Proposal Summary

Solvent Targeted Recovery and Precipitation (STRAP) for Recovery of Biogenic Materials and Plastics from Municipal Solid Waste (MSW)

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Project Description: Municipal Solid Waste (*MSW*) generation has reached unsustainable levels. Existing technologies can sort metal, glass, stone, etc. leaving a fraction containing paper, plastics, rubber, leather, textile, food, and yard trimmings. This sorted MSW fraction has 13-15 wt% plastics with the remaining being biogenics, including carbohydrates, cellulose, lignin, and triglycerides. This material is mostly cellulose based. Thus, MSW partitioning to biogenic/non-biogenic will reduce variability and contaminants that would improve downstream conversion processes. This project proposal proposes a novel solvent-based approach that preferentially dissolves the plastic resins and separates the plastics from the other materials. The biomaterials can be used to produce Sustainable Aviation Fuels (*SAF*) and the co-products (plastic resins) recovered can be used to lower the cost of producing biogenic material.
The solvent-based approach is used to extract the resins in pure forms, which can be reused as intended in the original applications. The process extracts only the respective polymer resins removing additives, ink, pigments, and adhesives. This solvent-based process is referred to as the Solvent Targeted Recovery and Precipitation (*STRAP*) process, with a pending patent application. In the process, we mix the shredded solid sorted MSW with a solvent that dissolves specific resin at a certain temperature, then filter the mix to remove the remaining solids. The solution is then cooled to precipitate the dissolved plastic, which is filtered to extract the resin. This method has been successfully applied to separate resins from MSW and plastic wastes at a lab scale.

Project Objectives: The key objectives of the project are as follows: (a) Scaling up the lab-scale process and building a Process Development Unit (PDU) with semi-continuous operation (b) Refinement of STRAP to improve ink removal from resins and allow better resin separation from mixed plastics, (c) Testing the biogenic material for suitability in the upgrading using hydrolysis and fermentation, and pyrolysis. (d) Using the produced resin (PE and PP) to produce cast films and sheets using a three-layer coextrusion line with industrial partners (e) Determining the total production cost and GHG emissions to achieve low SAF cost ($1.93-2.26/G) and at the minimum decrease of 70% GHG emission.

Potential Impact of the project: The main project outcome is the development of a PDU capable of separating polymer resins in MSW from the biogenic material and showing that (i) the biogenic material can be used as a feedstock for SAF production and (ii) the recovered resins can be used as intended in their original applications.