# Utilization of Triglycerides from Spent Coffee Grounds to Create Methyl Esters through Transesterification

Lee, Regina

Among the many biomass sources that can be used as biofuel, coffee grounds are a viable source of fatty acids for producing biodiesel. Over 500,000 tons of coffee ground waste is created yearly which can be used for biodiesel. The goal of this experiment was to test the conversion of used coffee grounds into biodiesel using Sulfuric Acid (H2SO4) as the catalyst and comparing its energy density with other fuels. Vegetable biodiesel was produced using the same procedure for comparative analysis. The coffee ground's oil was extracted using a Soxhlet extractor. Then, transesterification processes using H2SO4 were performed. The product was injected into a GC/MS machine for analysis to find the various methyl ester groups. A calorimeter was used to find the energy density, and the results were compared with Diesel No. 2 and vegetable biodiesel. It was found that the coffee biodiesel samples contained about 62.69% biodiesel. They had an average energy density of 2095.71 calories/gram of fuel, while the vegetable biodiesel had 2246.8 cal/g and Diesel No. 2 had 2265.65 cal/g. In conclusion, the experiment was successful in creating usable biodiesel from waste coffee grounds. The unwanted residue left behind after the transesterification process was reduced significantly, increasing the yield. The energy density is comparable to that of Diesel No. 2 and vegetable biodiesel. For future research, making this project on a larger scale can be pursued as it has potential to become a commercial fuel.

**Awards Won:**