Chemists can rapidly purify wastewater with sunlight

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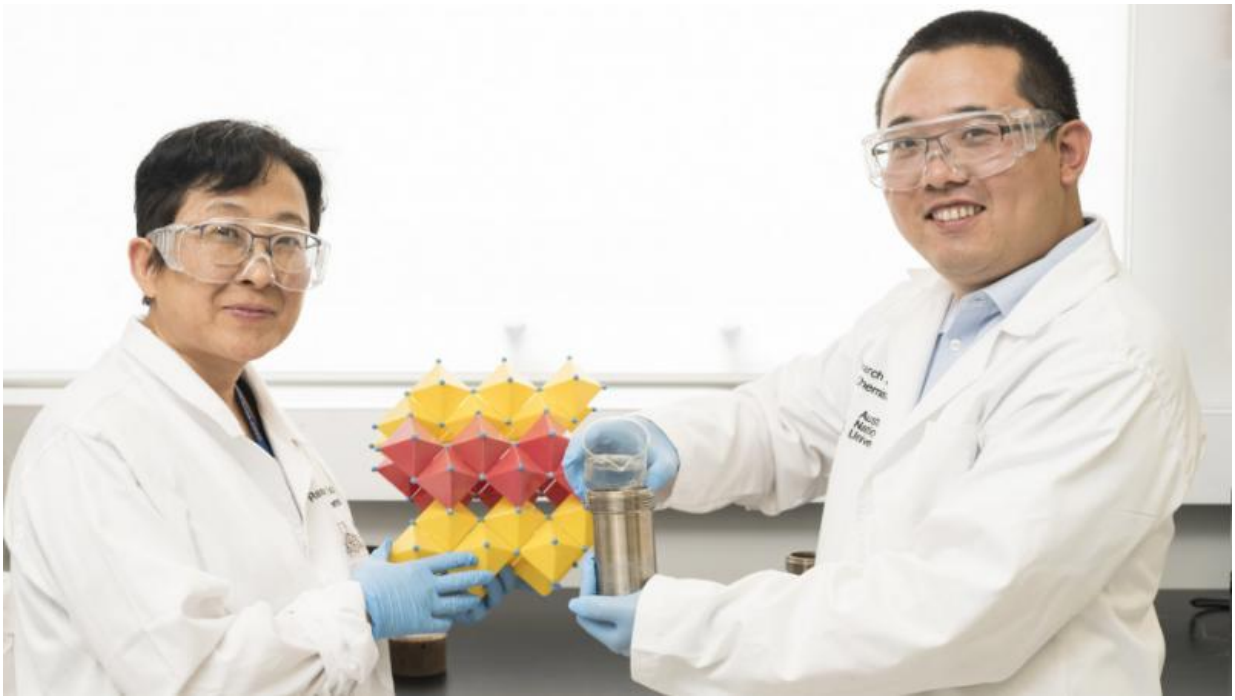

Professor Yun Liu and student Qungbo Sun. Credit: Australian National University

Chemists have found a way to use sunlight to purify wastewater rapidly and cheaply, and to make self-cleaning materials for buildings.

The technology uses modified titanium dioxide as a photocatalyst that works with sunlight, unlike other leading water purification products on

the market that need ultraviolet light.

Research group leader Professor Yun Liu from ANU said the team's invention was 15 times more efficient than leading commercialised products.

"With innovative chemistry design, we can use our photocatalyst to purify water with natural sunlight instead of UV light and dramatically reduce costs for operators," said Professor Liu from the ANU Research School of Chemistry.

"Our photocatalyst can completely decompose organic pollutants in wastewater in 20 minutes, compared with the leading commercilised products which take one hour to decompose only 26 per cent of the same pollutants."

The new technology could be useful for treating water for human consumption and has potential applications in making self-cleaning building materials, including glass, and splitting water to make hydrogen fuel.

Photocatalysts can also be used to speed up chemical reactions used in industrial processes in automotive, construction, environmental, medical and other sectors.

The team added nitrogen and niobium ions in pairs into the titanium dioxide to improve its performance as a photocatalyst.

"It's an important breakthrough for science and industry," Professor Yun Liu said.

"With four years of work done in this area, we now understand the science and can rationally design catalysts."

ANU conducted the research in collaboration with the Chinese Academy of Sciences, the University of New South Wales, Western Sydney University, and the Australian Nuclear Science and Technology Organisation.

ANU has filed a provisional patent covering the discovery, which involved the design strategy, chemical composition and manufacturing approach.

More information: Qingbo Sun et al. The Formation of Defect-Pairs for Highly Efficient Visible-Light Catalysts, *Advanced Materials* (2017). DOI: 10.1002/adma.201605123

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