Área: ELE
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Isolated Pd sites on functionalized carbon supports towards hydrogen peroxide electrosynthesis: A study of activity and stability

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Highlights

The stability of single-atom catalysts (SACs) under harsh conditions in real-world applications is still a concern for the implementation of electrochemical H_2O_2 production. Here, we synthesized and applied Pd-based SACs to address this challenge. The performance, selectivity, and durability of these catalysts were thoroughly evaluated under realistic conditions.

Resumo/Abstract

The *in-situ* electroproduction of hydrogen peroxide (H_2O_2) via selective 2-electron oxygen-reduction (ORR-2e$^-$) has gained a lot of attention in recent years because of its wide applicability ranging from industrial processes to water treatment technologies.[1] However, making the implementation of electrochemical H_2O_2 production a reality is still a challenge, as it requires the development of electrocatalysts that are more active, selective, and stable, while also using less noble metal content.[1,2] Single-atom catalysts (SACs) have emerged as a promising solution to this problem as they provide unprecedented levels of metal dispersion and unparalleled activity and selectivity towards ORR-2e$^-$.[2] But the (electro)chemical stability of SACs under harsh conditions in real-world electrochemical devices is still a concern.[3,4] To address this challenge, we synthesized and applied SACs based on palladium (Pd) dispersed in carbon support with functional groups that stabilize the isolated metallic center, resulting in highly efficient electrocatalysts for selective H_2O_2 production. We thoroughly evaluated the performance, selectivity, and durability of the newly synthesized Pd SAC-based electrocatalysts under realistic conditions using testing protocols that simulate actual H2O2-producing devices. Based on the experimental results, we highlight important structural factors for enhancing stability, including customizing the coordination environment around the active center and the importance of the carbon material.

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