Preetika Karnal

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Summary

Ph.D in Chemical and Biomolecular Engineering from **Johns Hopkins University** and B.Tech in Chemical Engineering with Honors from **IIT Bombay**, with extensive peer-reviewed research experience spanning over 8 years.

Seeking roles in **process engineering**, materials science, chemical engineering, **semiconductors** or related fields.

Detail-oriented and innovative **problem-solver** with strengths in **experimental design (DoE)**, data analysis, and cross-functional **collaboration**, complemented by prior experience at reputed organizations such as **3M Company** and **HPCL-Mittal Energy Limited**.

Education

Johns Hopkins University
Baltimore, MD

Ph.D. in Chemical and Biomolecular Engineering
2021

- Advisor: Joelle Frechette

Indian Institute of Technology Bombay
Mumbai, MH

B.Tech in Chemical Engineering *with Honors*
2014

- Advisor: Mahesh Tirumkudulu

Skills

Software	**Python**, C++, Minitab, LabView, ImageJ, **MATLAB**, Origin Pro, LaTeX, Abaqus
Material characterization	Oscillatory Rheology, Adhesion testing, Microscopy
Surface characterization	Zeta potential, Contact Angle, Fourier Transfer Infrared Spectroscopy, Optical Interferometry
Surface treatments	Glass Silanization, **Plasma treatment**, Piranha treatment

Work Experience

Postdoctoral Research Associate
Bethlehem, PA

Lehigh University| PI: Anand Jagota
Sep 2021 - PRESENT

- Led a project on interfacial mechanics and surface energetics.
- Developed an innovative tool to measure adhesion in rough elastomers, rigorously validated through **statistical analysis**.
- Automated image processing using machine learning, saving 1200 hours of manual work.

Doctoral Researcher
Baltimore, MD

Johns Hopkins University| PI: Joelle Frechette
Aug 2015 - Jul 2021

- Led research on viscoelasticity and interfacial phenomena in adhesive **thin films** under extreme conditions.
- Mastered new techniques and resolved challenges related to home-built Multifunctional Force Microscope.
- Analyzed pH-dependent adhesion of acrylic polymers, informing underwater adhesive design.
- Collaborated on connecting viscoelastic polymer deformation with Saffman-Taylor instabilities during debonding.

Summer Intern
Summer 2018

3M Company | Supervisor: Dr. Carlos Barrios

- Conducted high-resolution imaging of pressure-sensitive adhesive tapes during debonding in various environments.
- Developed an enhanced protocol for quantifying underwater adhesion in peel and tensile modes.

Graduate Engineer Trainee
2014-2015

HPCL-Mittal Energy Limited | Supervisor: Gaurav Kumar Gupta

- Optimized feed components and conducted root cause analyses to enhance product **yield** and quality.
- Developed daily production plans aligning with market conditions, demand, and supply.

Summer Researcher
Edmonton, CA

University of Alberta| PI: Arvind Rajendran *May 2013 - Jul 2013*

- Optimized productivity in simulated moving bed chromatography using Triangle Theory.
- Presented findings through a poster and a video conference with experts at LIT, Finland.

Undergraduate Researcher
Mumbai, MH

Indian Institute of Technology Bombay| PI: Mahesh Tirumkudulu *2013 - 2014*

- Investigated dynamic thickness changes in soap films under acoustic forcing using fluorescence imaging.
- Observed and quantified mass accumulation at antinodes, correlating with increased light intensity.

Publications

*co-first authors

1. Li, M.*,**Karnal, P.***, Lu, Y.*, Hui, C.Y., and Jagota, A., *Slicing of a soft solid*, Journal of Chemical Physics, 159(11), 2023.
2. **Karnal, P.**, Wang, Y., Jha, A., Gryska, S., Barrios, C., and Frechette, J., *Interface stabilization in adhesion caused by elastohydrodynamic deformation*, Physical Review Letters, 131(13):138201, 2023.
3. Lamberty, Z. D., Tran, N. T., van Engers, C. D., **Karnal, P.**, Knorr Jr, D. B., and Frechette, J., *Cooperative Tridentate Hydrogen-Bonding Interactions Enable Strong Underwater Adhesion*, ACS Applied Materials and Interfaces, 15(29):35720–35731, 2023.
4. Jha, A.,**Karnal, P.** and Frechette, J., *Adhesion of fluid infused silicone elastomer to glass.*, Soft Matter, 18(39):7579–7592, 2022.
5. **Karnal, P.**, Jha, A., Wen, H., Gryska, S., Barrios, C., and Frechette, J., *Contribution of Surface Energy to pH-Dependent Underwater Adhesion of an Acrylic Pressure-Sensitive Adhesive.*, Langmuir, 35(15):5151–5161, 2019.
6. **Karnal, P.**, Roberts, P., Gryska, S., King, C., Barrios, C., and Frechette, J., *Importance of Substrate Functionality on the Adhesion and Debonding of a Pressure-Sensitive Adhesive under Water.*, ACS applied materials and interfaces, 9(48):42344–42353, 2017.
7. Dillard, D. A., Mukherjee, B., **Karnal, P.**, Batra, R. C., and Frechette, J.,*A review of Winkler's foundation and its profound influence on adhesion and soft matter applications.*, Soft Matter, 14(19):3669–3683, 2018.
8. Maruyama, R. T., **Karnal, P.**, Sainio, T., and Rajendran, A., *Design of bypass-simulated moving bed chromatography for reduced purity requirements.*, Chemical Engineering Science, 205:401–413, 2019.