Starbucks: The New BP

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This experiment investigated the research question: How does the roasting of the coffea arabica bean affect the valorization of oil extracted from its grounds for the production of biodiesel through base-catalyzed transesterification? With the depletion of petroleum-based energy sources, an alternative source of energy is the creation of biodiesels from various oils. The ubiquitous coffee bean has been found to be up to 20% lipids, by mass, which can be converted into biodiesel through transesterification. Coffee oil provides an excellent source for biodiesel production as it contains a low percentage of saponifiable free fatty acids – molecules that decrease the percentage yield. However, the molecules that do form biodiesel, triglycerides, are known to undergo thermal degradation into unusable organic molecules. The world produce an estimated 7.5 million tons of waste grounds each year. An organization could potentially collect these grounds from shops and monetarily compensate in return. Should this study find the roasting process to be detrimental to the biodiesel produced, lighter-roasted feedstock shall be worth more and conversely, darker-roasted feedstock be worth less. In this experiment, green coffea arabica beans were roasted at 236?C, 246?C, and 256?C to produce light-roast, medium-roast, and dark-roast coffees. The lipids were extracted from the beans, transesterified and then purified. The viscosity, density, and flash-point were also measured in order to ensure the product is safe to run in a standard diesel engine sans modifications. The results indicated a significant degradation as biodiesel production decreased by 4.91% ± 0.25 from light to medium-roast and 8.42% ± 0.25 to dark-roast. All biodiesel samples complied with the EN 14214 standard.

Awards Won: