New process discovered to completely degrade flame retardant in the environment

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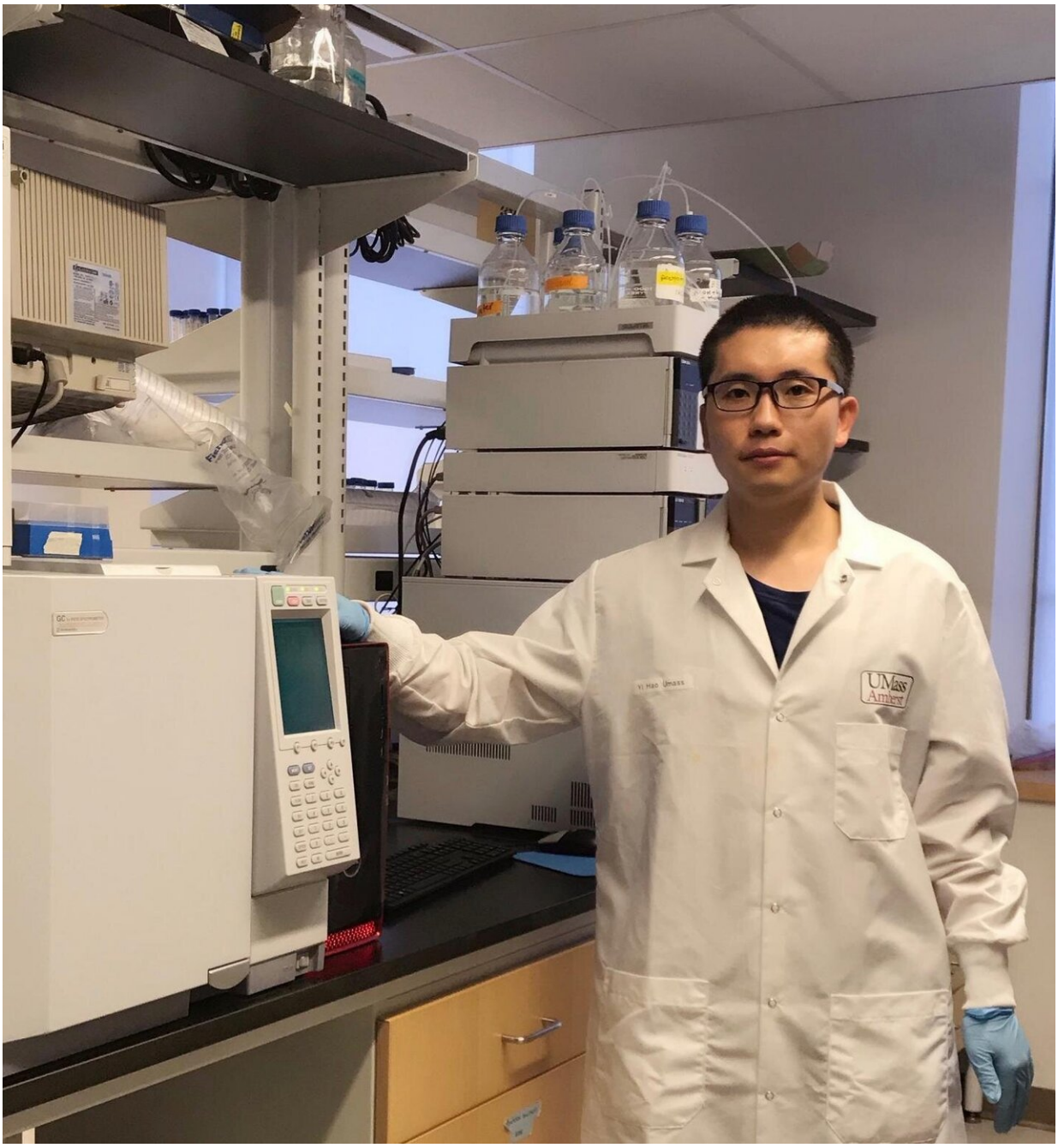


Lead author and UMass Amherst Ph.D. student Credit: UMass Amherst

A team of environmental scientists from the University of Massachusetts Amherst and China has for the first time used a dynamic, two-step

