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Facile synthesis of cobalt oxide as electrocatalyst for the oxygen reduction reaction in microbial fuel cells

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Abstract

Cost-effective cobalt oxides were synthesized at mild condition as alternatives to platinum catalyst for oxygen reduction in microbial fuel cells (MFCs). The catalysts were prepared by heating $Co(NO_3)_2$ above its decomposition temperature together with carbon black (CB). At a catalyst loading of 5 mg/cm^2, cobalt oxide cathodes with a $Co(NO_3)_2$ to CB ratio of 0.732:1 produced a maximum power density of 1220 mW/m^2, which was slightly lower than that of Pt/C cathodes (1360 mW/m^2). Further increase in the loading of cobalt oxides resulted in an increase in performance. The maximum power densities produced by cobalt oxide cathodes increased to 1400 mW/m^2 at a catalyst loading of 20 mg/cm^2 and 1540 mW/m^2 at 30 mg/cm^2, which outperformed the Pt/C control. The durability of cobalt oxide catalysts was comparable to that of Pt/C in single-chamber MFCs with biological