Researchers construct bifunctional catalysts for oxygen reduction and oxygen evolution reaction

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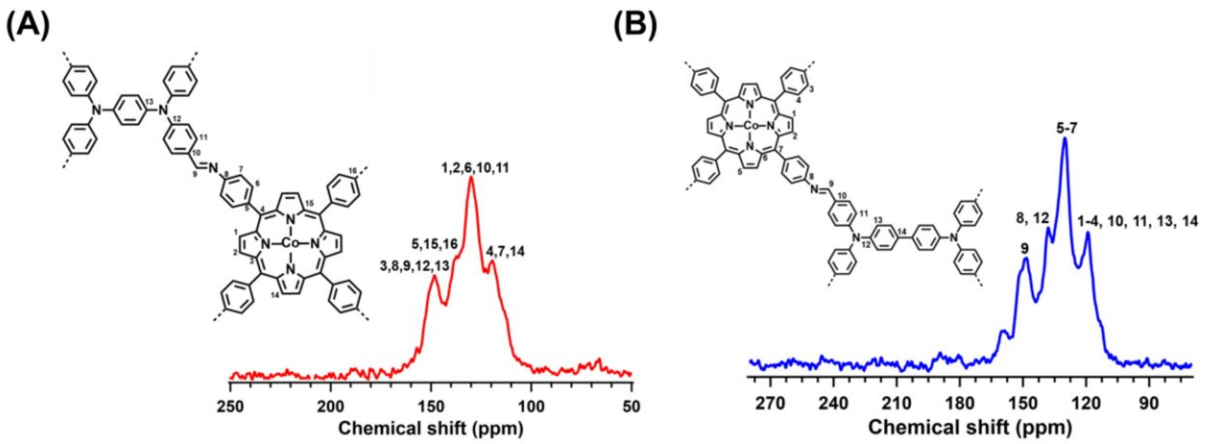

The Solid State ^{13}C NMR spectra of (A) CoTAPP-PATA-COF and (B) CoTAPP-BDTA-COF. Credit: *Angewandte Chemie International Edition* (2022). DOI: 10.1002/anie.202213522

Bifunctional oxygen electrocatalysts exhibit high activity for oxygen reduction reaction (ORR) and oxygen evolution reaction (OER).

Covalent organic frameworks (COFs), which possess ordered pores and high-precision functionalization, have been used in electrochemical energy and conversion systems because of their fast ion transport channels and well-defined electrochemical active sites.

However, the limited electron transport ability along the frameworks hindered their electroactivities, while the development of active sites in COFs towards ORR and OER is rarely explored.

Recently, a research team led by Prof. Zeng Gaofeng and Associate Professor Xu Qing from the Shanghai Advanced Research Institute (SARI) of the Chinese Academy of Sciences constructed novel bifunctional COFs towards ORR and OER by combining redox-active units with catalytic centers in the frameworks.

The COFs showed higher catalytic activities than that of the COF without redox-active units, with a halfwave potential of 0.80 V towards ORR, and an overpotential of 420 mV for OER in 0.1 M KOH, respectively.

Related results were published in *Angewandte Chemie International Edition* on Oct. 14.

Two novel COFs (CoTAPP-PATA-COF and CoTAPP-BDTA-COF) have ordered structure, high surface area and stable chemical stability. The diamine unit, as a typical electron donor and redox-active core, facilitates the electron transport along the framework and improves the electrochemical active surface area.

The theoretical calculation results demonstrate that the introduction of diamine units can effectively improve the oxygen electrocatalysis. By tuning the catalytic centers, the CoTAPP-PATA-COF catalyzes the ORR and OER with high activity and stability.

More information: Minghao Liu et al, Construction of Catalytic Covalent Organic Frameworks with Redox-Active Sites for the Oxygen Reduction and the Oxygen Evolution Reaction, *Angewandte Chemie International Edition* (2022). DOI: 10.1002/anie.202213522