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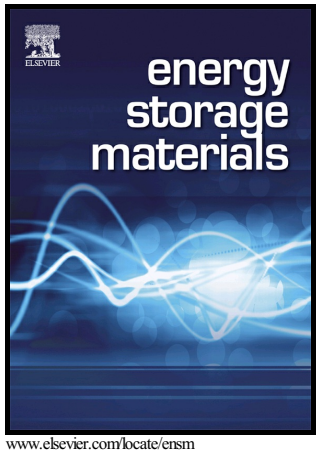

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Synergistic electrocatalytic oxygen reduction reactions of Pd/B_4C for ultra-stable Zn-air batteries

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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/B_4C) through a facile hydrothermal route. The Pd/B_4C 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/B_4C 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 B_4C support, first-principles computations reveal the synergistic effect between B_4C and Pd; B_4C could significantly promote O_2 adsorption and splitting on Pd/B_4C composites, while Pd particles on B_4C have a major effect on the transformation of O* to OH^-. The

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