



Exponent[®]
Engineering & Scientific Consulting

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Professional Profile

Dr. Zeynep Ayla is a chemical engineer with expertise in the areas of heterogeneous catalysis and reaction engineering. With an experimental background, she has strong skills in catalytic synthesis and characterization, kinetic analysis, batch and flow reactor design, and in-situ UV-Vis, FTIR, and Raman spectroscopy. At Exponent, she specializes in fire, explosion, and chemical release investigations, in addition to industrial chemical engineering arbitration and patent cases, catalyst performance in industrial systems, dust hazard analysis, and consumer product litigation including canned dusters and gasoline containers.

Prior to joining Exponent, Dr. Ayla was a graduate student researcher at UIUC. Her doctoral dissertation centered around kinetic and mechanistic analysis of oxidation reactions in both batch and flow reactors. She developed skills in catalyst design and characterization, reaction engineering, reactor design, and heat and mass transfer. More specifically, she has designed and built a reactor system for gas-phase epoxidation with hydrogen peroxide, developed kinetic models to understand substrate activation to form active forms of oxygen for oxidation reactions, and optimized time-resolved in situ spectroscopy to observe active intermediates formed on reactive surfaces. Dr. Ayla's projects include deconvoluting solvent and steric effects in porous environments in addition to identifying structural, kinetic, and mechanistic differences between catalysts with varying reaction rates.

Dr. Ayla earned her Ph.D. in Chemical Engineering at the University of Illinois at Urbana-Champaign in 2022 and a B.S. in Chemical Engineering with a minor in Sustainability at Arizona State University in 2017. She has also interned with the Reaction Engineering R&D team at Dow Chemical Company in 2021 and is fluent in Turkish.

Academic Credentials & Professional Honors

Ph.D., Chemical Engineering, University of Illinois, Urbana-Champaign, 2022

B.S., Chemical Engineering, Arizona State University, 2017

Licenses and Certifications

Blasting Certificate of Competency (MA)

Professional Affiliations

National Association of Fire Investigators (NAFI) 2022-Present

Society of Women Engineers (SWE) 2018-Present

Publications

Kwon, O.; Ayla, E.Z.; Potts, D.S.; Flaherty, D.W.; "Effects of Solvent-Pore Interaction on Rates and Barriers for Vapor Phase Alkene Epoxidation with Gaseous H₂O₂ in Ti-BEA Catalysts" ACS Catalysis 2023, 13, 6430-6444.

Ayla, E.Z.; Patel, D.; Harris, A.; Flaherty, D.W.; "Identity of the Metal Oxide Support Controls Outer Sphere Interactions that Change Rates and Barriers for Alkene Epoxidations at Isolated Ti Atoms" Journal of Catalysis 2022, 411, 167-176.

Bregante, D.T.; Chan, M.C.; Tan, J.Z.; Ayla, E.Z.; Nicholas, C.P.; Shukla, D.; Flaherty, D.W.; "The shape of water in zeolites and its impact on epoxidation catalysis" Nature Catalysis, 2021, 4, 9, 797-808.

Yun, D.; Ayla, E.Z.; Bregante, D.T.; Flaherty, D.W.; "Reactive Species and Reaction Pathways for the Oxidative Cleavage of 4-Octene and Oleic Acid with H₂O₂ over Tungsten Oxide Catalysts" ACS Catalysis 2021 11, 3137-3152.

Ayla, E.Z.; Potts, D.S.; Bregante, D.T.; Flaherty, D.W.; "Alkene Epoxidations with H₂O₂ over Groups 4-6 Metal-Substituted BEA Zeolites: Reactive Intermediates, Reaction Pathways, and Linear Free-Energy Relationships" ACS Catalysis 2020, 11, 139-154.

Bregante, D.T.; Potts, D.S.; Kwon, O.; Ayla, E.Z.; Tan, J.Z.; Flaherty, D.W.; "Effects of Hydrofluoric Acid Concentration on the Density of Silanol Groups and Water Adsorption in Hydrothermally Synthesized Transition Metal Substituted Silicalite-1" Chemistry of Materials, 2020, 32, 17, 7425-7437.

