Using reactive pyrolysis-GC/MS to characterize the fatty acids in algae prior to the conversion to biofuels

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There is an undeniable shift to renewable energy resources such as wind, solar, and bioenergy. One of the simplest and most cost-effective approaches involves the use of algae to produces high-quality biofuels. The energy content of the algae is related to the carbon content of the algae. It is important to characterize the fatty acid content of the algae.

Thermally assisted hydrolysis and methylation (TMA) or Reactive Pyrolysis (RxPy) – GC/MS is a very simple but powerful tool for characterizing various strains of algae. Very simply stated, RxPy is the process of combining a compound or macromolecule with a strong organic alkali, such as tetramethyl ammonium hydroxide (TMAH), at an elevated temperature. The alkyl derivatives that are formed are readily analyzed using GC/MS.

This work will describe the process of reactive pyrolysis using Frontier Laboratories' multi-functional pyrolyzer. The effectiveness of various reagents will be discussed and the fatty acid profiles of both dried and "wet" algae will be presented. Algae are commonly used as a carbon source for biodiesel, which can also be easily profiled using thermal desorption (TD) gas chromatography. The diesel is injected directly into a cup as a liquid. The cup is then "dropped" into the furnace at an elevated temperature (ca. 350ºC). This eliminates all sources of discrimination and peak distribution is accurate and reproducible. A single pyrolyzer/GC/MS can be used to characterize both the algae and biodiesel; thus, serving as a cost-effective analytical tool.