Development of a Pyrolysis Reactor to Determine the Efficiency of Polystyrene-based Biofuel

Nguyen, Stephanie (School: The Villages Charter High School)

The basis of this project relies on the fundamental properties of pyrolysis and its application to create bio-oil, bio-char, and syngas from repurposed plastic resins.The benefit of using these plastic resin feedstocks would be to simultaneously reduce fossil fuel and greenhouse gas emissions while also decreasing the amount of plastics in the biosphere. While the glass condenser revealed a slight amount of condensation of an unidentified liquid at the bottom, extracting the miniscule amount of condensation could not be done properly without either contaminating the liquid, if the reactor was flushed with water, or losing the condensation altogether because of its unidentified properties. In order to test and/or receive viable data that can be formed into a conclusion, it was mandatory for the condensation to form a uniform drop of liquid and exit into the storage vessel, where it can then be processed further, tested for quality, or compared to conventional diesel. Had the experiment produced a viable pyrolysis oil, the biofuel could be tested against regular diesel by burning the fuels and observing/collecting data about the emissions of either oil and determining how long each fuel burned for as a measure of its efficiency. Although the experiment did not provide viable data in order to prove a possible conclusion of the results of this project, the learning process of the investigation has supplemented a potential solution to plastic waste management and reduced usage of nonrenewable fossil fuels.

Awards Won: