Curriculum Vitae

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WORK EXPERIENCE

Florida International University, United States of America Aug 2020 – Present

Job Title: Assistant Teaching Professor

- Working as a full-time teaching Professor in the Department of Mechanical and Materials Engineering
- Handling courses in the domain of Engineering Design: computer aided design, finite element analysis, Mechanical Design and Manufacturing Process
- Core faculty for the Capstone senior year courses and projects
- Received UGS Faculty Status to supervise graduate student towards their Masters' dissertation
- PhD committee member for various computational, advanced manufacturing and corrosion based thesis
- Faculty Advisor for the Society of Manufacturing Engineers at FIU

Florida International University, United States of America Dec 2017 – Aug 2020

Job Title: Postdoctoral Research Associate- Mechanical and Materials Engineering

- Worked as a Research Fellow of National Science Foundation, Engineering Research Centre in their Cellular-Metamaterials (Cell-Met) Research. The research aims to transform cardiovascular health care by the amalgamation of nanotechnology with tissue engineering and regenerative medicine.
- Research tasks involved developing bio-polymers for extrusion/stereolithography type 3D printing of scaffolds to culture cardiomyocytes, develop finite element models of the nano-scaffolds to optimize the scaffold design and also developing novel porous graphene based materials via freeze drying technique as a potential bio-scaffold material. I also assisted my supervisor in writing project proposals apart from publishing the research outcomes in peer reviewed journals.

West Virginia University, United States of America Jan 2016 – Dec 2017

Job Title: Graduate Research Assistant- WVU Functional Ceramic Group

- The project was in collaboration with GE-Global Research Centre, to develop novel reduction and oxidation (redox) stable ceramic oxide anode materials for Solid Oxide Fuel Cell (SOFC) application. The funding is provided by US Department of Energy through co-operative agreement: DE-FE-0026169.
- Main tasks involved, finding alternative chemical formulations for a potential SOFC ceramic anode material, chemical characterisation (XRD, XPS, EDX, PSD, BET), conduct

mechanical (redox dilatometry, TGA) and electrical (DC-four point, EIS) characterisation to validate the chemical formulations and optimise ceramic powder morphology (SEM).

- Other responsibilities also include producing and supplying fully characterized powder samples to GE, liaising and managing team at WVU.

University of Bath, United Kingdom Sept 2014 – Nov 2014

Job Title: Research Assistant

- Identifying the chemical composition to fabricate carbon fibre reinforced extrudable concrete tiles, which was part of FIBCEM (Nanotechnology Enhanced Extruded Fibre Reinforced Foam Cement Based Environmentally Friendly Sandwich Material for Building Applications) project funded by European Commission under the 7th Framework Programme.
- Material characterisation of the extruded concrete tiles which included microscopic analysis using SEM & FESEM techniques and image analysis to study the dispersion of carbon fibre in the cement matrix. Chemical analysis by XRD, EDX and FTIR techniques to establish the chemical composition of the extruded tiles and also mechanical testing to establish the density, water adsorption rate, water permittivity, flexural and compressive strength of the novel extruded concrete tiles.

EDUCATION

University of Bath, United Kingdom Oct 2011 – Jun 2015

Doctor of Philosophy (PhD) in Mechanical Engineering

- Objective was to explore the manufacturing routes to fabricate micro, macro and graded porous ternary titanium based MAX-phase porous ceramic (Ti_2AlC) and $TiAl/TiAl_3$ lightweight alloy for multifunctional electrode.
- A part of the research dealt in studies related to fine tuning the processing parameters to produce micro porous Ti_2AlC ceramic via Self-propagating High temperature Synthesis (SHS) and thermodynamic modelling to understand the reaction mechanism and attain control over the SHS process.
- Involved in 3D parametric design of experimental components and fabrication techniques to produce micro to macro scale porous ceramic for electrodes in energy harvesting applications (e.g. microbial fuel cells) using foam replication and freeze casting techniques and designing equipment for in-house experiments. Research also dealt with designing heat treatment process (sintering) to optimise the grain size and to mitigate cracks in the structure due to thermal stress.

West Virginia University, United States of America Jan 2016 – Dec 2017

Master of Science (MS) in Material Science and Engineering

- The course is designed to achieve research focus on the study of various materials and its application in the world of engineering science. The programme augmented my knowledge

in areas like processing, structure and properties of materials and fundamentals of various material characterisation techniques
- As part of the MS thesis, I worked on research funded by US-DOE to develop novel oxide ceramic anode materials for Solid Oxide Fuel Cell applications.

