

C. Chandraprakash

CONTACT INFORMATION

Department of Mechanical Engineering
Indian Institute of Technology Kanpur

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RESEARCH INTERESTS

My current focus is on: Thermomechanics based NDE, acoustic metamaterials, biomimetic design, instrumentation, and multifunctional thin films. In all these projects, I apply numerical techniques and mathematical models to understand experiments towards building products.

EDUCATION

Doctor of Philosophy in Engineering Science and Mechanics **Aug 2011 - Feb 2017**
The Pennsylvania State University, University Park, PA, USA **GPA: 3.8/4**

- Dissertation: Multifunctional Parylene-C microfibrinous thin films
- Advisors: Prof. Osama O. Awadelkarim, Prof. Akhlesh Lakhtakia

Master of Technology in Mechanical Engineering **Aug 2008 - May 2010**
Specialization: Product Design **GPA: 8.2/10**
Indian Institute of Technology Madras, Chennai, India

- Dissertation: Modeling thermomechanical response of stainless steel subjected to monotonic tensile and cyclic loading
- Advisors: Prof. Krishnan Balasubramaniam, Prof. Krishnamurthy Chitti Venkata

Bachelor of Technology in Mechanical Engineering **Aug 2005 - May 2008**
Minor: Industrial Engineering **GPA: 8.2/10**
Indian Institute of Technology Madras, Chennai, India

ACADEMIC AND RESEARCH EXPERIENCE

Assistant Professor **Dec 2017 - present**
Indian Institute of Technology Kanpur, India

- **Sponsored research:** SERB Early Career Award – 36L, Initiation grant – 25L, Air Force – 35L.
- **Consultancy:** Sterlite Technologies – 1L and L & T Defense – 3L. Both completed
- **Guidance:** Ongoing – 2 M.Tech; Just joined – 2 MS, 2 M. Tech, and 1 PhD; Internships - 1 TEQIP and 3 SURGE.
- **Courses:** New modular course ME698E: Fabrication and mechanics of thin films. Instructor and tutor for Mechanical UG and PG, and ESO courses.
- **Acad service:** (a) Invited Dr. Anil Sinha of RRCAT, Indore for E C Subbarao Lecture, MSE and (b) Examiner for MS and M. Tech theses from EE, ChemE, MSE, and ME, and PhD theses of ME.
- **Committees:** Student awards, Techkriti, Smart India Hackathon, and Project Scientist.
- **Publications:** Published two journal papers.

Visiting Assistant Professor **Oct 2017 - Dec 2017**
Indian Institute of Technology Kanpur, India

- Charted plans for Masters theses, researched new topics, and prepared a half-time course

Research and Teaching Assistant **Aug 2012 - April 2017**
Pennsylvania State University, University Park, Pennsylvania USA

- Computational investigation of phononic and photonic filtering characteristics of Parylene-C microfibrinous thin films
- Experimental characterization of Parylene C columnar microfibrinous thin films via measurement of following: SEM images, low-frequency mechanical and dielectric properties, wetting characteristics, X-ray diffraction, and infrared spectrums
- Analytical modeling of microfluidic devices towards estimating resonance frequencies of trapped bubbles

Project Officer & Research Assistant

May 2008 - July 2010

Center for Non-Destructive Evaluation, Indian Institute of Technology Madras, Chennai, India

- Provided a micromechanics-based explanation for the thermal response of a SS304 material subjected to cyclic and tensile loading
- Developed thermomechanical models for cyclic and tensile loading and established correlations for the model parameters and grain boundary parameters
- Designed and conducted experiments for determining grain size of stainless steel using non-contact thermal techniques

TECHNICAL SKILLS

Fabrication: Fibrous and conventional Parylene C chemical vapor deposition, 4 years experience in class 1000/100 cleanroom and dealing with vacuum systems

Characterization: SEM imaging, Profilometry, C-D and dielectric breakdown, Dynamical mechanical analysis, Infrared spectroscopy – ATR and Transmission, X-Ray diffraction – WAXS, Contact angle measurements, Bulk mechanical testing, Infrared thermography, Energy dispersive spectroscopy

