

# ANJU TOOR

(281)-630-8067 • atoor@berkeley.edu • <http://anjutoor.com>

## RESEARCH INTERESTS

---

I am interested in the next generation of challenges at the intersection of functional nanomaterials, printed electronics and systems integration for energy storage and health-care applications.

## EDUCATION

---

### University of California, Berkeley

Ph.D., Mechanical Engineering (GPA: 3.94/4.0)

May 2017

Major: Nanotechnology; Minor: Manufacturing

M.S., Electrical Engineering & Computer Science (GPA: 4.0/4.0)

Dec 2015

### Netaji Subhas Institute of Technology, University of Delhi, India

B.E., Manufacturing Processes & Automation Engineering, 80.6/100, Top 1%

June 2010

## HONORS AND AWARDS

---

Bakar Innovation Fellow	07/2020
The Rising Stars, Women in Engineering Workshop, Asian Deans' Forum	10/2019
Rising Stars in EECS Workshop at Carnegie Mellon University	10/2016
Helene Cantor Graduate Fellowship	06/2015
Georgia Tech Nano IGERT Symposium Travel Grant	04/2014
Berkeley Graduate Division Conference Travel Grant	05/2014
Berkeley Mechanical Engg. Dept. NRT (Nonresident Tuition) Fellowship	01/2013
Berkeley Graduate Division NRT Award	01/2012
Dr. B.R. Ambedkar State Award for Toppers, Delhi, India	06/2011
University of Delhi Academic Merit Scholarship Award (full tuition waiver)	2006-10

## RESEARCH EXPERIENCE

---

*Arias Research Group*

Mar 2019 - Present

### Printed Miniaturized Li-ion Batteries for On-chip Electronics

- Developed a stencil-printing process to obtain batteries with active area scaled down to 1 mm<sup>2</sup>.
- Demonstrated areal capacities as high as 6.2 mAh/cm<sup>2</sup> and areal energy density of 23.6 mWh/cm<sup>2</sup>.

### Printed Flexible Electrochemical Sweat Sensors

- Developed a flexible sensing platform to monitor lactate, sodium (Na<sup>+</sup>) and ammonium (NH<sub>4</sub><sup>+</sup>) ions in sweat based on the electrochemical sensing.
- Demonstrated a printed, flexible potassium (K<sup>+</sup>) ion-selective electrode for sweat monitoring.

*Russell Group, Lawrence Berkeley National Lab*

May 2015 - Dec 2017

### Microfluidic Emulsions Stabilized with Stimuli-responsive Nanoparticle-Polymer Assemblies

- Designed and fabricated microfluidic droplet generation devices using soft lithography techniques.
- Studied the encapsulation of fluorescent proteins in nanoparticle-polymer surfactant stabilized droplets.

### 3D Printed Structured Liquids

Employed a 3D printer to generate bicontinuous, all-liquid systems that can be shaped into complex structures by functional, interfacially assembled nanoparticle monolayers.

## Interfacial Assembly of Nanoparticles at Liquid-Liquid Interfaces

- Developed a versatile self-assembly strategy to fabricate nanoparticle monolayers of varied materials, shapes and sizes.
- Measured the mechanical properties of resulting self-assembled nanoparticle assemblies using interfacial shear rheology.

*Berkeley Micromechanical Analysis & Design Lab, UC Berkeley*

August, 2011 - May 2015

## Development of High $k$ and Low Dielectric Loss Polymer Nanocomposite Materials

- Designed and synthesized nanocomposite materials by embedding functionalized sub-10nm metal nanoparticles in high breakdown strength polymer matrices.
- Achieved uniform particle dispersion with no agglomeration.
- Designed, fabricated and characterized supercapacitor devices for dielectric properties.
- Developed nanocomposites exhibit a dielectric constant of 3 times the value of base polymer material and low dielectric loss properties.

## TEACHING AND MENTORING

---

### University of California, Berkeley, US

ME 130 “**Design of Planar Machinery**”, Teaching Assistant

Fall 2015, Fall 2016

Developed the weekly lab practicum (class of 75 students) and led the discussion sessions, teaching students the principles of mechanism design, 3D computer modelling & motion analysis.