University of Bath, United Kingdom Sept 2010 – Sept 2011

Master of Science (MSc) in Engineering Design

- The objective of the postgraduate course was to understand the issues associated with creativity and innovation, develop knowledge and experience of the global commercial environment and to manage engineering design projects and teams.
- My final project involved design, modelling and development of a Titanium-Aluminium based alloy, which has the potential to be used in high temperature application mainly in aerospace and automobile industries.

Sri Jayachamarajendra College of Engineering, Mysore, India. Sept 2006 – May 2010

Bachelor of Engineering (B. E) in Industrial and Production Engineering

- The course has developed my ability in solving problems related to the operation of production processes in manufacturing industries and also designing processing techniques for specific applications on demand. The course also enhanced my knowledge in structural engineering through modules like strength of materials, design of machinery and kinetics of machinery.
- Optional modules taken: control systems, mechanical vibrations, world class manufacturing, tool design and non-traditional manufacturing.
- Management topics taken: Total quality management, supply chain and logistics.

PATENTS

ISSUED LIST

1. US 16/835,583; '*Method to Produce Graphene Foam Reinforced Low Temperature Co-Fired Ceramic (LTCC) Composite',* Arvind Agarwal, Benjamin Boesl, Tony Thomas, Cheng Zhang and Pranjal Nautiyal
2. US17/020,982 '*Method to Produce Graphene Foam Reinforced Low Temperature Co-Fired Ceramic (LTCC) Composite'*, Arvind Agarwal, Benjamin Boesl, Tony Thomas, Cheng Zhang and Pranjal Nautiyal
3. US16/913,212 '*Shape Memory Polymer Inks and Methods of Printing the Same*', Arvind Agarwal, Tony Thomas, Adeyinka Idowu and Benjamin Boesl
4. US 10,961,162 B2; '*Method to Produce Graphene Foam Reinforced Low Temperature Co-Fired Ceramic (LTCC) Composite'*,
5. US 17/932,819 **'***Ultra-High Temperature carbide (UHTC) Foams and Methods of Fabricating the Same*', Arvind Agarwal, Ambreen Nisar, Tony Thomas, Kazue Orikasa and Benjamin Peter Boesl
6. US 17/457,778, **'***Ultra-High Temperature carbide (UHTC) Foams and Methods of Fabricating the Same*', Arvind Agarwal, Ambreen Nisar, Tony Thomas, Kazue Orikasa and Benjamin Peter Boesl

7. US 18/295,928, *'In-situ 3D Greenland Anorthosite manufacturing using digital light processing (DLP)',* Arvind Agarwal, Ambreen Nisar, Tony Thomas and Brandon A. Aguiar

8. US18/325,188, '*Foams and Foam-Polymer Composites and Fabrication Methods Thereof',* Arvind Agarwal, Ambreen Nisar, Tony Thomas, Kazue Orikasa and Preyojon Dey

9. US18/454,169, '*Foams of Nanomaterials and Fabrication Methods Thereof',* Arvind Agarwal, Kazue Orikasa, Tony Thomas, and Tyler Dolmetsch

JOURNAL PUBLICATIONS

1. *T. Thomas* and C. R. Bowen, "Thermodynamic predictions for the manufacture of Ti_2AlC MAX-phase ceramic by combustion synthesis", Journal of Alloys and Compounds, vol 602, pages 72-77, 2014.
2. C.R. Bowen, T. Thomas and V. Adamaki, "Manufacture of porous electrically conductive ceramic", *Proceeding of the International* Conference on Mining, Material and Metallurgical Engineering (MMME2014), 2014.
3. T. Thomas and C.R. Bowen, "Macro-porous Ti_2AlC MAX phase ceramics by the foam replication method", *Ceramics International, vol 41[9, Part B], pages 12178-12185, 2015.*
4. T. Thomas and C.R. Bowen, "Effect of particle size on the formation of Ti_2AlC using combustion synthesis", *Ceramics International, vol 42[3], pages 4150-4157, 2016.*
5. V. Adamaki, T. Minster, T. Thomas, G. Fourlaris and C. R. Bowen, "Study of the mechanical properties of Ti_2AlC after thermal shock", Materials Science and Engineering: A, vol 667, pages 9-15, 2016.
6. T. Thomas, H. Qi, X. Liu, J. Zondlo, R. Hart and E. M. Sabolsky, "Investigation of alternative mixed-conducting oxides for SOFC anode applications", *231st ECS Meeting Proceeding, ECS Transactions*, *2017.*
7. T. Thomas, H. Qi, X. Liu, J. Zondlo, R. Hart and E. M. Sabolsky, "Effect of Mg/Mo ratio in a stoichiometric $Sr_2MgMoO_{6-\delta}$ (SMM) redox-stable anode", *SOFC-XV: 15th International Symposium on Solid Oxide Fuel Cells, ECS Transactions*, *2017.*
8. T. Thomas, H. Qi, X. Liu, J. Zondlo, R. Hart and E. M. Sabolsky, "Analysis of the thermal-mechanical redox stability of Nb_2TiO_7 and $Nb_{1.33}Ti_{0.67}O_4$ for SOFC application", *Ceramics International, vol 44[7], pages 8691-8694*, *2018.*
9. T. B. A. Ross, J. W. Zondlo, E. M. Sabolsjy, E. Ciftyurek, A. Koneru, T. Thomas, I. Celik, X. Liu, H. Sezer and U. M. Damo, "Performance and stability of large planar solid oxide fuel cells using phosphine contaminated hydrogen fuel", *Journal of Power Sources, vol 395, pages 185-195, 2018*
10. T. Thomas, C. Zhang, A. Sahu, P. Nautiyal, A. Loganathan, T. Laha, B. Boesl and A. Agarwal, "Effect of graphene reinforcement on the mechanical properties of Ti_2AlC

