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Green Processing of Fatty Acids for Fuel Production

Fuel is being consumed at an alarming rate and fuel reserves are running low. Alternative energy resources such as biofuels are being researched. A biofuel is any fuel made from biomass. Algae is the focus of many biofuel research projects due to its relatively easy growth and production. The current processes for synthesizing the algae into fuel are far less economic and efficient than our process. This project examines the possibility that a pericyclic reaction can occur in an unsaturated beta-gamma fatty acid to produce a hydrocarbon fuel. Although this reaction cannot occur with lipids, there are many ongoing attempts to genetically engineer algae to form increased levels of fatty making it a viable source of fuel. The past two years have been focusing on different aspects of the reaction, including the solvent used or the demonstration that the glycerol bond in lipids inhibits the reaction. This year the use of microwave irradiation instead of heating was investigated. Different temperatures and reaction times were tested. It was found using 1H NMR spectroscopy that a reaction consistent with a decarboxylation is not occurring in the microwave for oleic acid in aqueous solution. This means there must be some catalyst from the cell extract to produce the alkenes seen. There is also the possibility that the double bond in oleic acid is not able to isomerize in the microwave. Using a fatty acid with a double bond in the beta-gamma position may allow the pericyclic reaction to occur, making the process viable.