Bregante, D.T.; Tan, J.Z.; Schultz, R.L.; Potts, D.S.; Ayla, E.Z.; Torres, C.; Flaherty, D.W.; "Catalytic Consequences of Oxidant, Alkene, and Pore Structure on Alkene Epoxidations within Titanium Silicates" ACS Catalysis, 2020, 10, 17, 10169-10184.

Flores, A.; Choi, Hyun; Martinez, Rodrigo; Onyeabor, Moses; Ayla, E.Z.; Godar, Amanda; Machas, Michael; Nielsen, D.R.; Wang, X.; Frontiers in Bioengineering and Biotechnology, 2020, 8, 329.

Bregante, D.T.; Johnson, A.M.; Patel, A. Y.; Ayla, E.Z.; Cordon, M.J.; Bukowski, B.C.; Greely, J.; Gounder, R.; Flaherty, D.W.; "Cooperative Effects between Hydrophilic Pores and Solvents: Catalytic Consequences of Hydrogen-Bonding on Alkene Epoxidation in Zeolites" Journal of the American Chemical Society, 2019, 141, 7302 – 7319.

Flores, A.D.; Ayla, E.Z.; Wang, X.; Nielsen, D.R.; "Engineering a Synthetic, Catabolically Orthogonal Coculture System for Enhanced Conversion of Lignocellulose-Derived Sugars to Ethanol" ACS Synthetic Biology, 2019, 8, 5, 1089 – 1099.

Presentations

Ayla, E.Z.; Patel, D.; Harris, A.; Flaherty, D.W.; "Identity of the Metal Oxide Support Controls Outer Sphere Interactions that Change Rates and Barriers for Alkene Epoxidations at Isolated Ti Atoms" 27th North American Catalysis Society Meeting New York, NY, 2022

Ayla, E.Z.; Patel, D.; Harris, A.; Flaherty, D.W.; "Identity of the Metal Oxide Support Controls Outer Sphere Interactions that Change Rates and Barriers for Alkene Epoxidations at Isolated Ti Atoms" Boston, MA, 2021 Women in Chemical Engineering Travel Award

Ayla, E.Z.; Potts, D. S.; Bregante, D.T.; Flaherty, D.W.; "Linear Free Energy Relationships for Alkene Oxidations with H₂O₂ over Groups 4 – 6 M-BEA" Catalysis Club of Chicago Symposium, Virtual, 2020

Poster Prize Winner

Ayla, E.Z.; Bregante, D.T.; Flaherty, D.W.; "Role of Electronic Properties of Active Metal in Alkene Oxidations with H₂O₂ over Groups 4 – 6 Substituted BEA Catalysts" 2020 International Congress of Catalysis; San Diego, CA, 2020 (Canceled due to COVID-19)

Ayla, E.Z.; Bregante, D.; Flaherty, W.; "Reaction Pathways and Reactive Surface Intermediates Responsible for Alkene Oxidations with H₂O₂ over Groups 4-6 Metal-Substituted Zeolites" 26th North American Catalysis Society Meeting, Chicago, IL, 2019

Ayla, E.Z.; Bregante, D.; Flaherty, W.; "Reaction Pathways Responsible for Alkene Oxidations with H₂O₂ over Groups 4-6 M-BEA Catalysts" Catalysis Club of Chicago Symposium, Naperville, IL, 2019

Ayla, Z.; Bregante, D.; Flaherty, W.; "Green Epoxidations on Atomically Dispersed Groups 4-6 Metal Catalysts with H₂O₂" Catalysis Club of Chicago Symposium, Naperville, IL, 2018

Ayla, Z.; Flores, A.; Nielsen, D.; Wang, X.; "Engineering A Synthetic Co-Culture System for Enhanced Co-Utilization of Lignocellulose-Derived Sugar Mixtures" Honors Thesis Defense; Tempe, AZ, 2017

Ayla, Z.; Flores, A.; Nielsen, D.; Wang, X.; "Engineering A Synthetic Co-Culture System for Enhanced Co-Utilization of Lignocellulose-Derived Sugar Mixtures" Fulton Undergraduate Research Symposium; Tempe, AZ, 2016

Ayla, Z.; Dookeran, Z.; Nielsen, D.; "Exploring Amino Acid Cross-feeding Strategies in Support of Stable Co-Culture Growth" Tempe, AZ, 2015