

Project Summary

Project Title: Conversion of Material Recovery Facilities (MRF) Rejected Wastes to Value-added Products for Various Material Applications

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The goal of this proposed project is to develop integrated technologies to convert material recovery facilities (MRFs) rejected, low-quality wastes into multiple value-added co-product materials for construction industries. We will combine anaerobic digestion and pyrolysis to convert co-mingled wastes with high ashes and develop material synthesis and fabrication to produce high-value co-products. In addition to producing biogas, the proposed project will also develop waste-derived asphalt binder modifier, carbon-sequestering concrete additives, and reinforced biocomposites. We will perform techno-economic analysis and life cycle analysis to inform economic and environmental impacts of the technology.

Despite of the proactive recycling in MRFs, significant amounts of low-quality municipal solid wastes (MSW) are sent to landfills, creating various environmental issues and economic burden. Recycling the low-quality wastes with heterogeneous compositions and contaminants using single traditional processes is extremely challenging from both technical and economic perspectives. The proposed project will convert both biodegradable and non-degradable waste materials to produce performance-enhancing co-products. While biogas will be used as a sustainable, cheap, and low-carbon fuels, the waste-derived construction materials and biobased composites will maximize the co-product values and sequester carbon. The research outcomes will be of interest to stakeholders in various industrial sectors, such as waste management, constructions, composites manufacturers and users, as well as renewable energy industries. Overall, the proposed approach will utilize nearly all the components in low-quality MSW meant for landfills to develop renewable energy and low-cost, high value materials with sustainable large and economically advanced markets.