Synthesizing Biofuels From Waste Oil for a Sustainable Alternative in Diesel Engines

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Fuel is a necessity in the modern world as nations move towards industrialization and innovation. However, the fuels that are predominantly utilized are nonrenewable and commonly produce carbon emissions. Biofuels are an alternative solution that assuage the concerns with nonrenewable fuels and the subtype biodiesel, a fuel made with vegetable oils, can be produced in a manner that targets the additional issue of fast-food industries creating used cooking oil that would otherwise be discarded in landfills. Biodiesels have the potential to support a circular flow of carbon dioxide in the world, reduce the amount of fossil fuels consumed, and make fast food convenient and sustainable. Three biodiesels (made with unused, unheated used, and heated used oil) were synthesized to investigate how their energy contents, rpms generated, and energy over time could compare to those of diesel. This was done through the reflux of the oils and isopropanol in the presence of sodium hydroxide. The products were separated by density to isolate the biodiesel which was subsequently neutralized. The biodiesels were combusted to obtain the energy per time, energy content, and rpms generated. The biodiesels produced were able to reach values similar to the rpms generated, the energy over time, and energy content of diesel fuel when combusted. Biodiesel proves to be a viable alternative or supplement to existing fuels as it has a relatively high energy content, and its production is considered carbon neutral. This project provides a foundation for future research on the optimization of biofuels to propel the future of fuel.

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