Hands-on experience in laboratory and field

COMPUTATIONAL SKILLS

MATLAB, Shell scripting, COMSOL, C, Scheme, Mathematica

JOURNAL

17 peer-reviewed journal papers – 14 first-author papers and 3 second-author papers

PUBLICATIONS

C Chandraprakash, V C Venugopal, A Lakhtakia, and O O Awadelkarim, “Long-wavelength infrared characteristics of multifunctional microfibrillar thin films of Parylene C,” *Microwave Optics and Technology Letters*, vol. 61, no. 9, 2206–2209 (2019). doi:10.1002/mop.31868

C Chandraprakash, C V Krishnamurthy, and K Balasubramaniam, “Thermomechanical phenomenon – A non-destructive evaluation perspective,” *Transactions of the Indian Institute of Metals*, 1–11 (2019). doi: 10.1007/s12666-019-01656-6

I H Khawaji, C Chandraprakash, O O Awadelkarim, and A Lakhtakia, “Selectability of mechanical and dielectric properties of Parylene-C columnar microfibrillar thin films by varying deposition angle,” *Flexible and Printed Electronics*, vol. 2, no. 4, 045012 (2017). doi:10.1088/2058-8585/aa9f33

I H Khawaji, C Chandraprakash, O O Awadelkarim, and A Lakhtakia, “Dielectric properties of and charge transport in columnar microfibrillar thin films of Parylene C,” *IEEE Transactions on Electron Devices*, vol. 64, no. 8, 3360–3367 (2017). doi:10.1109/TED.2017.2711481

C Chandraprakash, “Multifunctional Parylene-C microfibrillar thin films,” Ph.D. thesis, *Pennsylvania State University*, February 2017. doi:10.13140/RG.2.2.10004.71049

C Chandraprakash, A Lakhtakia, and O O Awadelkarim, “Parylene-C microfibrillar thin films as phononic crystals,” *Journal of Micromechanics and Microengineering*, vol. 27, no. 7, 075012 (2017). doi:10.1088/1361-6439/aa717f

C Chandraprakash, A Lakhtakia, N R Brown, W Orfali, and O O Awadelkarim, “Temperature-dependent dynamic mechanical moduli of microfibrillar columnar thin films of Parylene C,” *Polymer Testing*, vol. 53, 89–97 (2016). doi:10.1016/j.polymertesting.2016.05.010

C Chandraprakash, A Lakhtakia, and O O Awadelkarim, “Reply to comment on surface energy of Parylene C,” *Materials Letters*, vol. 166, 325–326 (2016). doi:10.1016/j.matlet.2015.12.127

C Chandraprakash, A Lakhtakia, O O Awadelkarim, and W Orfali, “Relative permittivity of bulk Parylene-C in the infrared regime,” *Journal of Electromagnetic Waves and Applications*, vol. 29, no. 16, 2139–2146 (2015). doi:10.1080/09205071.2015.1074875

C Chandraprakash, A Lakhtakia, and O O Awadelkarim, “Surface energy of Parylene C,” *Materials Letters*, vol. 153, 18–19 (2015). doi:10.1016/j.matlet.2015.04.009

C Chandraprakash, N M Wonderling , A Lakhtakia, O O Awadelkarim, and W Orfali, "Microfiber inclination, crystallinity, and water wettability of microfibrillar thin-film substrates of Parylene C in relation to the direction of the monomer vapor during fabrication," *Applied Surface Science*, vol. 345, 145–155 (2015). doi:10.1016/j.apsusc.2015.03.165

Y Xie, C Chandraprakash, N Nama, S Yang, M Lu, Y Zhao, J D Mai, F Costanzo, and T J Huang, "Exploring bubble oscillation and mass transfer enhancements in acoustic-assisted liquid-liquid extraction with a microfluidic device," *Scientific Reports*, vol. 5, no. 12572 (2015). doi:10.1038/srep12572

