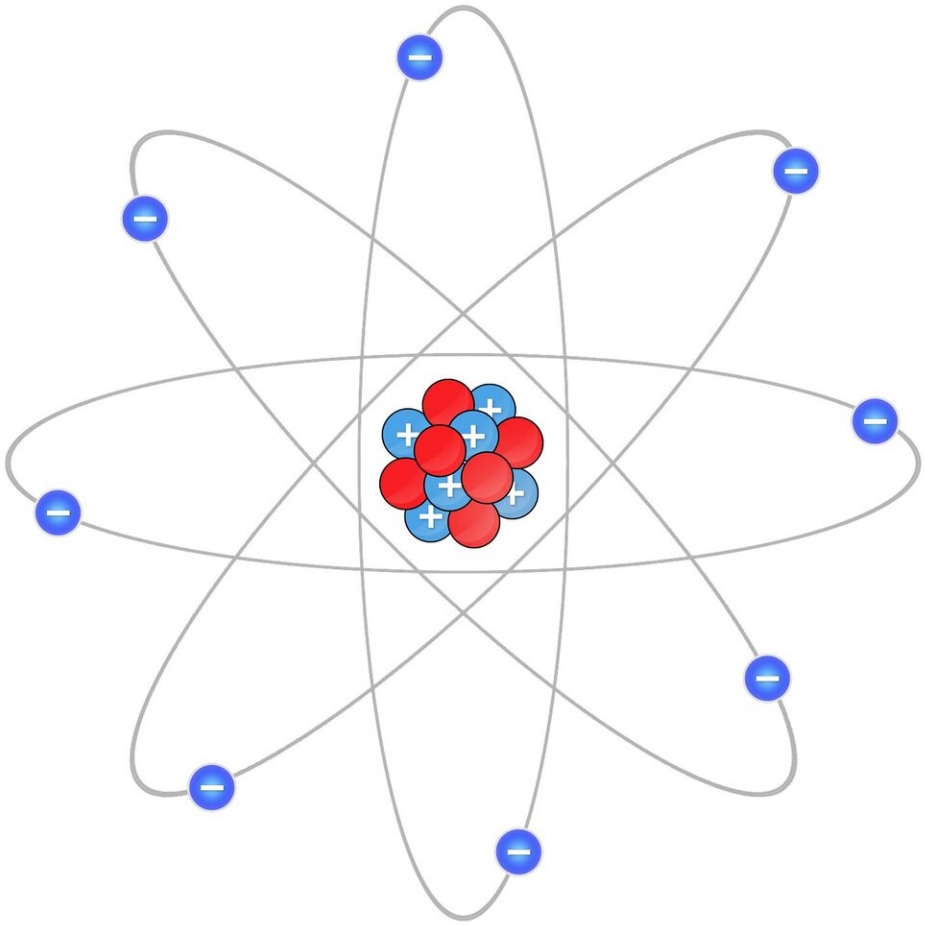
A step closer to ecofriendly hydrogen fuel production

April 6 2020



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Griffith University researchers are aiming to unlock a catalytic process that will enhance the breakdown of water, into hydrogen and oxygen and bring Australia a step closer to creating clean efficient hydrogen fuel.

Australia's National Hydrogen Strategy (2019) aims to establish Australia's hydrogen industry as a major global player by 2030.

In new research published in *Nature Communications*, Professor Huijun Zhao and Dr. Yuhai Dou from the Centre for Clean Environment and Energy are the first to fully unleash the power of $CoSe_2$ nanobelts as an electrocatalyst for the oxidation or breakdown of water. $CoSe_2$ nanobelts are ultrathin sheets made out of a lattice of cobalt (Co) and selenium (Se).

"The nanobelts are so small they have a thickness of about one nanometre, that's 50,000 times smaller than the width of a human hair," Dr. Dou said.

"This thinness hugely increases the surface area and thus reactivity of $CoSe_2$, as only atoms on the surface can react in a solution."

Both 'Iron (Fe) doping', replacing some of the cobalt on the nanobelt with iron, and 'Cobalt (Co) vacancy', removing some of the cobalt, when applied individually improve the nanobelt's ability to speed up reactions to a small degree.

The breakthrough at the Centre of Clean Environment and Energy was discovering that when both processes are put together their combined effect substantially increases the power of nanobelts to speed up

reactions.

"Our discovery, that by combining these two processes we can push this catalyst to its activity limit, is very exciting. This unlocks not just the catalytic power of CoSe2 nanobelts, but catalysts for all sorts of electrochemical reaction," Dr. Dou said.

He said the research would advance knowledge in the fields of material science and electrochemistry.

"More importantly, with hydrogen being an essential part of the Australian government future energy strategy, this work brings Australian capability to meet the challenge of ecofriendly and efficient hydrogen production a step closer to reality."

More information: Yuhai Dou et al. Approaching the activity limit of $CoSe_2$ for oxygen evolution via Fe doping and Co vacancy, *Nature Communications* (2020). DOI: 10.1038/s41467-020-15498-0

Provided by Griffith University