

Maryam Tavafoghi

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EDUCATION

2010-2015: Ph.D. in Materials Engineering, McGill University, Montreal, Canada

2006-2008: M.Eng. in Mechanical Engineering (manufacturing), Nanyang Technological University (NTU), Singapore

2002-2006: B.S. in Materials Engineering (metallurgy), Shiraz University, Shiraz, Iran

AWARDS

2010-2013: McGill Engineering Doctoral Award (MEDA), McGill University, Canada

2011: Non-conference Travel Award (NCTA), McGill University, Canada

2011: Graduate Research Enhancement and Travel (GREAT) Award, McGill University, Canada

2010: Rio Tinto-Richard Evans Graduate Fellowship, McGill University, Canada

2006-2008: Graduate Studies Awards, NTU, Singapore

RESEARCH EXPERIENCE

2014-2015: Research assistant/postdoctoral fellow, Additive Design and Manufacturing Laboratory, Department of Mechanical Engineering, McGill University in collaboration with Materium Company, Montreal, Canada

- Developed a simple technique including, physical mixing followed by pellet pressing and sintering to prepare silica-doped hydroxyapatite scaffolds with improved bioactivity
- Evaluated biocompatibility and bone regeneration properties of silica-doped hydroxyapatite scaffolds through in-vitro hydroxyapatite precipitation and cell culturing experiments
- Worked on the 3D-printing (binder jetting technique) of silica-doped hydroxyapatite powder for bone/dentin implant applications
- Investigated the mechanical properties of HA scaffolds prepared by the conventional pellet pressing technique vs 3D-printing

2010-2014: PhD student, Biointerface Laboratory, Department of Materials Engineering, McGill University, Montreal, Canada

- Studied the mechanism of hydroxyapatite precipitation in the presence of amino acids present in bone extra cellular matrix (ECM) and non-collagenous proteins (NCPs)
- Developed an arginine-coated graphene oxide composite material with improved bone regeneration properties for hard tissue engineering applications
- Studied the mechanism of vascular calcification through in-vitro calcification test of elastin and collagen gel
- Investigated the hydroxyapatite mineralization of poly (dl-lactic acid) (PDLA) film modified with amino acids, such as arginine and glutamic acid

2006-2008: Master's student, Department of Mechanical Engineering, NTU, Singapore

- Developed a homogeneous precipitation technique for synthesizing CeO₂ nanopowder
- Investigated the sinterability and nanoindentation properties of Y₂O₃-doped CeO₂ nanopowder for fuel cell applications

WORK EXPERIENCE

2010, 2013, and 2014: Laboratory demonstrator, MIME 317: Analytical and Characterization Techniques (Atomic Absorption, Emission and Fluorescence Techniques), McGill University, Montreal, Canada

- Demonstrated X-Ray photoelectron spectroscopy (XPS), scanning electron microscopy (SEM), and atomic absorption (AA) characterization techniques
- Marked lab reports and exams

2014: Laboratory safety demonstrator, McGill University, Canada

- Demonstrated chemistry laboratory safety rules at the Department of Materials Engineering

2010 and 2013: Teaching assistant, MIME 260: Materials Science and Engineering, McGill University, Canada

- Gave weekly tutorials on topics related to the basics of Materials Engineering
- Answered questions during office hours and by email from class of 90 students
- Marked midterm and final exams

2011: Laboratory assistant, McGill University, Canada

- Provided technical and training support for XPS instrument

2007: Laboratory demonstrator, Materials Characterization Techniques, NTU, Singapore

- Demonstrated optical microscopy technique to undergraduate students
- Marked lab reports

SUPERVISION EXPERIENCE

Supervising 9 undergraduate students on the following projects at Biointerface laboratory, McGill University, Canada:

2014: Nika Amehdi, “Investigating the heat of interaction between amino acids and calcium and phosphate ions in solution using isothermal titration calorimetry (ITC) technique”

2014: Guanhan Yao, “Investigating the calcification of elastin and collagen-based scaffolds in simulated body fluid (SBF)”

2013: Sanahan Vijayakumar, “Calcium phosphate coating on a bilayered chitosan-based scaffold for the regeneration of periodontal tissue”

2012: Roger Ren, “Investigating hydroxyapatite mineralization in the presence of PDLLA film modified with arginine and glutamic acid”

2012: Jethro Sanz-Robinson, “Investigating the formation of hydroxyapatite prenucleation clusters by fluorescence correlation spectroscopy (FCS) technique”

2012: Alvin Ma, “Fourier transform infrared (FTIR) characterization of hydroxyapatite powder”

2011: Joyce Zaftis, “Measuring the concentration of amino acids in solution using a colorimetric method (ninhydrin)”

2011: Jessie Zhu, “Hydroxyapatite mineralization of PDLLA scaffold made by salt leaching technique”

2010: Moqing Wang, Probing Ca concentration in the process of hydroxyapatite precipitation using a titration instrument (titrando)

SKILLS

Technical & laboratory skills

- Precipitation from aqueous solutions and in the presence of biomolecules (biomineralization)
- Synthesis of ceramic nanopowders by chemical techniques
- Fabricating various kinds of synthetic and natural scaffolds for hard tissue engineering applications
- Biological testing to evaluate bone regeneration properties of bioactive materials

