

# New electrochemistry for a greener world

**Wenzhen Li**, Herbert L. Stiles Faculty Fellow, associate professor of chemical and biological engineering and an associate scientist at the U.S. Department of Energy's Ames Laboratory, is a high-impact researcher in the areas of fuel cells, electrochemistry, renewable energy, and catalysis.

With a unique core strength in design of electrochemical flow cells for continuous production of valuable chemicals, Li's interdisciplinary team is starting three new projects, two funded by the National Science Foundation and one by the U.S. Department of Agriculture, aimed at improving integration of renewable energy and resources into the chemical industries.

## Nitrate wastes turned ecofriendly products

Li leads pioneering research on "electrochemical nitrate upcycling." Nitrogen-based compounds, manufactured from ammonia, require the use of fossil fuels and creates a high amount of greenhouse gas carbon dioxide emissions.

The goal of Li's research is to turn harmful nitrate wastes directly into useful, ecofriendly, nitrogen-based products powered by renewable electricity without the use of fossil fuels. Part of the project also includes workforce development in the field of advanced manufacturing.

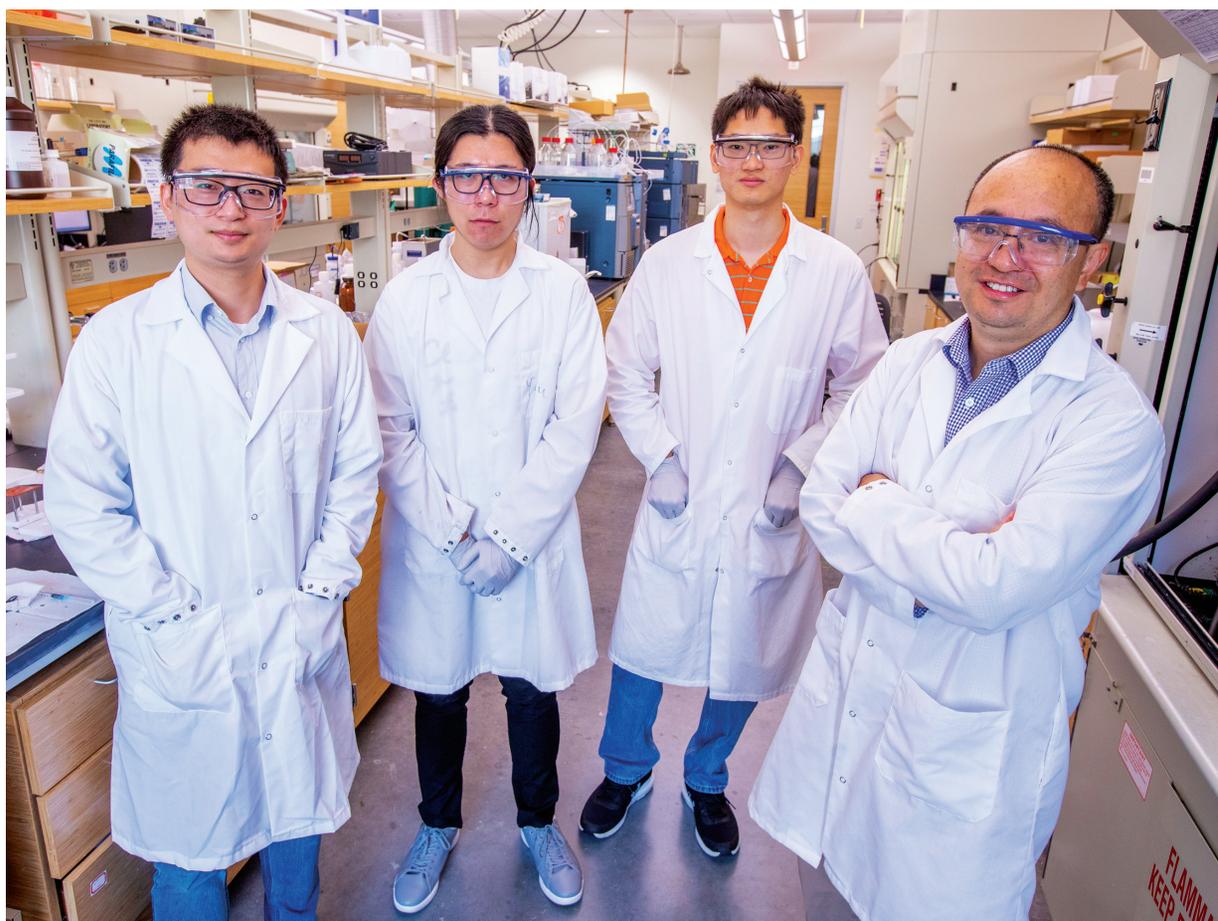
## Electrolyzers to store renewable electrons, convert carbon into valuable chemicals

In one of the NSF projects, Li's team is designing an innovative flow electrolyzer. The system uses electricity to directly create valuable

monomers from biorenewable furanic feedstock at both cathode and anode. In the USDA project, Li's team is pairing electrochemical reduction of carbon dioxide to formate and oxidation of biodiesel byproduct glycerol to valuable carboxylic acids. Both the two electrolyzers suppress less valuable byproducts, such as hydrogen and oxygen gases.

Designing such electrolyzers would make

possible the storing of renewable electrons in chemical bonds. The work will help researchers better understand and design electrolytic systems that support power resilience and help decarbonize the chemical industry. Li's discoveries will also be incorporated into new and existing curricula for community college and university students across Iowa and the Midwest.



Wenzhen Li (right) is shown with graduate students (left to right) Hengzhou Liu, Yifu Chen and Ting-Han Lee.