Researchers develop a concept for efficiency-enhanced noble-metal catalysts

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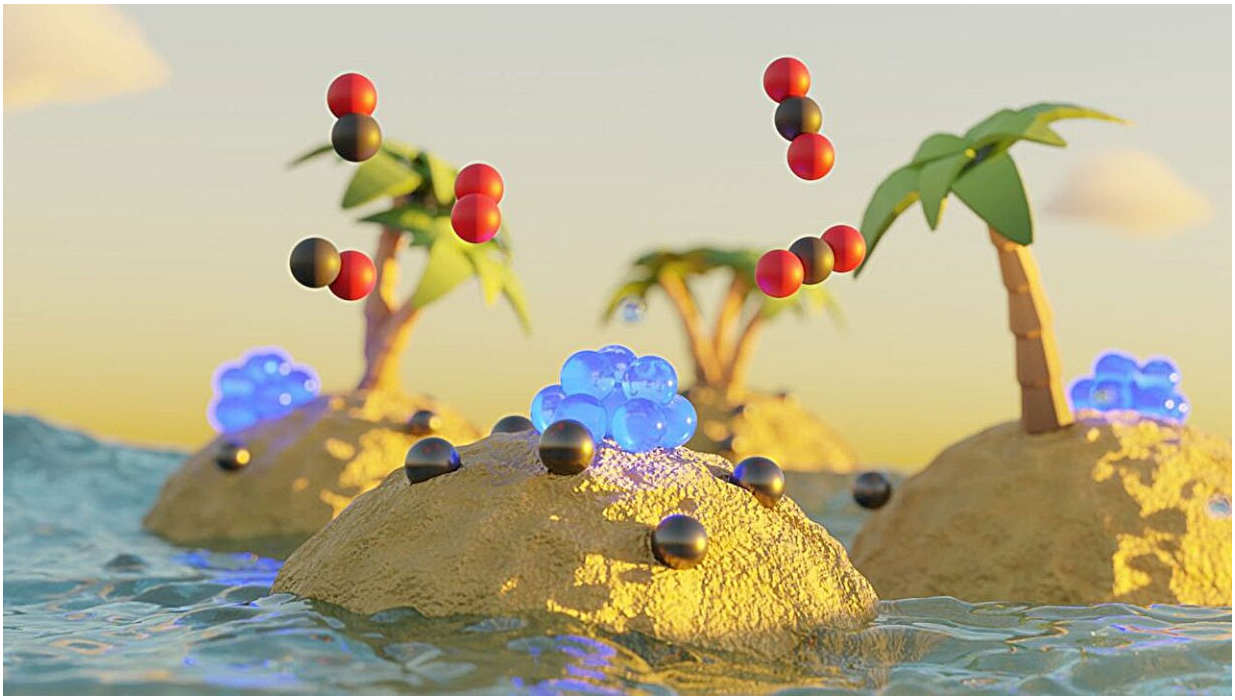

Nanometer-sized palladium particles on ceria “islands” make noble-metal catalysts stable and efficient. Credit: ITCP, KIT

The production of more than 90% of all chemical products we use in our everyday lives relies on catalysts. Catalysts speed up chemical reactions, can reduce the energy required for these processes, and in some cases, reactions would not be possible at all without catalysts.

Researchers of Karlsruhe Institute of Technology (KIT) have developed a concept that increases the stability of noble-metal catalysts and requires less noble metal for their production. Their study has been published in the journal *Angewandte Chemie*.

Noble-metal catalysts are used in many processes in the chemical industry. A reduction of the amount of noble metal required for their production is an important contribution to a sustainable resource use.

"Our approach will significantly improve the catalyst stability and ensure the formation of active noble-metal clusters even with a very low amount of noble metal used," says Dr. Daria Gashnikova from KIT's Institute for Chemical Technology and Polymer Chemistry (ITCP), who is the lead author of the study.

To obtain the best possible catalytic performance using the smallest possible amount of noble metals, the ITCP researchers investigated frequently used supported catalysts atom by atom. In these supported catalysts, the material where the reaction takes place is finely distributed on the support as small nanoparticles.

These clusters are dynamic and change their structure depending on the reaction conditions. They can combine with each other and grow into larger particles so that fewer surface atoms are available for the reaction. However, they can also break down into single atoms that are ineffective on their own. Both phenomena reduce the catalytic performance.

The novel concept developed by the ITCP researchers solves this problem by taking advantage of the varying interactions of noble metals with different support materials.

More information: Daria Gashnikova et al, Highly Active Oxidation

Catalysts through Confining Pd Clusters on CeO2 Nano-Islands, *Angewandte Chemie International Edition* (2024). DOI: 10.1002/anie.202408511

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