Chemists develop a simple, easy-to-use method to break down pollutants in water

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Credit: George Hodan/public domain

Chemists from Martin Luther University Halle-Wittenberg (MLU) have determined how stubborn pollutants in water can be disintegrated easily and cost-effectively. The process requires only a green LED light, a

catalyst and vitamin C, and can produce hydrated electrons that reliably destroy the pollutants in the water. Until now, complex laser systems were required. The study was recently published in *Angewandte Chemie*.

Researchers in photochemistry use light to initiate chemical reactions. "The idea is that light penetrates a molecule and triggers a reaction there," says chemist Martin Goez from MLU, whose research group developed the new process. Of particular interest are electrons, which are released by the light energy from their molecular compound in vitamin C and then exist freely in the water. "These so-called hydrated electrons are extremely reactive and can, for example, break down pollutants. The advantage over other substances is that the electrons completely disappear after the reaction, meaning they do not leave any harmful residues," Goez continues. These special electrons can even react with very stable substances and break them down into their individual components.

Until now, expensive and complex high-power lasers were required to generate these types of electrons. Using this kind of equipment is also linked to strict safety precautions. In contrast, the development made by Goez' team at MLU is significantly easier and more cost-effective. "Our system consists of a standard green light-emitting diode, traces of a metal complex that act as a catalyst and vitamin C. This method can be taught to undergrad students at a very early stage," says Goez. The research group tested the new method on chloroacetic acid, an extremely toxic, stable substance. With their system, the researchers were able to destroy the compound into harmless components. They were also able to demonstrate that their cost-effective alternative could generate just as many electrons as a high-power laser.

The development by the MLU's research group is not only suitable for decomposing harmful chlorides or fluorides, the approach can also be applied to many other photochemical reactions that are difficult to

initiate by other means.

More information: Robert Naumann et al, Generating Hydrated Electrons for Chemical Syntheses by Using a Green Light-Emitting Diode (LED), *Angewandte Chemie International Edition* (2017). DOI: 10.1002/anie.201711692

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