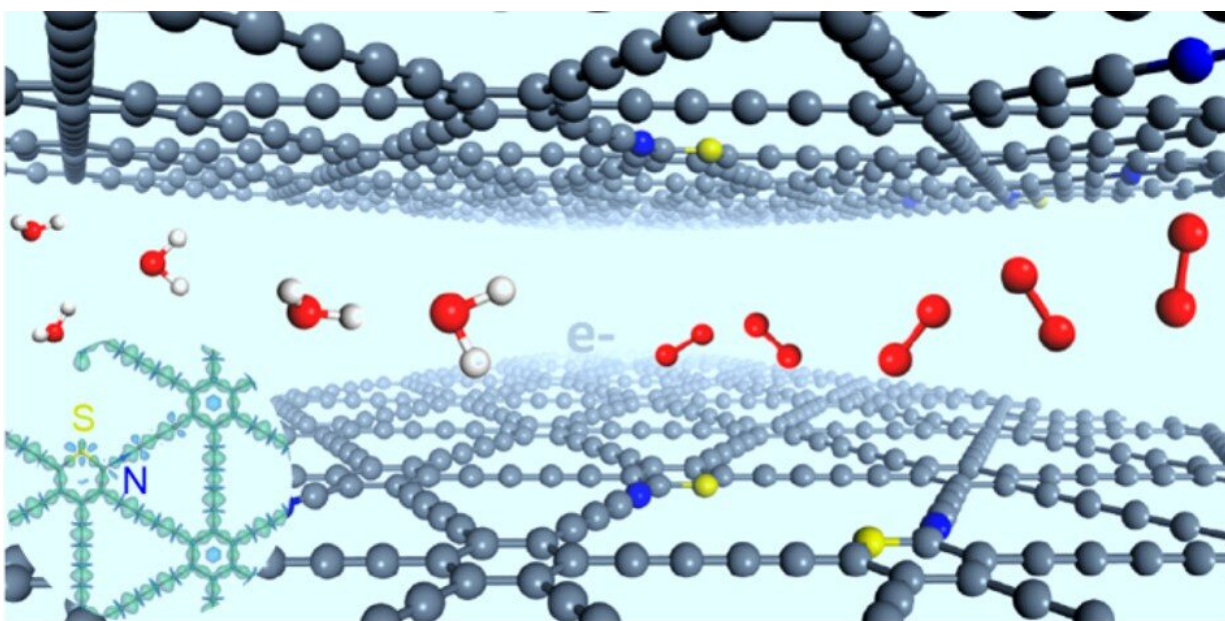


Scientists develop stereodefined N and S atom-codoped graphdiyne for oxygen evolution

May 1 2019



Stereodefined sp-N and S atoms for efficient oxygen evolution. Credit: Zhao Yasong

The oxygen evolution reaction (OER) is of great significance in energy-related techniques such as metal-air batteries and water splitting. Chinese scientists have doped site-defined sp-N and S atoms into graphdiyne, which enables highly active catalysis of OER. Their findings were published in *J. Am. Chem. Soc.*

