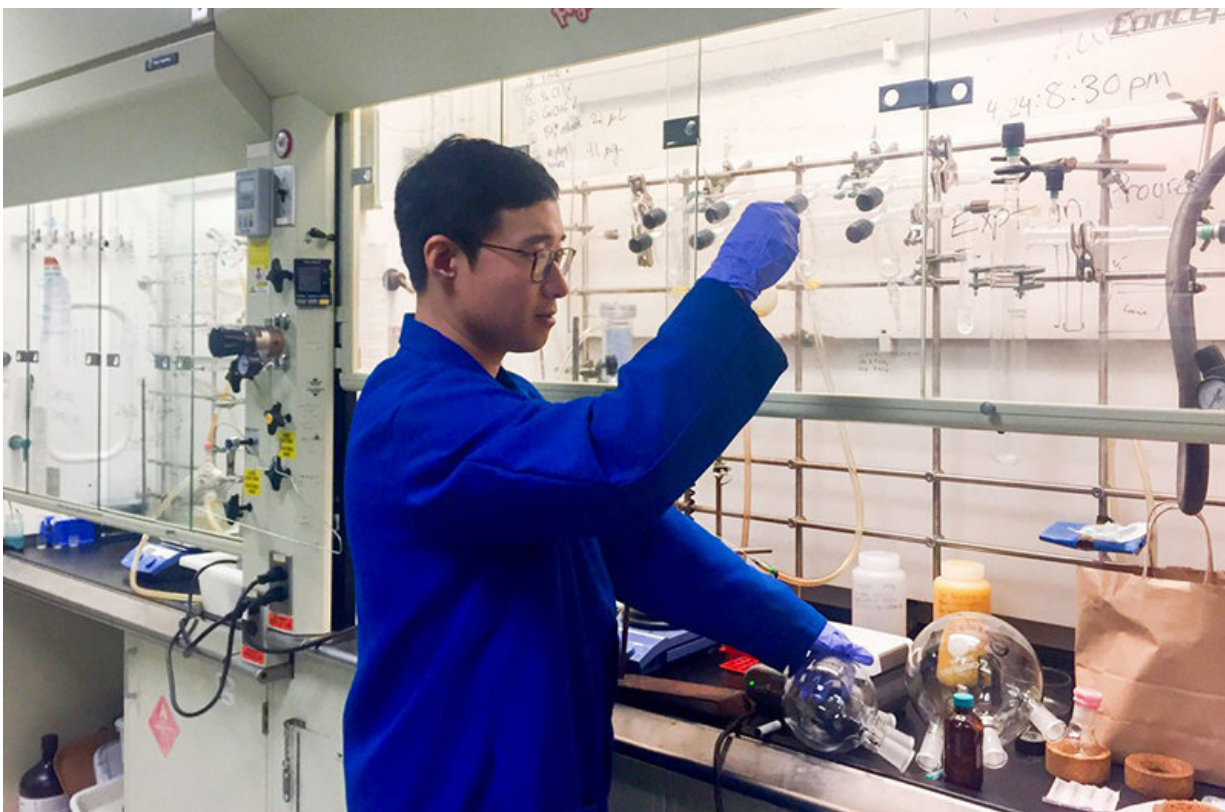


How to help the environment: Turn cooking oil into renewable fuels

November 8 2018, by Rhonda Hillbery



Zhiyao (Yao) Lu leads a USC Dornsife startup that has developed a technology designed to turn vegetable oil into renewable fuels and biodegradable plastic.
Credit: Rhonda Hillberry

Greenhouse gases and plastic waste are the targets of a USC Dornsife chemistry startup.

Postdoctoral scholar and Catapower Inc. director Zhiyao (Yao) Lu describes the company's technology as a molecular robot that turns [vegetable oil](#) into [renewable fuels](#) and biodegradable plastic.