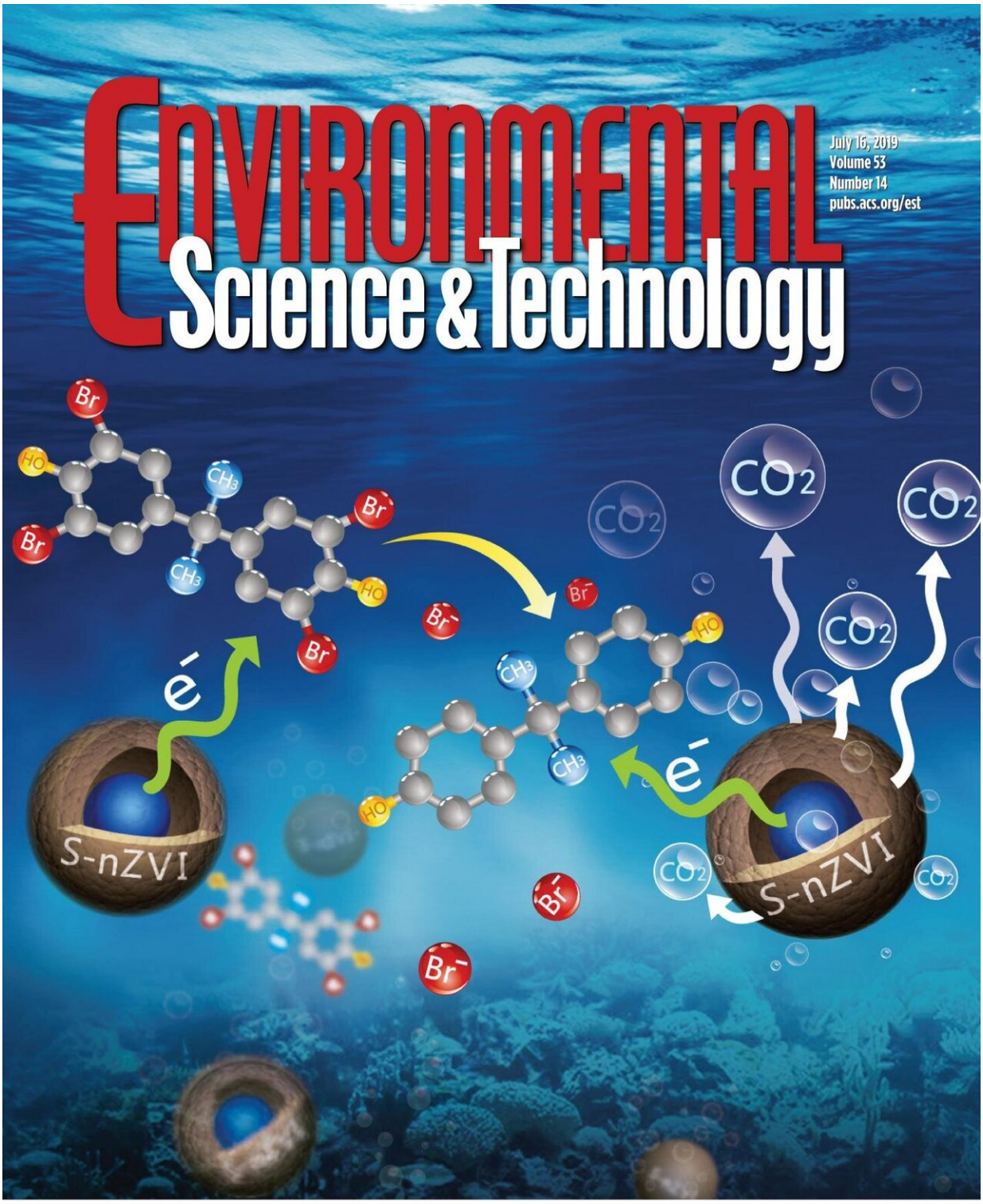
process to completely degrade a common flame-retardant chemical, rendering the persistent global pollutant nontoxic.

This new process breaks down tetrabromobisohenol A (TBBPA) to harmless carbon dioxide and water. The discovery highlights the potential of using a special material, sulfidated nanoscale zerovalent iron (S-nZVI), in water treatment systems and in the natural environment to break down not only TBBPA but other organic refractory compounds that are difficult to degrade, says Jun Wu, a visiting Ph.D. student at UMass Amherst's Stockbridge College of Agriculture and lead author of the paper published in *Environmental Science & Technology*.

"This is the first research about this dynamic, oxic/anoxic process," Wu says. "Usually, reduction or oxidation alone is used to remove TBBPA, facilitated by S-nZVI. We combined reduction and oxidation together to degrade it completely."

Wu emphasizes that "the technique is technically simple and environmentally friendly. That is a key point to its application."

The research is featured on the cover of *ES&T*, which is widely respected for publishing papers in the environmental disciplines that are both significant and original.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The paper is featured on the cover of Environmental Science & Technology. Credit: ES&T

"This research can lead to a decrease in the potential risk of TBBPA to the environment and human health," says Wu, who began the research at the University of Science and Technology of China in Hefei. At UMass Amherst, Wu works in the pioneering lab of Baoshan Xing, professor of environmental and soil chemistry, corresponding author of the new study and one of the world's most highly cited researchers.

"Our research shows a feasible and environmentally friendly process to completely degrade refractory brominated flame retardants in a combined oxic and anoxic system," Xing says. "This is important for getting rid of these harmful compounds from the environment, thus reducing the exposure and risk."

Among the most common flame retardants that hinder combustion and slow the spread of fire, TBBPA is added to manufactured materials, including computer circuit boards and other electrical devices, papers, textiles and plastics.

Associated with a variety of health concerns, including cancer and hormone disruption, TBBPA has been widely detected in the environment, as well as in animals and human milk and plasma.

Although Wu and Xing's research breaks new ground in the efforts to develop safe and effective processes to remediate groundwater and soil contaminated with TBBPA, they say more research is needed to learn how to best apply the process.

Their research was supported by grants from the National Natural

Science Foundation of China and the USDA-National Institute of Food and Agriculture's Hatch Program.

More information: Jun Wu et al, Degradation of Tetrabromobisphenol A by Sulfidated Nanoscale Zerovalent Iron in a Dynamic Two-Step Anoxic/Oxic Process, *Environmental Science & Technology* (2019). DOI: 10.1021/acs.est.8b06834