Supporting Information

A gold microarray electrode on poly(methylmethacrylate) substrate to improve the performance of microbial fuel cell by modifying biofilm formation

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The following is included as additional supporting materials for this paper:

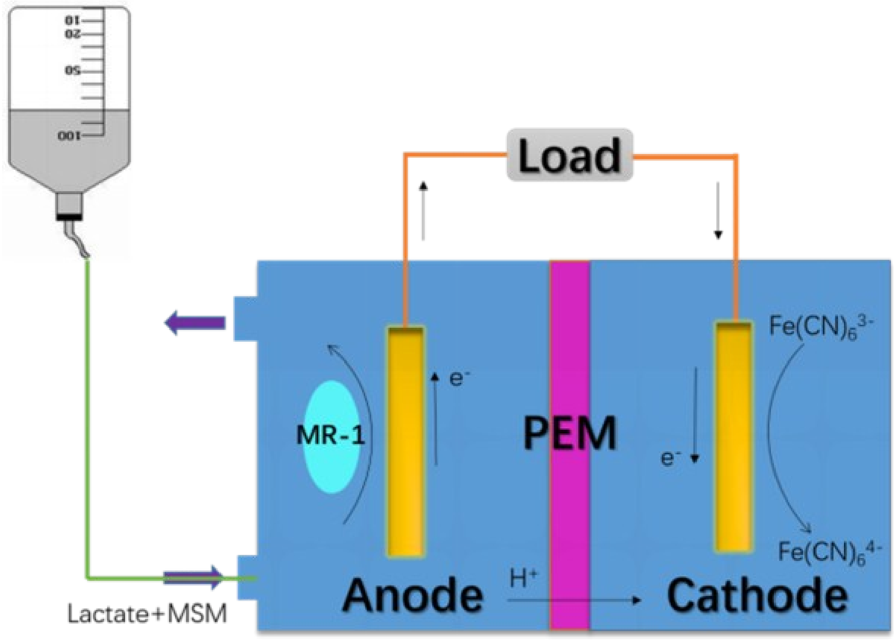

Fig. S1. Schematic diagram of two-chamber MFCs in this paper.

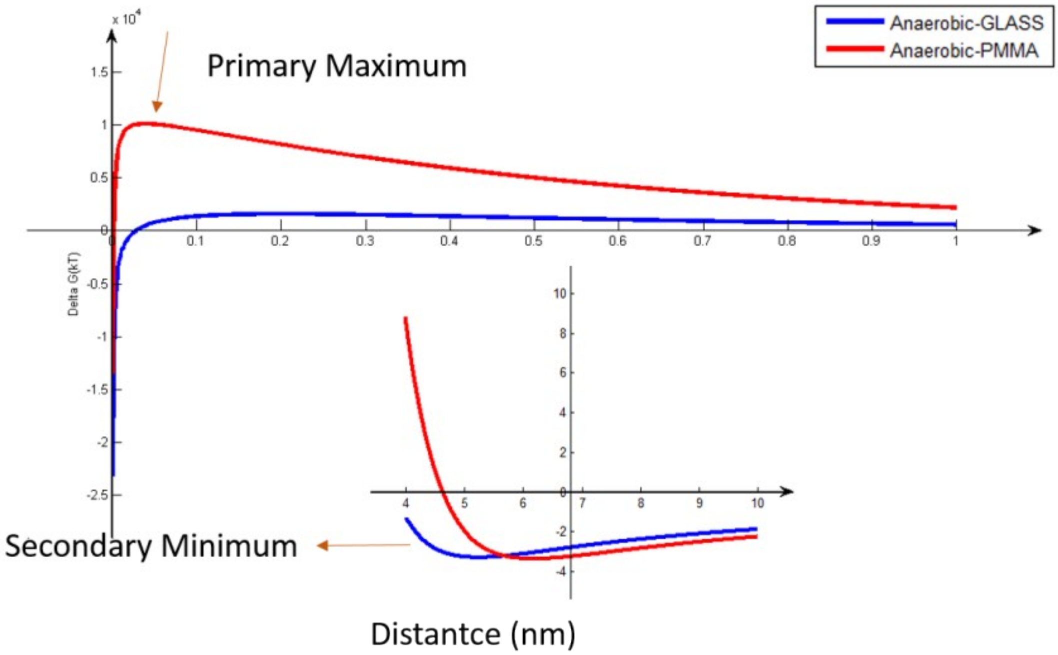

Fig. S2. The extended Derjaguin–Landau–Verwey–Overbeek (DLVO) model curves of bacteria-PMMA and bacteria-GLASS interaction.

The formulas used to theoretical analysis of bacteria-PMMA and bacteria-GLASS interaction (referenced from [1]).

The free energy of interactions ($\Delta G(d)$) is determined by Lifshitz–van der Waals ($\Delta G^{LW}(d)$), Lewis acid–base ($\Delta G^{AB}(d)$), and electrostatic ($\Delta G^{EL}(d)$) forces:

$$\Delta G(d) = \Delta G^{LW}(d) + \Delta G^{AB}(d) + \Delta G^{EL}(d).$$

where d indicates the distance between bacteria and a substrate and free energies are the functions of d.

And with the surface energy data, $\Delta G^{LW}(d)$, $\Delta G^{AB}(d)$, and $\Delta G^{EL}(d)$ are calculated as follows:

$$\Delta G^{LW}(d) = \frac{A}{6}\left[\frac{a}{d} + \frac{a}{d+2a} + ln\left(\frac{d}{d+2a}\right)\right]$$

$$\Delta G^{AB}(d) = 2\pi a\lambda \Delta G_{d_0}^{AB} exp\frac{(d_0 - d)}{\lambda}$$

$$\Delta G^{EL}(d) = \pi\varepsilon_0\varepsilon_r a\left(\zeta_B^2 + \zeta_S^2\right)\left\{\frac{2\zeta_B\zeta_S}{\zeta_B^2 + \zeta_S^2}\ln\frac{1+\exp(-\kappa d)}{1-\exp(-\kappa d)} + \ln\left[1-\exp(-2\kappa d)\right]\right\}$$

where *a* is the bacterial radius;

A is the Hamaker constant;

λ is the correlation length of molecules in a liquid medium;

ε_0 is the permittivity of vacuum;

ε_r is the relative permittivity;

ζ_B is the zeta potential of bacteria;

ζ_S is the zeta potential of substrate;

κ is the reciprocal of Debye length.

1. X. Ge, Y. Leng, X. Lu, F. Z. Ren, K. F. Wang, Y. H. Ding and M. Yang, *J Biomed Mater Res A*, 2015, **103**, 384-396.