- Surface modification with organic molecules using techniques, such as thiol/silane chemistry, EDC coupling and diazonium technique
- Hardness, tensile, compression, and fracture mechanical testing
- Widely experienced in material and chemical characterization techniques, such as Fourier transform infrared (FTIR), X-Ray photoelectron spectroscopy (XPS), scanning electron microscopy (SEM), X-ray diffraction (XRD), Raman, isothermal titration calorimetry (ITC), inductively coupled plasma (ICP), dynamic light scattering (DLS), BET, thermogravimetric analysis (TGA), atomic absorption (AA) , ultra violet (UV) spectroscopy, and transmission electron microscopy (TEM)

Computer skills

- ChemDraw, Origin, Microsoft Office (Word, Excel, PowerPoint)

Language skills

- English & Persian: Fluent written and spoken
- French: Limited working proficiency

CERTIFICATIONS

- Workplace Hazardous Materials Information System (WHMIS)
- Hazardous Waste Management & Disposal
- Introduction to Biosafety
- Safe Use of Biological Safety Cabinet (BSC)

PUBLICATIONS

Journal articles

- **M. Tavafoghi** , N. Brodusch, R. Gauvin, M. Cerruti, “Hydroxyapatite formation on graphene oxide modified with amino acids: arginine versus glutamic acid”, *Journal of The Royal Society Interface*, 2016, 13 (114), pp 1-12.
- E. Boccardi, V. Melli, G. Catignoli, L. Altomare, **M. Tavafoghi**, M. Cerruti, L.P. Lefebvre, L. Nardo, "Study of the mechanical stability and bioactivity of Bioglass® based glass-ceramic scaffolds produced via powder metallurgy-inspired technology", *Biomedical Materials*, 2016, 11 (1), pp 015005.
- **M. Tavafoghi** and M. Cerruti, “Amino acid/Ion aggregate formation and their role in hydroxyapatite precipitation”, *Crystal Growth & Design*, 2015, 15 (3), pp 1096–1104.
- **M. Tavafoghi**, G. Yao, and M. Cerruti, "The importance of amino acid interactions in the crystallization of hydroxyapatite", *Journal of The Royal Society Interface*, 2013, 10 (80), pp 1-14.
- **M. Tavafoghi**, M.J. Tan, “Effects of Sintering on Y₂O₃-doped CeO₂”, *Journal of Achievements in Materials and Manufacturing Engineering*, 2009, 34 (2), pp 130-136.

Submitted journal articles

- **M. Tavafoghi** and M. Cerruti, “The role of AAs in HA mineralization”, submitted as an invited review article to *Crystal Growth & Design*.

Articles in preparation

- **M. Tavafoghi**, C.G. Gamys, M. Gosselin, Y.F. Zhao, “3D-printing and in-vitro bone regeneration activity of silicon-doped hydroxyapatite prepared by a thermal technique”.

Conference proceedings

- **M. Tavafoghi**, M.J. Tan, “Sintering and nano indentation of Y₂O₃-doped CeO₂ powder”, *Proceedings of 2nd International Congress on Ceramics*, Verona, Italy, 2008.

- **M. Tavafoghi**, M.J. Tan, “Processing of cerium oxide nanoparticles”, *Proceedings of the 10th International Conference of the European Ceramic Society*, Berlin, Germany, 2007.

SEMINARS AND CONFERENCES

Oral presentations

- **M. Tavafoghi**, M. Cerruti, “Effect of reactants’ solutions aging time on hydroxyapatite precipitation in the presence of arginine and glutamic acid”, *Materials Research Society Fall Meeting*, Boston, MA, US, fall 2012.
- **M. Tavafoghi**, M. Cerruti, "Effect of L-Glu and L-Arg on the synthesis of Hydroxyapatite", *THERMEC (International conference on processing and manufacturing of advanced materials)*, Quebec, QC, Canada, summer 2011.

Poster presentations

- **M. Tavafoghi**, C.G. Gamys, M. Gosselin, Y.F. Zhao, “In-vitro dissolution and mineralization of silicon-doped hydroxyapatite prepared by a thermal technique”, 10th *WBC (World biomaterials congress)*, Montreal, QC, Canada, spring 2016.
- **M. Tavafoghi**, M. Cerruti, “Prenucleation cluster chemistry: the example of hydroxyapatite formation in the presence of amino acids”, *Biomaterials Colloquium, Canadian Biomaterials Society*, Montreal, QC, Canada, spring 2014.
- **M. Tavafoghi**, M. Cerruti, "Effect of L-Glu and L-Arg on the synthesis of Hydroxyapatite", *Society for Biomaterials Annual Meeting*, Orlando, FL, USA, spring 2011.
- **M. Tavafoghi**, M.J. Tan, “Sintering and nano indentation of Y₂O₃-doped CeO₂ powder”, 2nd *international conference on ceramics*, Verona, Italy, summer 2008.

Seminars

- **M. Tavafoghi**, Seminar on introducing Biomaterials Engineering to high school students, McGill University, Montreal, QC, Canada, 2012.

HOBBIES AND INTERESTS

Adventure and traveling, biking, swimming, art, music, literature

REFERENCES

- Prof. Fiona Zhao (postdoctoral supervisor)
Assistant professor, Department of Mechanical Engineering, McGill University, Canada
yaoyao.zhao@mcgill.ca, +1-514-3982523
- Prof. Marta Cerruti (Ph.D. supervisor)
Associate professor, Department of Materials Engineering, McGill University, Canada
marta.cerruti@mcgill.ca, +1-514-3985496
- Prof. Tan Ming Jen (M.Eng. supervisor)
Associate professor, Department of Mechanical Engineering, NTU, Singapore
mmjtan@ntu.edu.sg, +65-67905582