

Preparation, characterisation and application of Pd/ C nanocatalyst in passive alkaline direct ethanol fuel cells (ADEFC)

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Abstract

This work describes the use of Pd nanocatalyst on Vulcan XC-72 (at a very low loading, 8 wt % Pd) in passive alkaline direct ethanol fuel cell (ADEFC). The average Pd particle size obtained with TEM was 3.5 ± 0.5 nm. The XRD results of the prepared Pd nanocatalysts showed the dominant fcc structure. The catalytic activity towards ethanol electrooxidation in various concentrations of KOH was evaluated in the half-cell tests by cyclic voltammetry and chronoamperometry. Improved performance and stability on Pd/C was observed when the $[\text{hydroxyl}]/[\text{ethanol}] = 1$. The Pd/C nanocatalyst performance in ADEFC under passive state showed enhanced maximum current and power densities in 5 M KOH. 5 M ethanol showed power density of $7 \text{ mW cm}(\text{sup-2})$ and maximum current density of $33 \text{ mA cm}(\text{sup-2})$ in 1 M KOH. While at higher KOH concentration of 5 M, 5 M ethanol showed improved power density of $17 \text{ mW cm}(\text{sup-2})$ and $90 \text{ mA cm}(\text{sup-2})$ current density as well as stability.