Arvind Ganesan

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Education

Doctor of Philosophy (Aug'18 – Aug'23)
School of Chemical and Biomolecular Engineering, Georgia Institute of Technology, Atlanta, GA (GPA: 4.0/4.0)

Bachelor of Technology and Master of Technology (July'11 – May'16)
Department of Chemical Engineering, Indian Institute of Technology, Roorkee, India (GPA: 8.796/10)

Research Experience

Functional Porous Liquid-Based Adsorbents and Membranes for Carbon Capture: Postdoctoral (Sep'23 – Present)
Advisors: Dr. Shannon Mahurin & Prof. Sheng Dai, Oak Ridge National Laboratory

- Thermodynamics and kinetics of CO_2 adsorption in porous liquids with spectroscopic and gravimetric measurements.
- Synthesis and characterization of mixed-matrix membranes (MMM) from porous liquids for gas separations.

Controlled Demolition and Reconstruction of Metal-Organic Frameworks (MOFs) Into Functional New Materials: Doctoral Thesis (Aug'18 – Aug'23)
Advisors: Prof. Sankar Nair & Prof. David Sholl, Georgia Tech

- Developed and generalized the controlled reconstruction approach to recover acid gas-induced industrial degradation in MOFs and extended to the synthesize new MOFs from degraded crystals.
- Develop structure-property relations of hybrid MOFs with a particular focus on enhanced separations and catalysis.

Integrated Process for PET Recycling Combining Mechanochemical Depolymerization and Monomer Purification (Aug'20 – Jul'22)
Advisor: Prof. Sankar Nair, Georgia Tech

- Design and demonstrate energy-efficient separation process flow for recovery of ethylene glycol, and terephthalic acid (to desired specifications) from mechanocatalytically depolymerized PET (polyethylene terephthalate).
- Investigate gradual progress of depolymerization reaction with PFG-NMR (Pulse-Field Gradient Nuclear Magnetic Resonance) and micro-CT (computed tomography) to develop a viable reaction mechanism.

Mesoporous Alumina-based Trimetallic NiCoMo Catalyst for hydrotreating of heavy gas oil: Master's Thesis (Jul'15 – Jun'16)
Advisor: Prof. Shri Chand, IIT Roorkee

- Synthesize mesoporous alumina-based trimetallic catalyst and subsequently test for hydrotreating of heavy gas oil.
- Screen catalyst metal loading and synthesis to achieve optimal performance and process parameter.

Professional Experience

Scientist-SC, Space Application Centre- Indian Space Research Organisation (ISRO), India (Apr'17 – Jun'18)

- Technology Development Project- Development of gold electroplating process (pattern up plating) on microelectronic circuits (~10 nanometers) for space applications.
- Task Team Member- Development of TWTA (Travelling Wave Tube Amplifier) for satellite payloads.
- Engineer, Chemical Lab- Surface treatment on satellite payload parts (over 40 metal coating process).

Process Design Trainee, Chemical Technology Group- SRF Limited, India (Jul'16 – Apr'17)

- Process and Equipment Design of electrochemical facility and Active Intermediates production facility.
- Preparation of Basic Engineering Package consisting of Process Diagrams, Process Description, Design and Selection of Electrochemical cells, supporting equipment, and Instrumentation.

Professional Society Service

- Peer-reviewed 10+ manuscripts for several chemical engineering journals (Elsevier, ACS, and RSC)
- Session Chair, Membranes: Materials and Processes (Gordon Research Seminar) 2024
- Session Chair, postdoc symposium 2024 (ORNL)
- Conference Chair, Membranes: Materials and Processes (Gordon Research Seminar) 2026

Leadership Experience

Senator, Graduate Student Senate- Student Government Association (Jan'20 – Aug'20)

- Annual budget allocation for recurring student activities by the student senate.
- Member, Special Review Committee for updating Senate Constitution and By-laws

Student Representative, Amplifying Impact- Institute Strategic Planning Committee (Jan'20 – May'20)

- Draft Institute Goals for 'Amplifying Impact in Research' for 2021-2030
- Development of sub-aims and associated metrics for the institute's goals

Lab Manager and Safety Officer, Acid Gas Lab and Synthesis Lab (Aug'20 – Aug'23)

- Operations, inspection, and safety (purchase, storage, waste management)
- Represented Georgia Tech at Partners in Academic Laboratory Safety (Exxon PALS Workshop 2023)