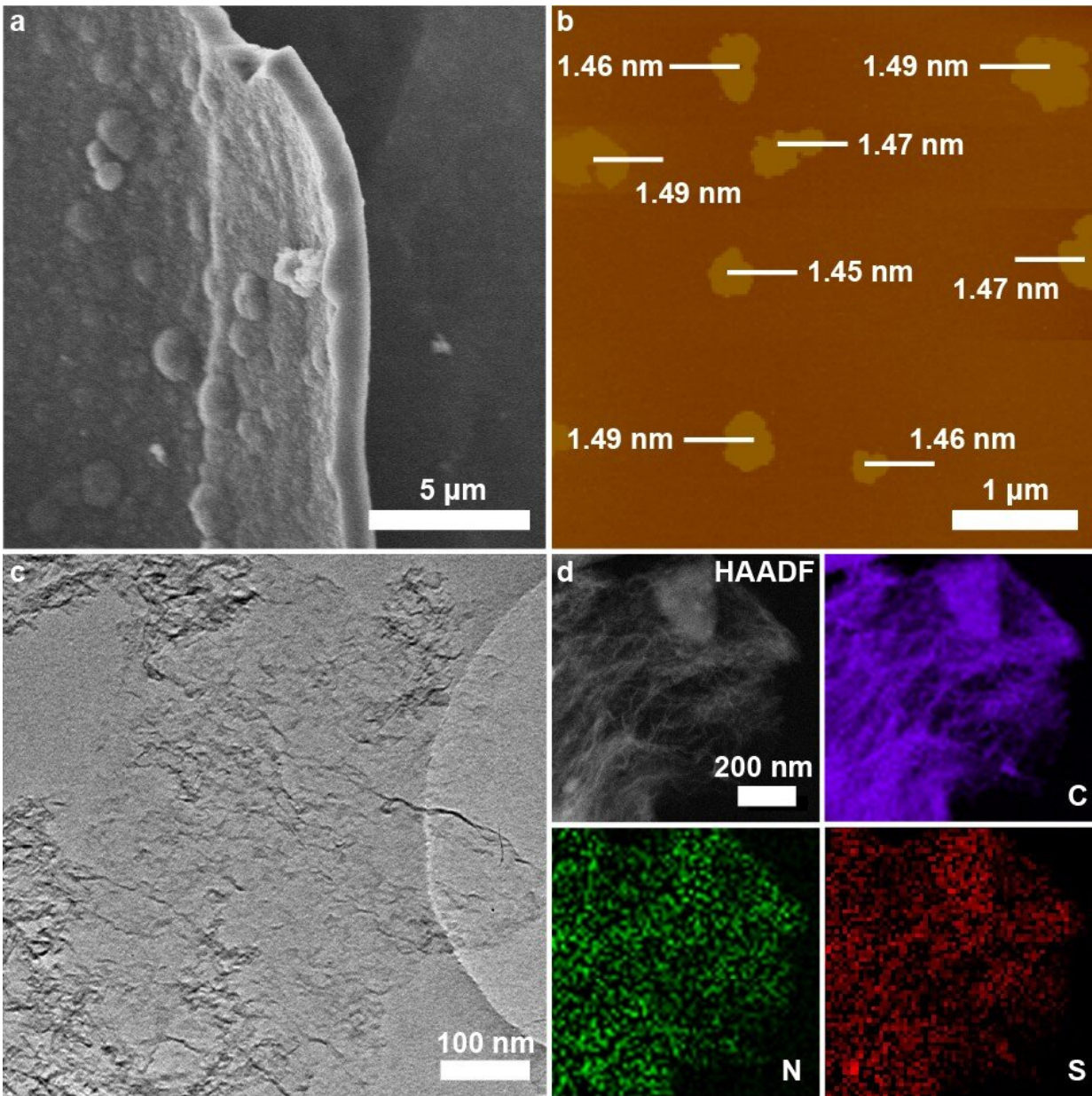
Traditional OER catalysts, e.g. RuO₂ and IrO₂, are limited by high cost and declining stability. Heteroatom-doped carbon materials, especially dual doping, have displayed intriguing potential for highly efficient electrocatalysis owing to the synergistic effect. However, the doping sites for different atoms are highly uncontrollable, which makes the structure-property study difficult.

The synergistic effect can only take place within a certain distance between the dual atoms, and 7.5 Å is the [upper limit](#) for N and S atoms to obtain a strong [synergistic effect](#).