ME 122, “**Processing of Materials in Manufacturing**”, Teaching Assistant

Spring 2016

- Taught the principles of traditional manufacturing processes (e.g. casting) and rapid prototyping techniques.
- Assisted students in their product design projects regarding practical application of manufacturing and material selection processes.

### Student Advising

UC Berkeley

*Undergraduates:* Albert Wen (2019), Robin Chang (2019), Sean Lamb (2017), Shefali Panse (2017) *Graduates:* Maruf Ahmed (2019-2020)

## PROFESSIONAL EXPERIENCE

---

### University of California Berkeley

03/04/2019 - Present

*Postdoctoral Researcher*

*Berkeley, CA*

Developing printed, miniature lithium-ion batteries for applications in IoT devices.

### Intel

12/04/2017 - 03/01/2019

*Process Engineer*

*Lehi, Utah*

Worked on 3D XPoint memory technology development and yield ramp; solved process integration challenges to meet reliability, yield and manufacturability requirements.

### Lawrence Berkeley National Lab

May, 2017 - Dec 2017

*Postdoctoral Fellow*

*Berkeley, CA*

Developed adaptive interfacial nanocrystal assemblies towards structuring of liquids.

### Bharat Heavy Electricals Limited, India

July, 2010 - July 2011

*Engineer Trainee*

*Noida, India*

Designed CAD layouts for fire protection systems for thermal power plants.

## INVITED TALKS

---

### Functional Nanocomposite Materials

University of Toronto, Canada

*Mar 2018*

McGill University, Canada

*Apr 2018*

### Effect of Nanoparticle Surfactants on the Plateau-Rayleigh Instability

APS March Meeting

*Mar 2017*

### Polymer Nanocomposite Dielectric Materials for High Performance Energy Storage

Stanford University, Dept. of Materials Science and Engineering

*Nov 2016*

Non-volatile Memory Storage Solutions Group, Intel, Boise

*Oct 2016*

The Clorox Company, Pleasanton

*Oct 2016*

IBM Almaden Research Center, San Jose

*Sept 2016*

### Gold Nanoparticle/Polymer Composites with Improved Particle Dispersion

IEEE NANO, Rome

*July 2015*

### Synthesis and Characterization of Gold Nanoparticle/SU-8 Polymer based Nanocomposites

IEEE NEMS, Hawaii,

*Apr 2014*

## SERVICE

---

- Reviewer: ACS Applied Electronic Materials, ACS Omega, Langmuir, Applied Surface Science, Journal of Materials Science, Physics of Plasmas, Sensors Actuators: A. Physical.
- I had run a weekly Nanotechnology colloquium event for three years (2013-2016). The event hosted women speakers from both academic backgrounds and industrial labs. The talk series served as a platform for graduate students to present their work and receive critical feedback.
- As an active member of the EECS graduate women association, I acted as mentor to help female graduate students transition to graduate school and advised them on coping with academic stress.

## PUBLICATIONS

---

### Theses

[T1] Polymer Nanocomposite Materials with High Dielectric Permittivity and Low Dielectric Loss Properties, Ph.D. Thesis, University of California Berkeley, 2017.

[T2] Synthesis and Characterization of the Gold Nanoparticle/SU-8 Nanocomposite Material, Masters' Thesis, University of California Berkeley, 2015.

### Book Chapters

[C1] J. Forth, **A. Toor**, Y. Chai, C. Huang, X. Liu, W. Feng, S. Shi, D. Wang, P. Ashby, B. A. Helms and T. P. Russell, "Bijels the Easy Way" in **Bijels: Bicontinuous Particle-stabilized Emulsions**, RSC Soft Matter, pp. 211–245, 2020.

### Journal Publications

[P1] **A. Toor**, A. Wen, F. Maksimovic, A. M. Gaikwad, K. S. J. Pister, and A. C. Arias, "Stencil-printed Lithium-ion Micro Batteries for IoT Applications", Accepted, **Nano Energy**, 2020.

