PALLAV K. JANI

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SUMMARY

Collaborative researcher with 4+ years of combined industrial and academic R&D experience in interfacial and surfactant science, rheology and tribology, test method development and surface characterization

Experimental & Analytical Skills: Rheological & tribological characterization of gels and coatings; Component interactions in polymeric formulations – isothermal titration calorimetry (ITC), quartz crystal microgravimetry (QCM); Goniometry; Electron microscopy; Confocal laser profilometry; FTIR spectroscopy; UV-vis spectroscopy

Computational Skills: MATLAB, Python, Origin, ImageJ, COMSOL

EDUCATION

North Carolina State University — **Raleigh, NC**
Doctor of Philosophy (Ph.D.), Chemical Engineering — expected December 2023

University of Michigan — **Ann Arbor, MI**
Master of Science in Engineering (M.S.E), Chemical Engineering — December 2018

Institute of Chemical Technology — **Mumbai, India**
Bachelor of Technology (B.Tech.), Oils, Oleochemicals and Surfactants — May 2017

RESEARCH EXPERIENCE

Graduate Researcher | North Carolina State University, Raleigh, NC — September 2019 - present
Advisors: **Saad Khan** and **Lilian Hsiao**

Friction reduction by an amphiphilic slip additive on polymeric substrates

- Demonstrated adhesion and load-dominant friction dissipation modes of erucamide, an organic slip additive, on different stiff and soft substrates such as PP, LDPE and silicone elastomer
- Correlated friction reduction benefit of solid lubricant to the dissipation mode and materials properties of the polymer

Thermodynamics of epoxy-metal oxide adhesion in bisphenol A (BPA)-based epoxy can coating formulations (with Eastman)

- Identified molecular binding mechanism of epoxy resins with metal oxides (SnO_2, Al_2O_3 and Cr_2O_3) using ITC
- Established critical role of benzene rings of the epoxy resins in the entropy-driven binding to optimize adhesion

pH-dependent effects of component interactions in collagen-tannic acid formulations on hydrogel rheology

- Determined quantitative correlation between interaction enthalpy (ΔH) and hydrogel mechanical strength at different pHs
- Identified role of hydrogel hydration in weakening collagen-tannic acid interactions using QCM

Research Assistant | University of Michigan, Ann Arbor, MI — October 2017 – April 2019
Advisors: **Johannes Schwank, Galen Fisher** and **John Hoard**

Anti-adhesive metal coating to mitigate low temperature (<250°C) turbocharger compressor coking (with Ford Motor Company)

- Developed sputtered thin transition metal coating to reduce low temperature turbocharger compressor coking by > 90%
- Optimized an oil aerosol testing apparatus at Ford R&D to simulate turbocharger deposits and screen metal coatings
- Designed and validated benchtop apparatus to simulate compressor flow conditions for testing coke-metal adhesion

Student Researcher | University of Michigan, Ann Arbor, MI — January – December 2018
Advisors: **Paul Zimmerman** and **Frank Reinhold** (BASF)

Impact of shear on dirt removal in automated washing (Multidisciplinary Design Project with BASF)

- Designed lab-scale rotating dishwashing setup to quantify dirt removal under shear and implemented 2^3 factorial DOE testing protocol
- Distinguished effect of non-ionic surfactant structure on detergency-driven and shear-driven dirt removal regimes

Undergraduate Researcher | Institute of Chemical Technology, Mumbai, India — November 2016 – April 2017
Advisor: **Ravindra Kulkarni**

Surfactant assisted co-precipitation to control nanoparticle morphology

- Examined the role of surfactant type on the morphology of synthesized nanoparticle precipitates using electron microscopy
- Optimized two precursor mixing strategies – dilution and droplet mixing, to control nanoparticle shape

PROFESSIONAL EXPERIENCE

Contact Physics & Tribology Intern | Corporate R&D, TE Connectivity, Harrisburg, PA June – August 2022

Tribological investigations of surface coatings for stamping tool life improvement and EMI shielding

- Characterized dry and lubricated friction, wear analyses and identifies failure modes for 15+ coating formulations
- Developed performance rating matrix to down-select 2-3 promising coatings for product-level testing
- Collaborated with stakeholders from two different business units across three R&D projects

Product Development Intern | Ford Motor Company, Dearborn, MI May – July 2019

Friction modeling in diesel engines to predict fuel economy benefits of friction reducing technologies

- Optimized and validated piston-ring friction simulation models in GT-Suite with field trial data for diesel engines with < 10% deviation
- Translated friction reduction of ring coatings and low viscosity oils into fuel economy benefits (0.6-1%) via modified fuel maps

Process Engineering Intern | Adani Wilmar Limited, Mundra, India May – June 2016

- Identified key areas of oil loss (1.4%) by documentation of material flow of palm oil and palm oil-based products
- Proposed optimizations in pressure leaf filtration system to minimize oil loss and increase efficiency of oil refinery

SELECT PUBLICATIONS & CONFERENCE PRESENTATIONS

- Sarker, P.#, **Jani, P.#** et al. "Interacting Collagen and Tannic Acid particles: Uncovering pH-dependent Rheological and Thermodynamic Behaviors" J. Colloid Interface Sci. **2023**, 650, 541-552 (#co-first author)
- Adhikari, P.#; **Jani, P.#** et al. "Interfacial contributions in nanodiamond-reinforced polymeric fibers" J. Phys. Chem. B **2021**, 125, 10312-10323 (#co-first author)
- **Jani, P.** et al. "Frictional shear stress dissipation in slip-induced solid lubricant using tribo-rheometry" The Society of Rheology 93rd Annual Meeting, PF9, **2022**
- **Jani, P.** et al. "Binding interactions at the bisphenol A (BPA) epoxy coating – metal oxide interface: An isothermal titration calorimetry study" American Chemical Society Spring Meeting, 3645016, **2022**
- **Jani, P.**; Farias, B.; Khan, S. A. "Polymer microgels containing nanodiamonds: pH dependent component interactions and rheology" Bulletin of the American Physical Society, 66, **2021**

LEADERSHIP AND OTHER ACTIVITES

Graduate Teaching Assistant | North Carolina State University, Raleigh, NC

- Advanced Process Modeling (Fall 2020), Transport Phenomena (Spring 2021), Polymer Rheology (Spring 2022)
- Designed homework and examinations for graduate-level courses of process modeling and polymer rheology for 30+ students
- Conducted weekly office hours to assist and guide students through the course across three semesters

Graduate Student Member

- American Institute of Chemical Engineers (AIChE), American Chemical Society (ACS), Society of Rheology (SoR)

Event Organizer | Sportsaga, Institute of Chemical Technology, Mumbai, India

- Supervised and coordinated a university-level cricket tournament comprising 16 teams across Mumbai (2014-2016)

AWARDS & PROPOSALS

- Contributed towards drafting successful research grant proposal on "biopolymer surface modification and biodegradability" sponsored by The Nonwovens Institute at North Carolina State University worth $180K (2022)
- 'Best Overall Award' and 'Best Technical Award' for technical and presentation excellence at The Nonwovens Institute's Industry Advisory Board Meeting for research on solid lubricant – surfactant coating interactions (2022-23)
- Graduate Student Association's Travel Award to support attendance at the ACS Spring Meeting (2022)
- 'Division of Soft Matter Meeting Grant' to support attendance at the American Physical Society Annual Meeting (2021)
- 'Provost's Doctoral Fellowship' and 'Graduate Merit Award' (2019-2020)