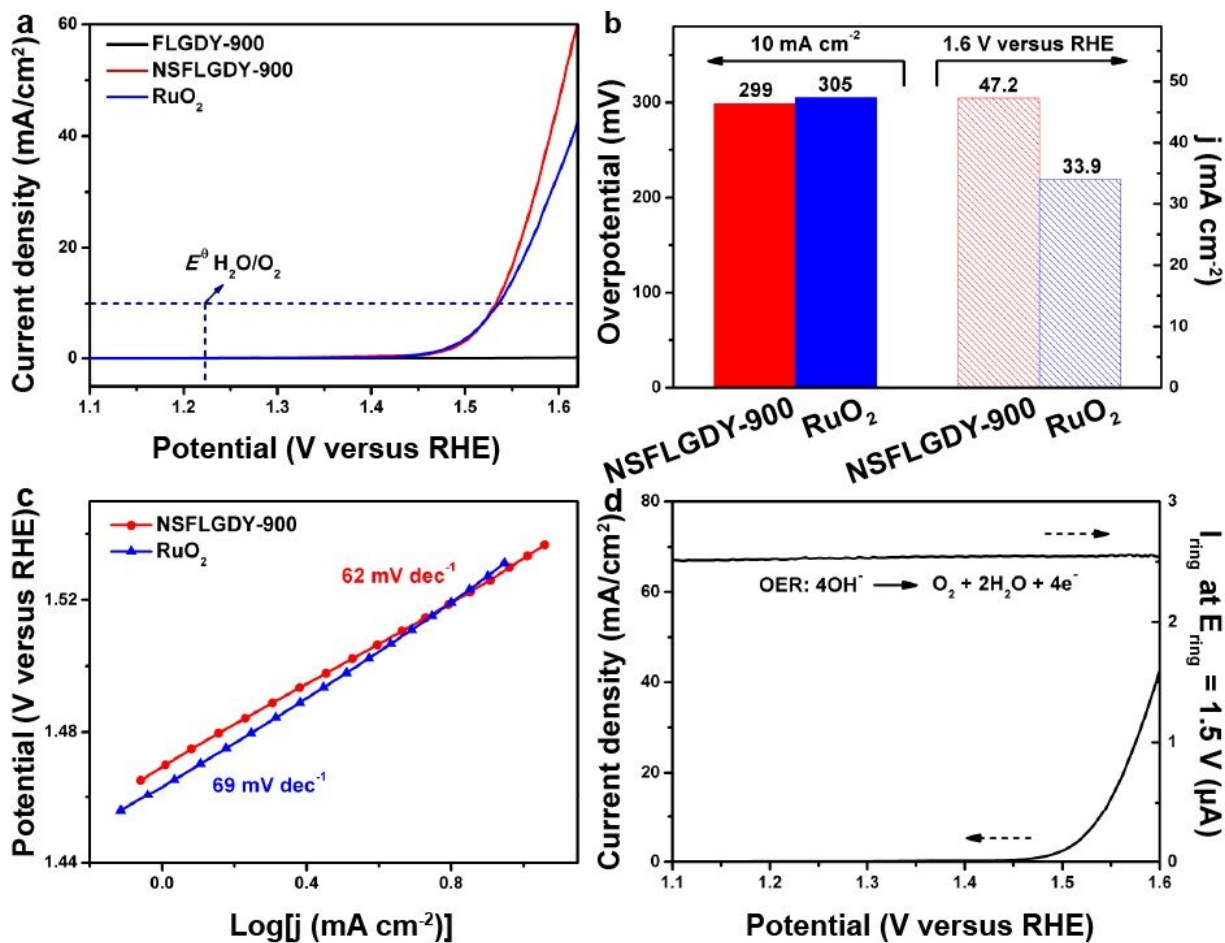
Scientists from the Institute of Process Engineering (IPE) of the Chinese Academy of Sciences successfully prepared "stereodefined" N and S atoms codoped graphdiyne, and the relative positions of the N and S [atoms](#) were well controlled.

"N-, S-codoped graphdiyne presented higher catalytic activity than those catalysts with individual-element doping (N or S atom) and commercial RuO₂ in catalyzing the OER, possessing lower overpotential (299 mV) and higher current density (47.2 mA/cm², 1.6 V), " said WANG Dan, who led this research.

This study opens an avenue for understanding the synergistic effects in heteroelement-doped metal-free catalysts, and for further guiding the rational design and preparation of highly efficient catalysts for energy conversion and storage.



SEM, AFM and TEM characterizations of catalysts. Credit: Zhao Yasong



OER performance of catalysts and commercial RuO₂. Credit: Zhao Yasong

More information: Yasong Zhao et al, Stereodefined Codoping of sp²-N and S Atoms in Few-Layer Graphdiyne for Oxygen Evolution Reaction, *Journal of the American Chemical Society* (2019). [DOI: 10.1021/jacs.8b13695](https://doi.org/10.1021/jacs.8b13695)

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