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Electrochemical Catalysis of Inorganic Complex $K_4[Fe(CN)_6]$ by *Shewanella oneidensis* MR-1

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The interaction between metal and bacteria is a universal and important biogeochemical process in environment. As a dissimilatory metal reduction bacterium, the electrochemically active bacterium *Shewanella oneidensis* MR-1 can transfer intracellular electrons to minerals¹. This ability is attributed to the redox proteins localized on the outer-membrane, for example, the MtrC, MtrB, MtrA and CymA². Here we investigate its electrochemical properties towards redox inorganic redox compounds. It shows strong electrocatalysis toward electrochemical oxidation of $K_4[Fe(CN)_6]$. As a redox molecule, $K_4[Fe(CN)_6]$ gives a pair of redox peaks on voltammetry on bare glassy carbon electrode (GCE), symmetric with ideal peak-peak separation of about 60 mV, indicating of a reversible one-electron transfer process (blue curve, Figure 1). Surprisingly, the presence of *S. oneidensis* MR-1 on GCE results an asymmetric redox peak, with almost disappearance of the cathodic peak and strengthen of the anodic peak, which is a typical catalysis feature of electrochemical oxidation. Further experiments show that *S. oneidensis* MR-1 does not give such electrocatalysis to redox compounds such as $Ru[(NH_3)_6]Cl_3$ and Resorufin. Selectivity and electrocatalysis mechanisms of *S. oneidensis* MR-1 are under investigation. The ability of *S. oneidensis* MR-1 to catalyze redox action of inorganic metal complex compounds will provide an insight on metal cycles in nature.

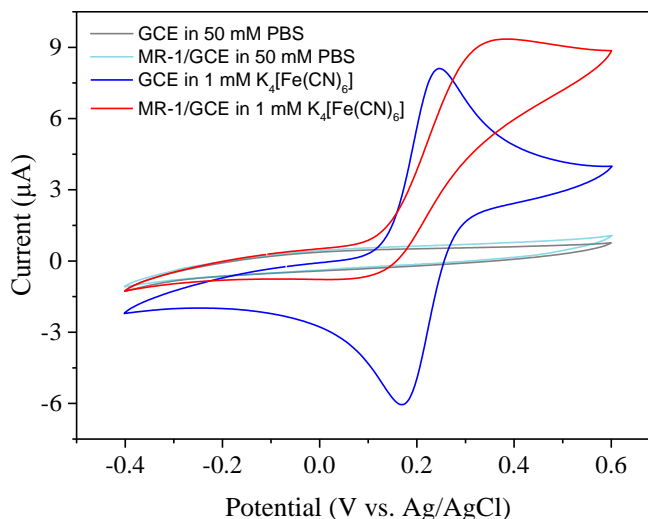


Figure 1. The cyclic voltammetry of $K_4[Fe(CN)_6]$ at GCE coating *Shewanella oneidensis* MR-1 (MR-1), the glassy carbon electrode (GCE) and GCE coating with MR-1 in phosphate buffer solution (PBS) and GCE in $K_4[Fe(CN)_6]$ were as control (scan rate: 10 mV/s)

References

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