"We started as a team of scientists tackling two of the world's most prominent environmental challenges—the relentless rise of [greenhouse gases](#) and the conglomeration of [plastic waste](#) in the oceans," Lu said, referring to well-documented plastic patches the size of Australia now floating in the Pacific Ocean. Approaching the problem as a chemist, he wanted to tackle both problems at once.

Catapower's momentum was underscored in March when Lu's presentation earned the top 2018 USC Wrigley Sustainability Prize of \$7,000. The annual competition promotes business concepts that help the environment. In weeks leading up to the competition, students drafted business plans and honed their pitches while assigned mentors helped them turn their ideas into action.

Lu was one of seven finalists to present his research to a panel of leading technology and science experts at the Ronald Tutor Campus Center.

On the heels of that success, Catapower was selected for the National Science Foundation Innovation Corps (I-Corps) program to learn how to run a startup, including customer acquisition, incorporation, licensing and fundraising. USC is home to the Southern California I-Corps hub, one of eight centers nation-wide, jointly administered by the California Institute of Technology and UCLA. The program aims to foster nationwide innovation by encouraging the translation of ideas and research beyond the laboratory for social and economic impact.

Turning cooking oil into fuel

Catapower intends to upgrade cooking oil from commercial and

household fryers into biodiesel and [lactic acid](#).

Biodiesel is an environmentally friendly, low-carbon fuel, but its widespread use in heavy equipment, airplanes, trucks and power generators has been stymied by its high cost of production. The new technology overcomes the cost obstacle affordably and sustainably, Lu said. And any type of vegetable oil can be used for the upgrading process.

"So now we have a process that makes two valuable products and no waste," he said.

The second product line harnesses the polymer form of lactic acid, a [biodegradable plastic](#) widely used in disposables and biodegradable medical devices. The salts of lactic acid are used as environmentally benign antimicrobial agents in a range of products from food to cosmetics and are valuable commodity chemicals.

Renewable fuels: Moving from the lab to something larger

As part of the intensive I-Corps program, Lu hit the road in August with his business partner and adviser, Professor of Chemistry Travis Williams, to talk with potential customers, partners and investors. Funding would enable Catapower to grow from lab and test-tube stage to something much larger. The founders said the company is in negotiations for large contracts to deploy its technology at refinery scale in 2019.

Although it might seem like things are happening quickly, Lu pointed out that he and other USC Dornsife chemistry students have been working diligently for more than five years to get this far.

"After developing and testing many generations of different catalysts, we finally arrived at this one—a molecular machine," said Lu, formally the company's chief technology officer. "It works millions of times with high precision, very selectively converting the glycerol waste into lactate while producing biodiesel."

Williams, who encouraged Lu to tackle the commercialization challenge on top of his postdoctoral responsibilities, serves as academic adviser, co-founder and technical adviser for the company. Several students in Williams' lab, including Ivan Demianets, Valeriy Cherepakhin and Talya Kapenstein, have also participated.

The Williams lab is working with the USC Wrigley Institute for Environmental Studies, which operates on Santa Catalina Island and the University Park campus, to create a demonstration project that provides practical and educational benefits.

"From our perspective, being able to refine biodiesel here on an island saves us the trouble of figuring how to get rid of used [cooking oil](#) and also reduces the amount of diesel fuel we need to bring onto the island," said John Heidelberg, associate professor of biological sciences at USC Dornsife and associate director of the USC Wrigley Institute.

Addressing a bigger problem

Lu, who grew up in northwestern China, studied pharmaceutical sciences in college before coming to USC Dornsife to earn his Ph.D. in chemistry.

"I've always wanted to make contributions to society by improving people's quality of life and thought I'd work in developing new medications that could help hundreds of thousands of people." As time passed, he saw the challenge in a different light.

"I thought, why are so many people getting sick?" he said. "We are polluting the environment, which is harming people's health. I realized there is a much bigger problem, the environmental deterioration that threatens the sustainable future of our society."

Provided by University of Southern California

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