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

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 minerals. This ability is attributed to the redox proteins localized on the outer-membrane, for example, the MtrC, MtrB, MtrA and CymA. Here we investigate its electrochemical properties towards redoxinorganic 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 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 strengthening 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.

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