Alkenones from Earth history to biofuels

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Clair Patterson: Basic and applied scientist

Dr. Clair Cameron Patterson is credited with the first accurate measurement of the Earth's age and documenting and leading to the reduction of lead pollution. This order of accomplishment is chronologically correct but debatable on overall impact. Nevertheless, Patterson's career followed a track of a scientist who began with interests in "basic" earth science that primed him for a transition into to the "applied" world of environmental chemistry and toxicology.

In this talk, I will discuss the long-chain alkenones, among the most extensively studied class of organic compounds in Earth science and their more recent usage in applied science.

As part of my post-doctoral studies, I was involved in radiocarbon-dating alkenones and even discovering one [1] [2]. Alkenones are organic compounds with 37 to 39 carbons, linked in segments by carbon-to-carbon double bonds produced by a few species of Haptophytes. By measuring ratios of double bonds in alkenones preserved in sediments, climate scientists have reconstructed countless paleo sea-surface records of temperature.

More recently, I became interested in algal-based biofuels and was drawn to past studies that remarked that the Haphtophyte, *Isochrysis* had some positive attributes regarding its lipid content and growth rates. Yet, not one study had mentioned the alkenones even though they can represent a significant fraction of the algal biomass. For the past several years, I have now focused on how to utilize the alkenones from *Isochrysis* to produce jet fuel, biodiesel, and other useful products [3] [4].

This talk will provide an overview on my transition from basic to applied applications of the alkenones. I will argue that my studies on the basic science of alkenones in earth science pre-primed me, too, for the applied usage of these unusual organic compounds in biofuels.

[1] Ohkouchi, *et al*. (2005), *Radiocarbon* **47**, 401-412 [2]. Xu, *et al*. (2001), *Organic Geochemistry* **32**, 633-645. [3] O'Neil, *et al*. (2014), *Energy and Fuels* **28**, 2677–2683. [4] O'Neil, *et al*. (2015), *Energy and Fuels* **29**, 922–930.