New electrocatalysts herald carbon neutrality

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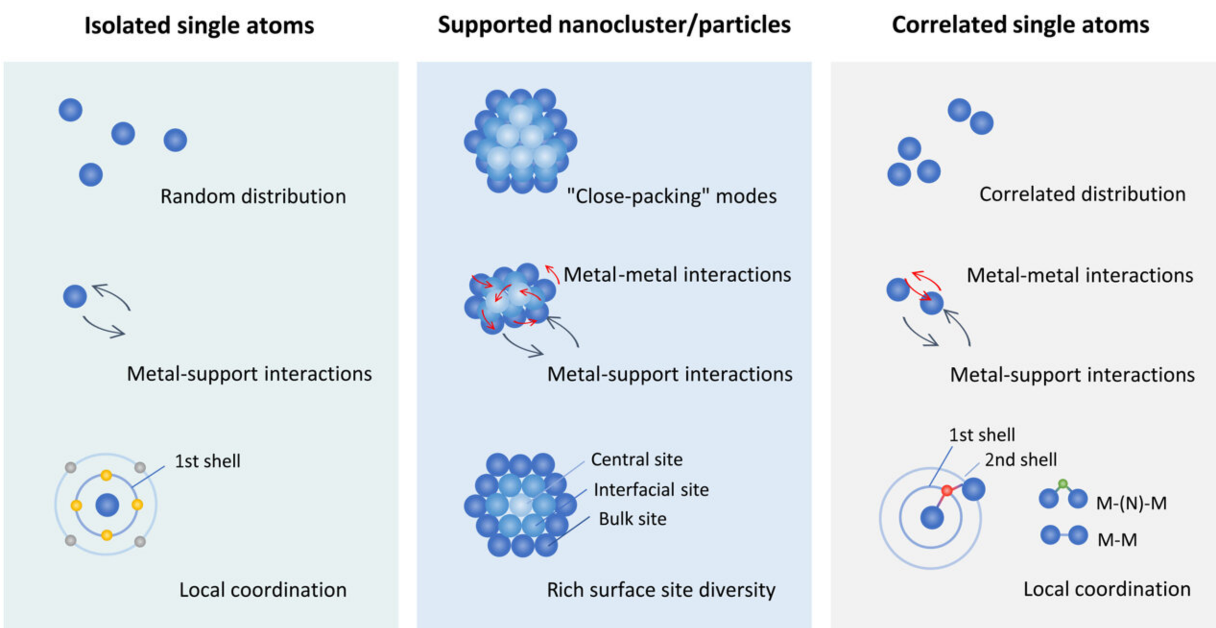

C-SACs with metal-metal interactions. Comparison of C-SACs with the conventional isolated SACs and supported metallic cluster/nanoparticle catalysts from the perspective of spatial distribution, intersite interactions, and local coordination. Credit: *Science Advances* (2022). DOI: 10.1126/sciadv.abo0762

A team of researchers at the University of Adelaide is undertaking fundamental research into new types of high-performance low-cost metal-based electrocatalysts that are the key to the development of sustainable energy solutions and help to achieve carbon neutrality. They are developing catalysts that can be "tailored" to different uses.

An electrocatalyst is a catalyst that increases the rate of the oxidation and reduction reactions in an electrochemical cell or electrolyzer. Improvements in the performance of electrocatalysts improve the efficiency of the device, which are critical for storing and converting renewable energy generated by remotely located solar and wind farms.

"Single atom catalysts are promising candidates for the next-generation of highly efficient electrocatalysts," said the University of Adelaide's Professor Shizhang Qiao, Director of the Centre for Materials in Energy and Catalysis, who leads the team.

"They benefit from high atomic utilization—how efficiently materials are used in a reaction, which helps to reduce the cost of energy generation and conversion applications. However, the simplicity of geometric structure restricts their application.

"We are working on a new class of correlated single atom catalysts with neighboring metal single atoms, which provides more opportunities to achieve structural modification," said Professor Qiao.

"By controlling metal-metal interactions between metal single atoms we have been able to regulate the geometric and electronic structure of active sites, and therefore facilitate performance enhancement toward a wider range of electrocatalytic applications.

"By critically examining recent progress, we outlined directions for future work in the design and development of high-performing correlated single atom catalysts."

These fundamental research advances will inspire the rational design of metal-based electrocatalysts with high performance and low cost, which will benefit the development of sustainable energy solutions.

The team, which critically reviewed current literature and set out future research directions, published their findings in the journal *Science Advances*.

More information: Jieqiong Shan et al, Metal-metal interactions in correlated single-atom catalysts, *Science Advances* (2022). DOI: 10.1126/sciadv.abo0762

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