ceramic fabricated by spark plasma sintering", *Materials Science and Engineering: A, vol 728, pages 45-53, 2018*

11. T. Thomas, C. Zhang, P. Nautiyal, B. Boesl and A. Agarwal, "3D graphene form reinforced low-temperature ceramic with multifunctional mechanical, electrical, and thermal properties", *Advanced Engineering Materials, vol 21, pages 1900085-94, 2019.*

12. H. Qi, T. Thomas, W. Li, F. Xia, N. Zhang, E. M. Sabolsky, J. W. Zondlo, R. Hart and X. Liu, "Reduced thermal expansion and enhanced redox reversibility of $La_{0.5}Sr_{1.5}Fe_{1.5}Mo_{0.5}O_{6-\alpha}$ anode material for solid oxide fuel cells", *ACS Applied Energy Materials, vol 6, pages 4244-54, 2019.*

13. T. Thomas, A. S. Rubfiaro, P. Nautiyal, R. Brooks, D. Dickerson, J. He and A. Agarwal, "Extrusion 3D printing of porous silicone architectures for engineering human cardiomyocytes-infused patches mimicking adult heat stiffness", *ACS Applied Bio Materials, 3(9), 5865-5871, 2020.*

14. T. Thomas and A. Agarwal, "A facile and scalable approach in the fabrication of tailored 3D graphene foam via freeze drying", *Materials, vol 14, 864, 2021*

15. T. Thomas, C. Zhang, K. M. Felicianao Ruiz, C. I. Ramos-Pagan, D. R. Negron and A. Agarwal, "Engineering graphene-ceramic 3D composite foams by freeze drying", *Advanced Engineering Materials, vol 23(7), 2001546, 2021*

16. P. Nautiyal, V. Wiedorn, T. Thomas, N. Bacca, A. White and A. Agarwal." Unraveling the Mechanisms Governing Anisotropy in Accordion-Shaped Honeycomb Microlattice Fabricated by Two-Photon Polymerization", *Advanced Engineering Materials, 24(5), 2101190, 2022*

17. T. Thomas, T. Paul, D. John, K. Orikasa and A. Agarwal, Novel Method to Investigate Plastic Flow in Micrometer Powder Particles by Integrated Experimental and Computational Approach. *Materials Today Communications, 105275, 2022*

18. A. Idowu, T. Thomas, B. Boesl and A. Arvind, "Cryo-assisted extrusion 3D printing of shape memory polymer-graphene composites", *Journal of Manufacturing Science and Engineering, 145(4), 041003, 2023*

19. T. Thomas and A. Agarwal, "Corrosion Behavior of 1D and 2D Polymorphs of Boron Nitride Ceramic", *ACS Omega, 8(3), 3184-3189, 2023*

20. B. Palacios, T. Paul, S. M. Mohammed, K. Orikasa, D. John, K. Rodriguez, T. Thomas, S. Langan, A. Michelson and A. Agarwal. "Role of structural hierarchy on mechanics and electrochemistry of wire arc additive manufactured (WAAM) single phase titanium". *Journal of Manufacturing Processes*, *93*, 2023.