C Chandraprakash, A Lakhtakia, N R Brown, W Orfali, and O O Awadelkarim, "Frequency- and temperature-dependent storage and loss moduli of microfibrillar thin films of Parylene C," *Materials Letters*, vol. 116, 296–298 (2014). doi:10.1016/j.matlet.2013.11.054

C Chandraprakash, A Lakhtakia, O O Awadelkarim, and W Orfali, "Acoustic scattering from microfibrillar fibers of Parylene C," *Journal of Applied Physics*, vol. 116, no. 13, 134905 (2014). doi:10.1063/1.4896946

C Chandraprakash, N Nama, M I Lapsley, F Costanzo, and T J Huang, "Theory and experiment on resonant frequencies of liquid-air interfaces trapped in microfluidic devices," *Journal of Applied Physics*, vol. 114, no. 19, 194503 (2013). doi:10.1063/1.4827425

C Chandraprakash, "Fourier modal method and its applications in computational nanophotonics," *Journal of Nanophotonics*, vol. 7, no. 1, 9898 (2013) – book review. doi:10.1117/1.JNP.7.079898

C Chandraprakash, C V Krishnamurthy, K Balasubramaniam, and R V Prakash, "Thermomechanical response of metals: Maxwell vs. Kelvin–Voigt models," *Materials Science and Engineering: A*, vol. 560, 54–61 (2013). doi:10.1016/j.msea.2012.08.152

CONFERENCE
PROCEEDINGS

I H Khawaji, C Chandraprakash, W Orfali, A Lakhtakia, and O O Awadelkarim, "Electrical studies on Parylene-C columnar microfibrillar thin films," *The Electrochemical Society*, Phoenix, USA vol. 69, no. 5, 113–119, October 2015. doi:10.1149/06905.0113ecst

M I Lapsley, D Ahmed, C Chandraprakash, F Guo, M Lu, L Wang, and T J Huang, "Monitoring acoustic bubble oscillations with an optofluidic interferometer," *16th International Conference on Miniaturized Systems for Chemistry and Life Sciences*, Okinawa, Japan, 1906–1908, October 2012

R V Prakash, K Thiyagarajan, C Chandraprakash, and K Balasubramaniam, "Thermographic evaluation of SS 304 material during monotonic loading," *ASME 2009 International Mechanical Engineering Congress and Exposition: Processing and Engineering Applications of Novel Materials*, Florida, USA, vol. 14, 183–187, November 2009. doi:10.1115/IMECE2009-10697

CONFERENCE
PRESENTATIONS

I H Khawaji, C Chandraprakash, O O Awadelkarim, and A Lakhtakia, "Engineering the dielectric and mechanical properties of Parylene-C columnar microfibrillar thin films by controlling the deposition angles," *Materials Science & Technology: Advances in Dielectric Materials and Electronic Devices*, Pittsburgh, USA, October 2017

C Chandraprakash, A Lakhtakia, and O O Awadelkarim, "Charge-storage and absorption characteristics of Parylene-C columnar thin films," *Center for Dielectric and Piezoelectrics, Spring Meeting*, University Park, USA, April 2017

C Chandraprakash, N M Wonderling , A Lakhtakia, O O Awadelkarim, and W Orfali, "Columnar multifunctional microfibrillar Parylene-C thin films: Microfiber inclination, crystallinity, and water wettability," *Materials Research Symposium: Multifunctionality in Polymer-Based Materials, Gels and Interfaces*, Boston, USA, December 2015

I H Khawaji, C Chandraprakash, W Orfali, A Lakhtakia, and O O Awadelkarim, "The effects of morphology on the dielectric and mechanical properties of Parylene-C microfibrillar thin films," *The Electrochemical Society*, Cancun, Mexico, no. 11, 683–683, October 2014

C Chandraprakash, N R Brown, O O Awadelkarim, W Orfali, and A Lakhtakia, "Mechanical properties of microfibrinous films of Parylene C for acoustic applications," *Materials Science & Technology: Mechanical Behavior of Technological Coatings and Thin Films – Relating Synthesis, Structure, and Mechanical Property Relationships*, Pittsburgh, USA, October 2014

