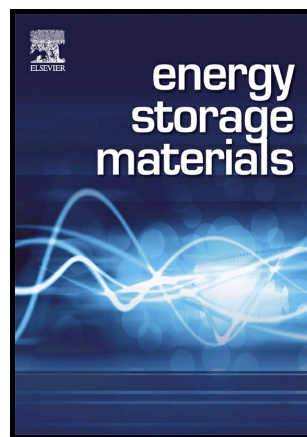


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Synergistic electrocatalytic oxygen reduction reactions of Pd/B₄C for ultra-stable Zn-air batteries

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ABSTRACT:

Highly active and durable electrocatalysts are desired to promote oxygen reduction reactions (ORR) for Zn-air batteries. Here we report a promising catalyst of Pd nanoparticles supported on boron carbide (Pd/B₄C) through a facile hydrothermal route. The Pd/B₄C electrode not only shows the same onset potential of 0.96 V vs. RHE as the Pt/C electrode, but also an obviously larger limiting current density. More importantly, compared with noble metal electrodes, Pd/B₄C shows higher power density (187 mW cm⁻²) and much more durable cycle life (up to 1333 h) in Zn-air batteries. To gain insight into the enhanced ORR activity by B₄C support, first-principles computations reveal the synergistic effect between B₄C and Pd; B₄C could significantly promote O₂ adsorption and splitting on Pd/B₄C composites, while Pd particles on B₄C have a major effect on the transformation of O* to OH⁻. The

¹ Both authors contributed equally to this work.

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