Selected Publications

- Mokhtari-Nori, N., Qiu, L., Song, Y., He, L., **Ganesan, A.**, Ivanov, A., ... & Dai, S. Unveiling the Porosity Effect of Superbase Ionic Liquid-Modified Carbon Sorbents in CO 2 Capture from Air. *Available at SSRN 4907419*.
- Li, E., Li, B., **Ganesan, A.**, Qiu, L., Jiang, D. E., Mahurin, S. M., ... & Dai, S. "Supramolecular Complexation-enhanced CO2 Chemisorption in Amine-derived Sorbents" *Chemistry–A European Journal*, e202402137.
- **Ganesan, A.**, * Anglou, E., * Chang, Y., Fu, Q., Bradley, W., Jones, C.W., Sievers, C., Nair, S., and Boukouvala, F. "Process Development and Techno-Economic Analysis for Mechanochemical Recycling of Poly(ethylene terephthalate)" – *Chem. Eng. J. 2023*: 148278.
- **Ganesan, A.**, Metz, P. C., Thyagarajan, R., Chang, Y., Purdy, S. C., Jayachandrababu, K. C., Page, K.; Sholl, D. S., Nair, S. "Structural and Adsorption Properties of ZIF-8-7 Hybrid Materials Synthesized by Acid Gas-Assisted and De Novo Routes" – *J. Phys. Chem. C 2023*, 127 (49) 23956–23965.
- Chiang, Y., Fu, Q., Liang, W., **Ganesan, A.**, & Nair, S. "Recovery of 2, 3-Butanediol from Fermentation Broth by Zeolitic Imidazolate Frameworks" – *Ind. Eng. Chem. Res. 2023*, *62*(41), 16939-16944.
- **Ganesan, A.**, Leisen, J., Thyagarajan, R., Sholl, D. S., & Nair, S. (2023). "Hierarchical ZIF-8 Materials via Acid Gas-Induced Defect Sites: Synthesis, Characterization, and Functional Properties" – *ACS Appl. Mater. Interfaces*, *15*(34), 40623-40632.
- Anglou, E., Chang, Y., **Ganesan, A.**, Nair, S., Sievers, C., and Boukouvala, F. "Discrete Element Simulation and Economics of Mechanochemical Griding of Plastic Waste at an Industrial Scale" – *Comput. Aided Chem. Eng*. Vol. 52. *Elsevier, 2023*. 2405-2410.
- Min, Y. J., **Ganesan, A.**, Realff, M. J., & Jones, C. W. "Direct Air Capture of CO2 Using Poly (ethyleneimine)-Functionalized Expanded Poly (tetrafluoroethylene)/Silica Composite Structured Sorbents" – *ACS Appl. Mater. Interfaces 2022*, 14(36), 40992-41002.
- Tricker, A.W., Osibo, A.A., Chang, Y., Kang, J.X., **Ganesan, A.**, Anglou, E., Boukouvala, F., Nair, S., Jones, C.W. and Sievers, C. "Stages and Kinetics of Mechanochemical Depolymerization of Poly (ethylene terephthalate) with Sodium Hydroxide" – *ACS Sustain. Chem. Eng.* 2022, 10(34), 11338-11347
- Metz, P. C., Ryder, M. R., **Ganesan, A.**, Bhattacharyya, S., Purdy, S. C., Nair, S., & Page, K. "Structure Evolution of Chemically Degraded ZIF-8" – *J. Phys. Chem. C 2022*, 126(23), 9736-9741.
- **Ganesan, A.**, Purdy, S. C., Yu, Z., Bhattacharyya, S., Page, K.; Sholl, D. S., Nair, S. "Controlled Demolition and Reconstruction of Imidazolate and Carboxylate Metal–Organic Frameworks by Acid Gas Exposure and Linker Treatment" – *Ind. Eng. Chem. Res. 2021*, 60 (43), 15582–15592.

- Metz, P. C., Purdy, S. C., Ryder, M. R., **Ganesan, A.**, Nair, S., & Page, K. “Detailed total scattering analysis of disorder in ZIF-8” – J. Appl. Crystallogr. 2021, 54(3), 759-767.
- Korde, A., Min, B., **Ganesan, A.**, Yang, S., Wang, Z., Grosz, A., Jones, C.W. and Nair, S. “AEL Zeolite Nanosheet-Polyamide Nanocomposite Membranes on α-Alumina Hollow Fibers with Enhanced Pervaporation Properties” – *Ind. Eng. Chem. Res. 2020*, 59(33), 14789-14796.
- Badoga, S., **Ganesan, A.**, Dalai, A. K., and Chand, S. “Effect of synthesis technique on the activity of CoNiMo tri-metallic catalyst for hydrotreating heavy gas oil” – *Catalysis Today 2017*, 291, 160-171.
- Alhseinat, E., Pal, P., **Ganesan, A.**, and Banat, F. “Effect of MDEA degradation products on foaming behavior and physical properties of aqueous MDEA solutions” – *Int. J. of Greenh. Gas Control 2015*, *37*, 280-286.

Posters and Presentations

- **Ganesan, A.**, Janke. C., Li, E., Moitra, D., Mahurin, S.M., and Dai, S. “Proous Liquids as Precursor for Mixed-Matrix Membranes” – *2024 GRC and GRS Membranes: Materials and Processes.*
- **Ganesan, A.**, Osibo, A.A., Anglou, E., Boukouvala, F., Sievers, C., and Nair, S. “Separations Processes in Mechanocatalytic Plastics Recycling/Upcycling” – *2022 GRC and GRS Chemical Separations*.
- **Ganesan, A.**, Purdy, S. C., Yu, Z., Bhattacharyya, S., Page, K., Sholl, D. S., and Nair, S. “Controlled Demolition and Reconstruction of Metal-Organic Frameworks By Acid Gas Treatment and Linker Insertion” – *2021 AIChE Annual Meeting*.

Skills

Material Synthesis	• MOF, zeolite synthesis • Porous liquids synthesis (porous solids, ionic liquids, and polymeric surface functionalization) • Acid gas exposure • Membrane Fabrication (Flat-sheets)	
Characterization & Measurement	• Liquid breakthrough column (adsorption) measurements • Solution & solid-state NMR • UV-Vis, FTIR, Raman, Circular Dichroism • X-ray photoelectron spectroscopy • Vapor sorption isotherms • Membrane Permeance (Gas and Liquid)	• Diffusivity NMR • X-ray and neutron diffraction/scattering • Electron Microscopy • Porosity Measurements • Dynamic light scattering (DLS) • X-ray microtomography
Process Simulation	• MATLAB	