

Ananya Renuka Balakrishna

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EDUCATION AND TRAINING	National Institute of Technology Karnataka , Surathkal, India B. Tech in Mechanical Engineering	2012
	University of Oxford , Oxford, UK PhD in Solid Mechanics and Materials Engineering	2016
	Massachusetts Institute of Technology , Cambridge, MA, USA Lindemann Postdoctoral Fellow in Materials Science and Engineering	2016 – 2018
	University of Minnesota , Minneapolis, MN, USA Postdoctoral Fellow in Aerospace Engineering and Mechanics	2018 – 2020
APPOINTMENTS	University of Southern California , Los Angeles, CA, USA Provost’s Assistant Professor Department of Aerospace and Mechanical Engineering	July 2020 – present
AWARDS & RECOGNITIONS	Provost Assistant Professor Fellowship WiSE Gabilan Fellowship Lindemann Postdoctoral Fellowship British Federation of Women Graduates Award UK’s top young innovator under the age of 35 (Falling Walls London Lab) Felix Graduate Scholarship (5 awarded across India) Cambridge International & Commonwealth Trust (Honorary scholar)	2020 2020 2016 2015 2014 2012 2012
PUBLICATIONS	<p>[13] Renuka Balakrishna A & James RD. A tool to predict coercivity in magnetic materials. 2021. <i>Acta Materialia</i>, 116697.10.1016/j.actamat.2021.116697</p> <p>[12] Renuka Balakrishna A & James RD. A solution to the permalloy problem. 2021. <i>Under review</i>, arXiv preprint arXiv:2101.09857.2101.09857</p> <p>[11] Christensen, C. K., Mamakhel, M. A. H., Renuka Balakrishna A, Iversen, B. B., Chiang, Y. M., & Ravnsbaek, D. B. 2019. Order–disorder transition in nano-rutile TiO₂ anodes: a high capacity low-volume change Li-ion battery material. <i>Nanoscale</i>, 11(25), 12347-12357. 10.1039/C9NR01228A</p> <p>[10] Renuka Balakrishna A, Chiang, Y. M., & Carter, W. C. 2019. Phase-field model for diffusion-induced grain boundary migration: An application to battery electrodes. <i>Physical Review Materials</i>, 3(6), 065404. 10.1103/PhysRevMaterials.3.065404</p> <p>[9] Bucci G, Talamini B, Renuka Balakrishna A, Chiang Y-M, and Carter WC. 2018. Mechanical instability of electrode-electrolyte interfaces in solid-state batteries. <i>Physical Review Materials</i>, 2(10), 105407. 10.1103/PhysRevMaterials.2.105407.</p> <p>[8] Renuka Balakrishna A and Carter WC. 2018. Combining phase field crystal methods with a Cahn-Hilliard model for binary alloys. <i>Physical Review E</i>, 97(4), 043304. 10.1103/PhysRevE.97.043304</p> <p>[7] Muench I, Renuka Balakrishna A, and Huber JE. 2018. Simulation of periodic, 3D domain</p>	

patterns in tetragonal ferroelectrics. *Archive of Applied Mechanics*. 10.1007/s00419-018-1411-9

[6] **Renuka Balakrishna A**, Huber JE, and Muench I. 2016. Nanoscale periodic domain patterns in tetragonal ferroelectrics: A phase-field study. *Physical Review B* 93 (17), 174120. 10.1103/PhysRevB.93.174120

[5] **Renuka Balakrishna A** and Huber JE. 2016. Nanoscale domain patterns and a concept for an energy harvester. *Smart Materials and Structures* 25 (10), 104001. 10.1088/0964-1726/25/10/104001

[4] **Renuka Balakrishna A** and Huber JE. 2015. Scale effects and the formation of polarisation vortices in tetragonal ferroelectrics. *Applied Physics Letters* 106 (9), 092906. 10.1063/1.4913917

[3] **Renuka Balakrishna A**, Muench I, and Huber JE. 2015. Study of periodic domain patterns in tetragonal ferroelectrics using phase-field methods. *Proceedings of ASME SMASIS conference*, Colorado Springs, USA. 10.1115/SMASIS2015-8823

[2] **Renuka Balakrishna A**, Huber JE, and Landis CM. 2014. Nano-actuator concepts based on ferroelectric switching. *Smart Materials and Structures* 23 (8), 085016. 10.1088/0964-1726/23/8/085016

[1] **Renuka Balakrishna A** and Huber JE. 2014. Design optimisation of ferroelectric nano-actuator using phase field methods. *Proceedings of MRS conference*, San Francisco, USA. 10.1557/opl.2014.545

MANUSCRIPTS IN
PREPARATION

[15] Zhang D*, Sheth J, Sheldon B and **Renuka Balakrishna A**. Substrate straining enhances reversible cycling of thin film intercalation electrodes.

[14] **Renuka Balakrishna A** and James RD. A search for magnetic alloys with low hysteresis.

*Ph.D. student advised at USC

INVITED TALKS

[7] “Mathematical Design of Energy-related Materials”, Mechanical and Aerospace Engineering Department Seminar, University of California, Irvine, 2021.

[6] “A search for novel magnetic alloys with surprisingly small hysteresis”, Mechanical and Civil Engineering Department Seminar, California Institute of Technology, 2020. [Link to the talk](#).

[5] “Chemo-mechanical modeling of intercalation materials”, Energy storage session for Early Career Researchers, TMS Annual Meeting, 2020.

[4] “Phase field methods for simulating ferroelectrics and other materials”, Warwick Centre for Predictive Modelling Seminar, University of Warwick, 2019.

