Novel mesoporous MnCo2O4 nanorods as oxygen reduction catalyst at neutral pH in microbial fuel cells

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ABSTRACT

The aim of this work was to evaluate the comparative performance of hybrid metal oxide nanorods i.e. MnCo2O4 nanorods (MCON) and single metal oxide nanorods i.e. Co3O4 nanorods (CON) as oxygen reduction catalyst in microbial fuel cells (MFC). Compared to the single metal oxide, the hybrid MCON exhibited a higher BET surface area and provided additional positively charged ions, i.e., Co2+/Co3+ and Mn3+/Mn4+ on its surfaces, which increased the electro-conductivity of the cathode and improved the oxygen reduction kinetics significantly, achieved an io of 6.01 A/m2 that was 12.4% higher than CON. Moreover, the porous architecture of MCON facilitated the diffusion of electrolyte, reactants and electrons during the oxygen reduction, suggested by lower diffusion (Rd), activation (Ract) and ohmic resistance (Rohm) values. This enhanced oxygen reduction by MCON boosted the power generation in MFC, achieving a maximum power density of 587 mW/m2 that was ~29% higher than CON..

Keywords: Co3O4 nanorods; Microbial fuel cell; MnCo2O4 nanorods; Oxygen reduction reaction.