

## Accepted Manuscript

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PII: S1385-8947(18)30305-X  
DOI: <https://doi.org/10.1016/j.cej.2018.02.092>  
Reference: CEJ 18571

To appear in: *Chemical Engineering Journal*

Received Date: 12 December 2017  
Revised Date: 20 February 2018  
Accepted Date: 21 February 2018

Please cite this article as: X. Xia, M. Li, T. Liu, P. Liang, X. Huang, Facile synthesis of cobalt oxide as electrocatalyst for the oxygen reduction reaction in microbial fuel cells, *Chemical Engineering Journal* (2018), doi: <https://doi.org/10.1016/j.cej.2018.02.092>

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Date: February 20, 2018 (originally submitted December 10, 2017)

Submitted to: *Chemical Engineering Journal*

## 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  $\text{Co}(\text{NO}_3)_2$  above its decomposition temperature together with carbon black (CB). At a catalyst loading of  $5 \text{ mg/cm}^2$ , cobalt oxide cathodes with a  $\text{Co}(\text{NO}_3)_2$  to CB ratio of 0.732:1 produced a maximum power density of  $1220 \text{ mW/m}^2$ , which was slightly lower than that of Pt/C cathodes ( $1360 \text{ mW/m}^2$ ). 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  $1400 \text{ mW/m}^2$  at a catalyst loading of  $20 \text{ mg/cm}^2$  and  $1540 \text{ mW/m}^2$  at  $30 \text{ mg/cm}^2$ , 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

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