DEPARTMENT OF CHEMICAL AND ENVIRONMENTAL ENGINEERING
COLLEGE OF ENGINEERING AND APPLIED SCIENCES

RESEARCH OPPORTUNITIES FOR UNDERGRADUATE students

APPLICATION DEADLINE: April 27, 2025

PROJECT TITLE: Developing a High Precision Municipal Solid Waste Sorting Process for Biofuel Production

Physical Requirement : Must be able to lift 20Lb
Project's Technical Skills Requirement : background in chemical, environmental, biological, and mechanical processes.
Project's Available Positions : Available student position for project

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Project Description

Developing a High Precision Municipal Solid Waste Sorting Process for Biofuel Production

Municipal solid waste (MSW) landfill is the third-largest source of human-related methane emissions in the United States. More than 50% of the generated waste were landfilled containing the biodegradable fraction (green waste, food waste, wood waste, and pruning waste) known as organic fraction of municipal solid waste (OFMSW). The disposal of OFMSW at landfills causes serious environmental issues including emission of toxic greenhouse gases. OFMSW represents a valuable source of low-cost feedstock for the development of biofuels/bioproducts. However, the heterogeneity and variability of MSW components containing plastics, glass, and metals are major bottlenecks for biochemical conversion. Thus, these impurities in MSW must be sorted to produce a high-purity organic stream for use as conversion-ready feedstocks. The main objective of this project is to develop advanced sorting and fractionation technology to separate organic fraction waste from non-recyclable MSW and to blend, formulate, and densify organic waste with lignocellulosic biomass for biochemical conversion. We are currently developing high-precision sorting of organic waste using integrated disc screen and magnetic separation and determine and optimize the process parameters for efficient separation. The recovered organic fraction will be subsequently valorized to produce biofuels via fermentation process. This technology has great potential to generate high purity organic streams, reduce the preprocessing cost, and produce conversion-ready feedstock.

This research project will be completed at UC Center Hill facility Bioenergy lab. Students will work with graduate students and a postdoc to operate the pilot-scale equipment system.
Other Projects involved: The selected student will also conduct batch scale fermentation studies for biofuel production and learn state-of-art omics technologies for biological characterization of native and engineered bacterial strains. The funding does not require UC citizenship and need their approval.
Preferred skills required: Interest & experience with chemical, environmental, biological, and mechanical processes.
Learning Outcomes:
• Hands-on experience of pilot scale equipment operation.
• Knowledge of mass balance and chemical composition.
• Inter-disciplinary collaboration with national laboratory scientists.
• Potential for research publication and presentation at AIChE conference.