[3] “Microstructural engineering of energy-related materials”, Solid Mechanics and Materials Engineering Seminar, University of Oxford, 2019

[2] “Phase field modeling of microstructural evolution”, Aerospace Engineering and Mechanics Research Seminar, University of Minnesota, MN, 2017

[1] “Phase field crystal modeling of lithium batteries”, Interdisciplinary Centre for Advanced Materials Simulation, Ruhr-University Bochum, Germany, 2017

CONFERENCES

- [21] “Substrate strain enhances the reversible cycling of thin-film electrodes”, MRS Spring/Fall Meeting, Online, 2020.
- [20] “A search for magnetic alloys with low hysteresis”, Virtual Technical Meeting of the Society of Engineering Science, Oral presentation, Online, 2020
- [19] “Crystallographic engineering of intercalation electrodes”, Virtual Technical Meeting of the Society of Engineering Science, Oral presentation, Online, 2020
- [18] “A tool to predict coercivity in bulk magnetic alloys”, Joint SIAM/CAIMS Annual Meeting and SIAM Conference, Oral presentation, Virtual meeting, 2020
- [17] “Substrate strain engineering of electrodes for reversible cycling”, 2019 MRS Fall Meeting and Exhibit, Oral presentation, Boston, MA, 2019
- [16] “Intercalation induced mechanical failure of olivine compounds”, 2018 MRS Fall Meeting and Exhibit, Oral presentation, Boston, MA, 2018
- [15] “Combining the crystallographic texture of an electrode with Li-composition field”, Aerospace Engineering and Mechanics Symposium, University of Minnesota, MN, 2018
- [14] “Modeling Phase Transition in Battery Electrodes Using the Coupled Cahn-Hilliard – Phase Field Crystal Methods”, 233rd ECS meeting Seattle, WA, 2018
- [13] “Phase field crystal modeling of nanoscale electrodes”, American Physical Society (APS) March Meeting, Los Angeles, CA, 2018
- [12] “Modeling Phase Transition in Lithium Batteries Using Multi-Scale Continuum Models”, Batteries Gordon Research Conference and Seminar, Ventura, CA, 2018, **Invited Discussion leader**
- [11] “Phase Field Crystal Modeling of Coherent Interfaces in Lithium Batteries”, 231st Electrochemical Society meeting, New Orleans, LA, 2017
- [10] “Phase Field Crystal Modeling Using Transformation Matrices – an Application to Lithium Battery Electrodes”, MRS Fall Meetings and Exhibits, Boston, MA, 2017
- [9] “Phase-field Modeling of Material Microstructures”, Multiscale Theory and Computation Conference, University of Minnesota, MN, 2017
- [8] “Stability of laminate patterns in ferroelectrics” (poster), From Grain Boundaries to Stochastic Homogenization: PIRE Workshop, Leipzig, 2015
- [7] “Phase-field modelling of polarization patterns in ferroelectrics”, 9th European Solid Mechanics Conference, Madrid, 2015.
- [6] “A conceptual design of a ferroelectric energy harvester”, MRS Spring Meetings and Exhibits, San Francisco, USA, 2015
- [5] “A conceptual design of a ferroelectric energy harvester”, ASME SMASIS Spring Meetings and Exhibits, Utah, USA, 2014, **Best Student Paper Award**
- [4] “Nano-actuator concepts”, Falling-Walls London-Lab, London, 2015
National Winner – represented UK in the finals held in Berlin, funded by AT Kearney

- [3] “Working principle of a nano-actuator based on ferroelectric switching”, the proceedings of EC-COMAS conference on Smart Struct. Mat., Turin, 2013
- [2] “Modelling and analysis of resonant beam micro-pressure sensor”, National Conference on MEMS and Smart Materials, Coimbatore, India, 2012, **Best Paper – ISSS Undergraduate Award**
- [1] “Sound energy harvesting using macro-fibre composites”, 8th European Solid Mechanics Conference, Graz, Austria, 2012

TEACHING

Mentor for undergraduates, Massachusetts Institute of Technology 2018

Project: Spinodal decomposition under Cahn-Hilliard equation
Mentored and advised two undergraduate students on developing a Cahn-Hilliard code

Teaching faculty, Oxford Royale Academy 2014 – 2015

Designed course on “Mathematics as an Engineering tool” for prospective undergraduates
Taught to a class of 25 students during summer terms

Tutor, Pembroke College, University of Oxford 2015

Mechanics of Materials course
Tutored 8 undergraduate students in the Trinity term

Instructor, Department of Engineering, University of Oxford 2015

Laboratory demonstration on bridge-design and construction to undergraduates

Training

Kaufman Teaching Certificate, MIT teaching and learning laboratory	2018
Bringing Modeling and Simulation into My Classroom course (MRS Fall meeting)	2017
Leadership and management workshop for scientists, MIT EECS	2017

PROFESSIONAL ACTIVITIES

Ad hoc Reviewer

Science
Physical Review (Letters, E, B, Materials)
Journal of Mechanics and Physics of Solids
Journal of Computational Physics
Smart Materials and Structures
European Journal of Mechanics

Professional memberships

Electrochemical Society,
Materials Research Society
Society for Industrial and Applied Mathematics
Society of Engineering Science

Co-organizer of minisymposium “Materials Modeling Across Scales: From First Principles Calculations to Mesoscale Physics” at the USNCCM conference 2021.

Invited **Discussion leader** at the Gordon Research Seminar on Batteries 2018.

MIT **representative** for Science Policy Initiative for Congressional Visit in Washington DC, 2017.