

UCLA's James Liao Receives Presidential Green Chemistry Challenge Award From EPA

EurekaAlert

James C. Liao, the Chancellor's Professor of Chemical and Biomolecular Engineering at the UCLA Henry Samueli School of Engineering and Applied Science, has been awarded the 2010 Presidential Green Chemistry Challenge Award from the U.S. Environmental Protection Agency.

The award promotes research on and development of less-hazardous alternative technologies that reduce or eliminate waste - particularly hazardous waste - in industrial production.

Liao, the first UCLA professor to receive the award in its 15-year history, is being recognized for his groundbreaking work recycling carbon dioxide for the biosynthesis of higher alcohols. This process turns CO₂ - a greenhouse gas produced by burning fossil fuels - into products that can be used in alternative transportation fuels or chemical feedstock, reducing greenhouse emissions and providing for cleaner, greener energy worldwide.

In the last few years, Liao has received widespread attention for his work in developing methods for the production of more efficient biofuels by genetically modifying *E. coli* bacteria, and, most recently, for modifying cyanobacterium to consume CO₂ to produce the liquid fuel isobutanol. The reaction is powered directly by energy from sunlight, through photosynthesis.

"The release of CO₂ from the use of petroleum as a source of fuel and chemicals has contributed significantly to climate change in the past few decades," Liao said. "To alleviate this problem, it is essential to develop a renewable source to replace petroleum as the major chemical and energy source. I am honored that our work is being recognized with this award from the EPA."

Liao continues to be at the forefront of efforts to develop new methods for producing environmentally friendly biofuels and chemicals. Sponsored by KAITEKI Institute Inc. (TKI), the strategic arm of one of Japan's largest chemical companies, he and his team are researching ways to recycle and convert CO₂ into chemicals that can be used to produce a variety of industrial products, including car bumpers, packaging materials, DVDs and even diapers.

"Bio-based chemicals and fuels are potentially carbon-neutral. However, their development has been hampered by a few obstacles," Liao said. "Our technology addresses the problems effectively and increases the range of alcohols that can be produced biologically. An independent review shows that our CO₂-conversion technology compares very favorably to all other existing and more mature technologies."

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In addition to his TKI sponsorship, Liao was awarded \$4 million this May by the U.S. Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E) to develop a method for converting carbon dioxide into liquid fuel isobutanol using electricity as the energy source instead of sunlight. The process would store electricity in fuels that can be used as high-octane gasoline substitutes.

The potential immediate impact of this research, Liao says, is that it would solve the electricity storage problem by converting electrical energy to liquid fuels that are fully compatible with the current infrastructure for distribution, storage and utilization. In the long run, the process could be extended to utilize solar energy via electricity or electron mediators to directly produce liquid fuel usable in internal combustion engines.

"Global climate change has heightened the need to reduce carbon dioxide emissions. Jim's work will provide cleaner energy sources and change the world for the better," said Vijay K. Dhir, dean of UCLA Engineering. "We are proud of his significant accomplishments."

Over the past 15 years, the work of those honored with the EPA's Presidential Green Chemistry Challenge Award has led to the elimination of more than 1.3 billion pounds of hazardous chemicals and solvents, nearly 43 billion gallons of water, and about 450 million pounds of carbon dioxide.

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