

Transportation Fuels [Thiel abstract]

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Hydrogen has the potential to provide a clean, storable, transportable and renewable source of energy that can supplement and eventually replace fossil fuels as the primary source of power in the U.S. However, most current methods for production of hydrogen require the use of fossil fuels. Pollution-free, renewable hydrogen can be provided using bio-hydrogen produced from sunlight and water by a microorganism such as the filamentous cyanobacterium, *Anabaena variabilis*. Almost all microorganisms that can bio-produce hydrogen using sunlight fail to do so in the presence of air because their hydrogen-producing enzymes are very sensitive to oxygen. *Anabaena variabilis* bio-produces hydrogen from water, sunlight, and carbon dioxide, a greenhouse gas, in the presence of air. It can do so because it has cells called heterocysts, in which there is almost no oxygen. European laboratories have shown that *Anabaena* produces hydrogen in outdoor bioreactors in the presence of air, but 50-fold too little for commercial success. Our research is focused on genetically engineering this strain for greatly increased hydrogen production in order to make it an economically feasible renewable source of energy for transportation.