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World Biodiesel Congress & Expo

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Resin-based strategies for producing biodiesel from algae

Production of biodiesel from algae, despite its potential, has been limited due the expense incurred at several stages of the process. Sustained growth of pure strains of high-yield algae at large scales has been most successful in photobioreactors that require large initial investments. The density of algal growth is limited by light absorption such that harvesting algae typically requires processing large amounts of water to obtain relatively small amounts of biomass. Finally, efficient extraction of algal oil may further require drying the algae which requires energy and solvent recovery. We have explored the use of synthetic resins for processing algae that have the potential to eliminate many of these difficulties. Resins can concentrate algae from dilute solutions and thereby separate the biomass from the water. Subsequent treatment of resins with solutions of dilute sulfuric acid in alcohol then removes the algae from the resin allowing reuse of the resin while converting algal lipids to FAMEs (biodiesel). In our studies, we have obtained close to 50% by weight of FAME from algae that produce 15-20% by weight triacylglycerol. This biodiesel can be readily separated from the sulfuric acid -alcohol solution using a flow-through porous fiber extractor and the acid-alcohol solution can then be reused for subsequent cycles of resin elution. We propose that resin-based harvesting and processing of algae could make it possible to economically obtain reasonable yields of biofuel from less fastidious algae that commonly grow in the wild.

Figure 1 An algal slurry is poured through a resin into a receiver flask. The algae accumulate on the resin whereas the flow-through is crystal clear.

Biography

Martin Poenie has a background in cell and molecular biology as well as synthetic organic chemistry and associated analytical techniques. He has brought this background to bear on the algal lipid extraction and analysis as well as the synthesis and application of resins for binding and processing algae to biofuel. He has collaborated with Frank Seifert, Robert Hebner and others at the University of Texas in developing patented processes for collecting oil from aqueous slurries and processing algae to biofuels.

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