[P2] J. Forth, Y. Chai, A. Mariano, **A. Toor**, J. Hasnain, Y. Jiang, W. Feng, X. Liu, P. Geissler, P.D. Ashby, B.A. Helms and T. P. Russell, "Wrinkling, Folding, and Stress Decays in Jammed Nanoparticle Surfactant Assemblies at the Oil-Water Interface", **Under review**, 2020.

- [P3] A. M. Zamarayeva, N. A. D. Yamamoto, **A. Toor**, M. E. Payne, C. Woods, V. I. Pister, Y. Khan, J. W. Evans, and A. C. Arias. "Optimization of Printed Sensors to Monitor Sodium, Ammonium, and Lactate in Sweat." **APL Materials**, 8(10), 2020.
- [P4] A. M. Zamarayeva , A. Jegraj, **A. Toor**, V. I. Pister et al., "Electrode Composite for Flexible Zinc-Manganese Dioxide Batteries through in-situ polymerization of polymer hydrogel", **Energy Technology**, 2019.
- [P5] **A. Toor**, J. Forth, S. B. Araujo, M. C. Merola, G. Fuller and T. P. Russell, "Mechanical Properties of Solidifying Assemblies of Nanoparticle Surfactants at the Oil–Water Interface", **Langmuir**, 2019.
- [P6] **A. Toor**, B. A. Helms and T. P. Russell, "Reconfigurable Microfluidic Droplets Stabilized by Nanoparticle Surfactants", **ACS Nano**, 2018.
- [P7] J. Forth, X. Liu, **A. Toor**, S. Shi, B. A. Helms and T. P. Russell, "Reconfigurable Printed Liquids", **Advanced Materials**, 2018.
- [P8] R. Li, Y. Chai, Y. Jiang, P. Ashby, **A. Toor**, T. P. Russell, "Carboxylated Fullerene at the Oil/Water Interface", **ACS Applied Materials & Interfaces**, 9(39), pp. 34389-34395, 2017.
- [P9] **A. Toor**, B. A. Helms, and T. P. Russell, "Effect of Nanoparticle Surfactants on the Breakup of Free-Falling Water Jets During Continuous Processing of Reconfigurable Structured Liquid Droplets", **Nano Letters**, 17(5), pp. 3119-3125, 2017.
- [P10] **A. Toor**, H. So, and A.P. Pisano, "Improved Dielectric Properties of Polyvinylidene Fluoride Nanocomposite Embedded with Poly(vinylpyrrolidone)-Coated Gold Nanoparticles", **ACS Applied Materials & Interfaces**, 9 (7), pp. 6369-6375, 2017.
- [P11] **A. Toor**, H. So, and A.P. Pisano, "Enhanced Dielectric Permittivity and Low Dielectric Loss Properties of SU-8 Photopolymer Based Nanocomposites", **Applied Surface Science**, 414, pp. 373-379, 2017.
- [P12] K. M. Dowling, H. So, **A. Toor**, C. A. Chapin, D. G. Senesky, "Lithography-free Microfabrication of AlGaIn/GaN 2DEG Strain Sensors using Laser Ablation and Direct Wire Bonding", **Microelectronic Engineering**, 2017.
- [P13] **A. Toor**, T. Feng, and T. P. Russell, "Self-assembly of nanomaterials at fluid interfaces", **The European Physical Journal E**, vol. 39(5), 2016.
- [P14] A. Garg, **A. Toor**, S. Thakkar, S. Goel, S. Maheshwari, and S. Chand, "The Autotrix: Design and Implementation of an Autonomous Urban Driving System", **Advanced Materials Research**, vol. 403–408, Nov. 2011, pp. 3884–3891.
- [P15] **Anju**, S. Goel and P. Khanna, "Mathematical Analysis of Centreboard Hopper Parts Feeder", **International Journal of Advanced Engineering Applications**, vol. 3 (6), 2010, pp. 94-100.