21. B. Aguiar, A. Nisar, T. Thomas, C. Zhang and A. Agarwal, "In-situ 3D Lunar Regolith Manufacturing using Digital Light Processing", *Ceramics International, 49(11) Part A, 17283-17295, 2023*

22. A. Idowu, T. Thomas, J. Bustillos, B. Boesl and A. Arvind, "Electrically and Thermally Triggered Three-Dimensional Graphene Foam Reinforced Shape Memory Epoxy Composite"*, Polymers, 15(13), 2023*

23. A. Nisar, K. Lopez, T. Thomas, B. Boesl and A. Agarwal. "Fracture Resistant and Thermally Insulating Ultra-High Temperature Carbide Foams". *Advanced Engineering Materials,25 (22), 2023*

24. T. Thomas, A. Nisar, C. Zhang, S. Joglekar, M. Pankow, B. Boesl and A. Agarwal. "High strain rate response and mechanical performance of tantalum carbide–hafnium carbide solid solution". *Ceramics International, 49(23), 2023.*

25. T. Thomas, A. Bakhshiannik, P. Nautiyal, J. D. Hutcheson and A. Agarwal. "Freeze casting to engineer gradient porosity in hydroxyapatite-boron nitride nanotube composite scaffold for improved compressive strength and osteogenic potential". *Journal of the Mechanical Behavior of Biomedical Materials, 150, 2024.*
26. K. Orikasa, C. Park, S. H. Chu, C. Lum, T. Thomas, T. Dolmetsch, L. Benedetti and A. Agarwal. "Foam with direction: unraveling the anisotropic radiation shielding properties of 2D boron nitride nanoplatelet foams". *npj 2D Materials and Applications, 8(1), 2024*.

PRESENTATION

1. T. Thomas and C.R. Bowen, "Thermodynamic Study for the Manufacture of MAX-phase Ceramic by Combustion Synthesis Process", **Poster presentation** at Electroceramics XIII, University of Twente, Enschede, Netherlands, 2012
2. T. Thomas and C.R. Bowen, "Manufacture of Ti-Al-C Based, Electrically Conductive Micro and Macro Porous MAX-phase Ceramic", **Poster Presentation** at EUROMAT 2013, Sevilla, 2013
3. K. Schneider, T. Thomas, C. R. Bowen and P. Cameron, Ti_2AlC Ceramics with Metal like Properties – Versatile Shapeable Electrodes with Improved Cell Adherence, **Poster Presentation** at 4th International Microbial Fuel Cell conference, Cairns, Australia, 2013
4. T. Thomas, H. Qi, E.M. Sabolsky, J. Zondlo, X. Liu and R. Hart, "Effect of Mg/Mo Ratio in a Stoichiometric Sr2MgMoO6 (SMM) Redox-Stable Anode", **Oral presentation** at the 15th International Symposium on Solid Oxide Fuel Cells (SOFC-XV), Hollywood, Florida, 2017.
5. T. Thomas, H. Qi, E.M. Sabolsky, J. Zondlo, X. Liu and R. Hart, "Redox Stable Anode Materials for SOFC", **Oral presentation** at the 41st International Conference and Expo on Advanced Ceramics and Composites, Daytona Beach, Florida, 2017
6. E.M. Sabolsky, X. Liu, J. Zondlo, H. Qi, T. Thomas, R. Hart, and E. Jezek, "Investigation of Alternative Mixed-Conducting Oxides for SOFC Anode Applications", **Oral presentation** at the 231st ECS Meeting, New Orleans, LA, 2017.
7. K. Sabolsky, T. Thomas, H. Qi, E.M. Sabolsky, X. Liu, J.W. Zondlo, and R. Hart, "Redox Stability of Alternative Ceramic Compositions for Solid Oxide Fuel Cell Anodes," **Poster presentation** at the 16th European Ceramic Society Conference 2019 (XVI. ECerS), Torino, Italy, 2019
8. T. Thomas, X. Lu, A. Loganathan, B. Boesl, A. Agarwal, "Facile and Scalable Fabrication of Free-Standing Reticulated 3D Graphene Foam via Freeze Drying", **Oral presentation** at Materials Science and Technology (MS&T), Portland, Oregon, USA, 2019

9. T. Thomas, K. Lopez and A. Agarwal, 3D Foam of 2D Materials for Polymer Composites", **Invited Talk** at The Minerals, Metals and Materials Society (TMS), 2021

RESEARCH GRANTS

Florida International University, United States of America

1. **Co-Principle Investigator**: '*Corrosion Behavior of 3D Printed Stainless Steel and Titanium Alloy'* research project funded by Honeywell Federal Manufacturing & Technologies
    - Phase 1: Agreement #. N000352189, May 2020 – August 2020
    - Phase 2: Agreement #. N000404367, July 2021 – October 2021
    - Phase 3: Agreement #. N000433854, January 2022 – August 2022
    - Phase 4: Agreement #. N000465904, December 2022 – August 2023

AWARDS

1. Elected to Senior Member of National Academy of Inventors, 2023
2. Rewarding Excellence in Teaching, FIU Faculty Leadership and Success, 2023
3. Faculty Senate Awards for Excellence in Teaching, 2024