**Adam McNeeley won the 2024 AIChE Process Development Student Paper Award**

**Adam McNeeley**, a chemical engineering doctoral student advised by **Professor Y. A. Liu**, Alumni Distinguished Professor and a member of the Macromolecular Innovation Institute, has won **the 2024 Process Development Student Paper Award of the American Institute of Chemical Engineers.** AIChE is the largest global organization of chemical engineering professionals and students with over 60,000 members from more than 100 countries. McNeeley is selected for the award after a global competition with nominations from multiple countries. The award recognizes the quality and impact of his two-part article, entitled: Adam McNeeley and Y. A. Liu, “Assessment of PET Depolymerization Processes for Circular Economy: 1. Thermodynamics, Chemistry, Purification and Process Design; and 2. Process Design Options and Process Modeling Evaluation of Methanolysis, Glycolysis and Hydrolysis”, *Industrial and Engineering Chemistry Research,* 2024, Volume 63, pp. 3355-3424.

Poly (ethylene terephthalate) (PET) is the most widely produced thermoplastic and is used in drink bottles, packaging, and textiles. Chemical depolymerization reacts the post-consumer PET waste with methanol, glycol or water, to form the desired monomers after product purification as feedstocks for polymerization to form PET. The corresponding process path is called methanolysis, glycolysis or hydrolysis, respectively.

Part 1 of the paper is unique in providing a thorough assessment of the depolymerization thermodynamics, chemistry, purification, waste management and sustainable design of PET depolymerization processes, identifying the critical issues for R&D focus if a new technology is going to be feasible commercially. This contrasts over one thousand prior reviews and papers which focused primarily on kinetics and catalysis only, and ignored mostly the industrial patents.

This work gives detailed descriptions of different variants of PET depolymerization processes. It summarizes available data necessary to design a PET depolymerization process and indicates where gaps in data exist. This paper demonstrates the importance of separation and purification sections of the process, which are rarely addressed in academic literature. It also demonstrates different designs and strategies that industrial technologies employ to address challenges.

Part 2 integrates industrial patent literature and process design knowledge to simulate complete depolymerization processes. Prior to this work, there was surprisingly no substantial effort made to completely model any of the existing PET depolymerization technologies and their variants. This paper presents for the first time in the literature the computer simulation models for methanolysis, glycolysis and hydrolysis processes. The simulation quantifies the complete mass and energy balances together with energy demand and CO2 emission. It demonstrates how different configurations and process variables impact the depolymerization performance.

This work emphasizes the purification methodologies to remove additives, colorants, and impurities, as well as waste management strategies to minimize waste generation and maximize material recycle and reuse. For each process model, this paper presents details of operational insights as well as advanced process integration and intensification innovations for sustainable design of each depolymerization process. The paper includes detailed supporting information for academic researchers and industrial practitioners to further develop PET depolymerization processes and explore process alternatives. The designs produced in this work demonstrate an effective modeling methodology and offer a starting point for future studies.

The award nomination has received strong endorsements from academic and industrial leaders. Dr. Phillip Savage, Editor-in-Chief for 2014 to 2023, describes the paper as “a truly outstanding published work in chemical engineering process development fundamentals and practice”. Mr. Joe Bays, Licensing Technology Manager, Eastman Chemical Company, an industrial PET depolymerization expert who was recently involved in the startup of the Eastman demonstration plant for a large-scale methanolysis process, says “this paper is a thought-provoking study, exhibiting a high level of scholarship. I am a fan of the heat integration and some other features of the groundbreaking vapor-phase methanolysis process design reported in the paper’. Dr. Dimitris Collias, former senior director and research fellow at Proctor and Gamble for circular economy and a member of the U. S. National Academy of Engineering, said: This paper represents a seminal contribution to the field, addressing a critical gap in the literature with profound implications for industrial practices in polymer recycling and the advancement of circular economy principles. The paper not only advances our collective understanding of PET depolymerization, but also embodies a steadfast commitment to excellence and innovation.