmas G, 2015. Freeform extrusion fabrication of titanium reinforced bioactive glass scaffolds. 26th Annual International Solid Freeform Fabrication Symposium – An Additive Manufacturing Conference, Austin, TX, pp 1688-1699.
4. **Kolan K**, Thomas A, Leu M, Hilmas G, 2014. In vitro assessment of laser sintered bioactive glass scaffolds with different pore geometries. 25th Annual International Solid Freeform Fabrication Symposium – An Additive Manufacturing Conference, Austin, TX, pp 1031-1041.
5. **Kolan K**, Leu M, Hilmas G, Comte T, 2013. Effect of architecture and porosity on mechanical properties of borate glass scaffolds made by selective laser sintering. 24th Annual International Solid Freeform Fabrication Symposium – An Additive Manufacturing Conference, Austin, TX, pp 816-826.
6. Velez M, Jung S, **Kolan K**, Leu M, Day D, Chu T-M, 2012. In vivo evaluation of 13-93 bioactive glass scaffolds made by selective laser sintering (SLS). In *Biomaterials Science – Processing, Properties, and Applications II: Ceramic Transactions* (eds Narayan R, Bose S, Bandyopadhyay A), 237, pp. 91-99.
7. **Kolan K**, Leu M, Hilmas G, Velez M, 2011. Effect of particle size, binder content, and heat treatment on mechanical properties of 13-93 bioactive glass scaffolds. 22nd Annual International

Solid Freeform Fabrication Symposium – An Additive Manufacturing Conference, Austin, TX, pp 523-535.

8. Velez M, **Kolan K**, Leu M, Hilmas G, Brown R, 2010. Selective laser sintering fabrication of 13-93 bioactive glass scaffolds. In Biomaterials Science – Processing, Properties, and Applications II: Ceramic Transactions (eds Narayan R, Bandyopadhyay A, Bose S), 228, pp. 185-193.
9. **Kolan K**, Leu M, Hilmas G, Velez M, 2010. Selective laser sintering of 13-93 bioactive glass. 21st Annual International Solid Freeform Fabrication Symposium – An Additive Manufacturing Conference, Austin, TX, pp 504-512.

Book Chapters

1. Leu M, **Kolan K**, Delli P, 2017. Digital design and fabrication in dentistry. In Biomaterials and prototyping applications in medicine (Second Edition). Springer, New York, pp 125-155. *under preparation*.

PROPOSAL WRITING EXPERIENCE

- Assisted advisor, Dr. Ming Leu, in writing complete grant proposals for National Science Foundation (NSF) and National Institutes of Health (NIH)
- NIH proposals – written for R15 Academic Research Enhancement (AREA) program and R21/R33 Exploratory/Developmental Research programs
- NSF proposals – SBIR/STTR program and Engineering of Biomedical Systems (EBMS) program under CBET

SERVICE ACTIVITIES

Publons Profile: <https://publons.com/author/1178651/krishna-kolan#profile>

Reviewed for

Biofabrication

Journal of Engineering in Medicine

Nanotechnology

Journal of Micromechanics and Microengineering

Additive Manufacturing

Rapid Prototyping

Solid Freeform Fabrication Symposium

Professional Associations

The American Society of Mechanical Engineers (ASME)

Biomedical Engineering Society (BMES)