

The applicability of the Maximum Power-point of Microbial Fuel Cells: Influence of Potential Scan rate and real-time external Load

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Performance evaluation of a microbial fuel cell (MFC) is usually done with linear sweep voltammetry (LSV) [1] at a given potential scan rate (PSR) [2]. This evaluation does not often reflect the long-term performance of the MFC under real-time external loads [1]. In this study, the performance of a single-chamber MFC was evaluated with three external loads (1206, 470, and 270 Ohms) calculated from LSV maximum power point (MPP) with three PSRs (0.1, 0.5, and 1 mV/s). The estimated power from the MPP in ascending order of PSR were 61.96, 87.88, and 166.68 mW/m² at 116.5, 229.6 and 403 mA/m², respectively. The average power obtained with 1206, 470, and 270 Ohms in the first two hours of operation were 73 ± 16.7, 36.3 ± 42, and 88.5 ± 120.1 mW/m² at current densities of 124.6 ± 14.3, 121.2 ± 73.4, and 232.6 ± 176.2 mA/m², respectively. The result showed that overestimation was more pronounced at higher PSRs. Although the MFC was initially underestimated at 0.1 mV/s, this PSR more accurately reflects the true and applicable estimate of the long-term performance of the MFC. These results are explicitly beneficial for electrochemical estimation of the actual performance of MFCs under real-time external loads.

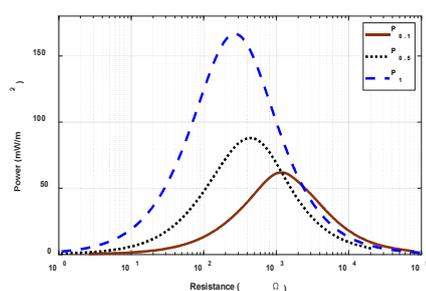


Fig. 1. Maximum power at different scan rates

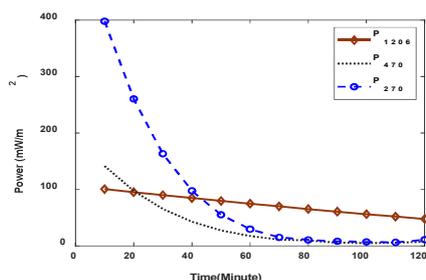


Fig. 2. Short-term performance at different external loads

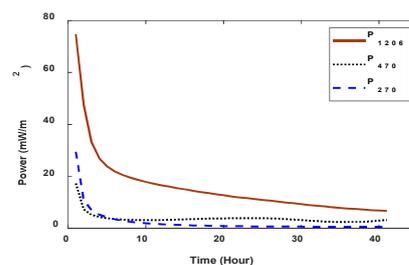


Fig. 3. long-term performance at different external loads

Keywords: maximum power, microbial fuel cell, external load, potential scan rate

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References

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