#### Peer-reviewed Conference Publications

- [P16] **A. Toor** and A.P. Pisano, "Gold Nanoparticle/Polymer Composites with Improved Particle Dispersion", IEEE NANO, International Conference on Nanotechnology, Rome, Italy, July 2015.
- [P17] M. Makihata, B. Eovino, X. Jiang, **A. Toor**, K.L. Dorsey and A.P. Pisano, "Non-invasive and remote pipeline rehabilitation technology using reactive and magnetic particles", PIPELINES, International Conference on Pipeline Engineering and Construction, Maryland, United States, August 2015.
- [P18] **A. Toor**, J.C. Cheng and A.P. Pisano, "Synthesis and Characterization of Gold Nanoparticle/SU-8 Polymer based Nanocomposite", IEEE NEMS, International Conference on Nano/Micro Engineered and Molecular Systems, Honolulu, Hawaii, April 2014, pp. 664-668.

- [P19] **A. Toor**, A. Garg, S. Thakkar, S. Goel, S. Maheshwari, and S. Chand, “Object Identification and Mapping using Monocular Vision in an Autonomous Urban Driving System”, International Conference on Machine Vision, 2010, pp. 637–641.
- [P20] **Anju**, S.P. Singh, S. Ghosh, and P. Khanna, “ Mathematical Performance Analysis of Reciprocating fork feeder”, Student Conference on Research & Development, Serdang, Malaysia, 2009, pp. 464-467.
- [P21] **Anju**, S. Goel, and P. Khanna, “ Design, Fabrication & Analysis of Centreboard Hopper Parts Feeder”, International Conference on Advances in Mechanical Engineering, Surat, India, 2008.

### Peer-reviewed Meeting Abstracts

- [A1] Y. Chai, A. Lukito, J. Hasnain, **A. Toor**, Y. Jiang, J. Forth, P. Geissler, and T.P. Russell, “2D to 3D transition of nanoparticles assembled at the liquid interface”, American Physical Society (APS) March Meeting, 2020.
- [A2] **A. Toor**, A. Wen and A.C. Arias, “Printed miniature Lithium-ion batteries for IoT devices”, Materials Research Society (MRS) Fall Meeting, 2019.
- [A3] M. Ahmed, A. Vogliano, **A. Toor**, et al. “Flexible, Printed Non-Fullerene Acceptor Based Near-Infrared Organic Photodiodes”, MRS Fall Meeting, 2019.
- [A4] Y. Chai, A. Lukito, J. Hasnain, **A. Toor**, W. Feng et al. “Anomalous Compliance of Structured Liquids”, MRS Fall Meeting, 2019.
- [A5] B. Helms, T.P. Russell, W. Feng, J. Forth, **A. Toor**, “Reconfigurable all-liquid systems via nanoparticle-polymer surfactants assembled at a liquid-liquid interface”, American Chemical Society (ACS), 2018.
- [A6] **A. Toor**, B. Helms and T. P. Russell, “Nanoparticle-Polymer Surfactant Covered Monodispersed Droplets using Microfluidics”, APS March Meeting, 2018, L60-164.
- [A7] J. Forth, **A. Toor**, X. Liu et al., “Printed Active Liquids”, APS March Meeting, 2018, L60-048.
- [A8] A. Mariano, J. Forth, J. Hasnain, **A. Toor** et al. “Wrinkle-Fold Coexistence and Stress Propagation in Nanoparticles at the Oil-Water Interface”, APS March Meeting, 2018, A54-007.
- [A9] **A. Toor**, B. Helms and T. P. Russell, “Reconfigurable Microfluidic Droplets Stabilized by Nanoparticle Surfactants”, MRS Fall Meeting, 2017.
- [A10] **A. Toor** and A.P. Pisano, “Design and Characterization of sub-10 nm Metal Nanoparticle-PVDF Nanocomposite Based Solid-State Dielectric Material”, MRS Spring Meeting, 2017.
- [A11] **A. Toor**, B. Helms, and T. P. Russell, "Effect of nanoparticle surfactants on the Plateau-Rayleigh instability", APS March Meeting, 2017, H17-003.
- [A12] J. Forth, **A. Toor**, T. P. Russell et al. "Nanoparticle-surfactant Films: Coalescence and Interfacial Rheology", The Society of Rheology, 88th Annual Meeting, 2017.