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From Oil to Fuel

The uses of oils as biofuels are limited by the development of processes that convert the highly oxygenated biofuels to low oxygen-content hydrocarbon fuels. In this project, pyrolytic reaction of olive oil, a low boiling oil, was carried out at three different temperatures. Last year it was shown that a low energy pericyclic decarboxylation reaction could convert short chain unsaturated carboxylic acids, as well as longer chain fatty acids to hydrocarbons. Advantages of this process are the generation of very pure fuel and the lower temperatures needed in comparison to the current industrial processes. The reaction product was analyzed using 1H NMR spectroscopy and was compared to predicted spectra obtained from ChemDraw. The hypothesis was that the pericyclic reactions cannot take place on the triglyceride portion of the olive oil to form the predicted alkene products. The reaction was only thought possible on the fatty acid components of the oil. The pyrolytic reaction on olive oil showed a variety of products including alkene, alkane, and glyceride products. To understand the olive oil pyrolysis better, the reaction of one fatty acid component of olive oil, oleic acid, was also examined. These experiments showed that several reactions took place with this substrate possibly including pericyclic reactions. This approach deserves further inquiry because what was observed wasn't expected. This type of process could potentially increase the energy efficiency of fuel production for use throughout the world due to the lower temperature needed for the process.