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Basic Studies of Green Diesel from Biostock

There is a need for an inexpensive and environmentally friendly process to form fuel from biomass. A promising approach is to convert fatty acids to alkenes through pericyclic reactions. Presented here is a model study with an acid called trans-3-pentanoic acid. The acid will form a fuel called butene through a decarboxylation reaction. This reaction has to take place in a solvent. This experiment tested which solvent, phenanthrene or naphthalene, would produce a purer product. The hypothesis was that phenanthrene would yield a purer product. The idea was for the reaction to take place (carbon dioxide was released into the air) and then because butene has a lower boiling point than the solvent, it would distill over, condense and freeze when it reached a receiver flask cooled in a dry ice-acetone bath. For analysis the product was dissolved in deuterated chloroform and quantitated by NMR. The NMR spectrum also identifies any impurities. The sample with phenanthrene as a solvent gave a pure product, but the sample from naphthalene as solvent gave no butene, but had many impurities. Based on this these results the hypothesis was accepted and it was concluded that phenanthrene was a better solvent for this reaction. This experiment was significant in developing the new, lower temperature process to form fuel from lipids. The fact that naphthalene didn't reach a high enough temperature for the reaction to occur sets a lower limit for the reaction and gives researchers a temperature range for melting points for appropriate solvents.