Phosphomolybdic Acid coupling with Vulcan XC72 Carbon as Superior Catalyst to Enhance ORR Activity and Performance of MFC

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Microbial fuel cell (MFC) is an emerging technology that can treat wastewater and recover energy simultaneously. However, there are many factors that limit its application, among which cathode catalysts are one of the main obstacles. In this study, H₃PMo₁₂O₄₀/Vulcan XC72 carbon (PMo/CB) material was successfully prepared by a feasible process and used as efficient catalyst on oxygen reduction reaction (ORR) to improve the performance of MFC. The electrochemical performance of PMo/CB and Pt/C were evaluated by LSV, EIS, and Tafel plot. The results showed that the ORR activities of samples were following the order of PMo/CB-2 > Pt/C > PMo/CB-3 > PMo/CB-1 > PMo/CB-4 > CB. Moreover, PMo/CB exhibited a high durability compared to Pt/C in MFC after 4 months of operation. Finally, the catalytic reaction mechanism of PMo/CB was discussed. The results demonstrated the high ORR activity of the sample could be attributed to the favorable specific surface area of CB and the effect of electrostatic coupling between PMo and CB, which enhanced the adsorption and reduction of O₂. Therefore, PMo/CB will be a promising cathode ORR catalyst for microbial electrochemical system.

Keywords: Phosphomolybdic acid, Vulcan XC72 carbon, Oxygen reduction reaction, Microbial fuel cells.

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