INVITED TALKS

"Multifunctional metamaterials of Parylene C," *Millersville University*, Pennsylvania, USA, March 2017

"Plane-wave expansion method for multifunctional metamaterials," *QIP Short Course* on "Electromagnetic Metamaterials: Microwave-Infrared-Optical Applications" in IIT Kanpur, Uttar Pradesh, India, August 2019

TEACHING EXPERIENCE

Distinguished Teaching Fellow in College of Engineering, Penn. State Univ., USA

- **E MCH 211 Statics** **Spring 2016**
Complete responsibility of the course. Prepared and delivered lectures, conducted weekly-quizzes, and 3 exams for 80 students

Teaching Assistant at Center for Nanotechnology Education and Utilization, Penn. State Univ., USA

- **E SC 211, 212, 213, & 214 – Nanotechnology** **Summer 2016**
Responsible to prepare standard operation procedures, notes for reading material, lectures, and theory for measurements
Prepared notes for Masters program and taught the operation of Scanning Electron Microscope

Teaching Assistant in Engineering Science and Mechanics, Penn. State Univ., USA

- **E MCH 315 – Mechanical response of materials** **Fall 2011 and Spring 2012**
Responsible for grading weekly assignments of 380 and 250 students in a team of 2
Developed guidelines for problem-solving approaches to sophomores and juniors
- **E MCH 211 – Statics** **Spring 2015**
Responsible for grading exams and weekly quizzes of 80 students
- **E MCH 212 – Dynamics** **Fall 2016**
Responsible for grading exams and reciting weekly lectures of 110 students
- **E SC 400, 404H** **Spring 14 - Spring 2016**
Substituted for a total of 18 lectures for "Mathematical methods for Engineers," and "Electromagnetic Fields" courses

INDUSTRIAL EXPERIENCE

Technical Manager in Noise Vibration Harshness department

Engineering Research Center, Tata Motors Ltd., Pune, India **Sep '10 - July '11**

- Quantitative data analysis for noise and vibration characteristics of 'small commercial vehicles'
- Developed technical reports, presentations, and proposals for field and external collaborations

Internship Trainee

Engineering Design Centre, Caterpillar India Private Ltd., India **May '08 - July '08**

- Worked on designing of anti-toppling mechanisms for gantry structures and developed stability criteria for shop floor structures
- Performed 'Value Stream Mapping' for the Virtual Manufacturing Engineering group to determine flaws in the current work distribution

AWARDS AND HONORS

- Paul A. Lester Memorial Award for best PhD research in microelectronics in Department of Engineering Science and Mechanics, Penn State University 2017
- Distinguished Teaching Fellow in College of Engineering, Penn State for 2015-16
- Won 3rd prize for poster presentation in *ESM Today*, graduate research symposium of Department of Engineering Science and Mechanics, Penn State University 2017
- Won 2nd prize for poster presentation in *ESM Today* 2013

- Won *Project-X*, a hands-on design competition in *WAVES* – Technical festival of Department of Naval Architecture and Ocean Engineering, IIT Madras 2008
- Recipient of Merit cum Means award from IIT Madras 2005-09
- Secured 132nd rank among 200,000 students in Graduate Aptitude Test Examination 2008
- Secured 143rd rank among 450,000 students in All-India-Engineering-Entrance-Examination 2005

CO-CURRICULAR
ACTIVITIES

- President (Aug'13 - May'14) and Vice-President (Aug'14 - May'15) Engineering Science and Mechanics Graduate Student Council
 - Organized annual Graduate Research Symposium comprising poster presentations and seminars from graduate students
 - Coordinated ESM graduate student recommendations to faculty
- Reviewer for College of Engineering Research Symposium, CERS 2015
- Reviewer for 'Materials Letters' journal 2015 to present
- Reviewer for 'Sadhana' journal 2018 to present
- Reviewer for 'Applied Surface Science' journal 2016 to present
- Reviewer for 'Physical Chemistry Chemical Physics' journal 2017 to present
- Student member of 'Material Advantage Program (TMS, ACerS, AIST, ASM)' for 2014–17
- Member of 'The Materials Research Society' for 2015–17