'Synthetic biology' could replace oil for chemical industry

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Vats of blue-green algae could one day replace oil wells in producing raw materials for the chemical industry, a UC Davis chemist predicts.

Shota Atsumi, an assistant professor of chemistry, is using "synthetic biology" to create cyanobacteria, or blue-green algae, that convert carbon dioxide in the air into complex hydrocarbons, all powered by sunlight.

Cyanobacteria are single-celled organisms that, like green plants, can use sunlight to turn carbon dioxide and water into sugars and other carbohydrates.

The U.S. Department of Energy has set a goal of obtaining a quarter of industrial chemicals from biological processes by 2025. Today 99 percent of the raw materials used to make paint, plastics, fertilizers, pharmaceuticals and other chemical products come from petroleum or natural gas, according to Atsumi.

While some chemicals, such as biofuels, can be obtained from converted plant material, plants are relatively slow to grow, and using farms to grow fuel takes arable land out of food production.

Instead, Atsumi is engineering cyanobacteria to make chemicals they do not make in nature. By carefully analyzing genes in these and other organisms, his team will assemble artificial synthetic pathways and put them into living cells.

"We can use genes as building blocks to create these new functions," Atsumi said.

Provided by University of California - Davis