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Electrocatalytic oxidation of K₄[Fe(CN)₆] by metal-reducing bacterium Shewanella oneidensis MR-1

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The microbial metabolic activities between metals and bacteria play a vital role on biogeochemical cycling of metal compounds¹. One of these activities is extracellular electron transfer (EET), in which some microbes exchange electrons with external redox minerals, electrodes, or even other microorganisms²-⁴. The bacteria can either take electrons or give electrons. Shewanella oneidensis MR-1 (MR-1) is electrochemical active, it can transfer electrons from cell to extracellular electron acceptors including Fe(III) (hydro)oxides. In this study, we report that MR-1 electrocatalyze the oxidation of an inorganic redox compound K₄[Fe(CN)₆]. A pair of symmetric peak in the cyclic voltammetry (CV) of K₄[Fe(CN)₆] were found on bare glassy carbon electrode (GCE) (Scheme 1). Surprisingly, when the GCE is coated MR-1, the anodic peak almost sustained at the same level; while the cathodic peak apparently shrunk (Scheme 1, right). We attribute this phenomenon to the electrocatalytic oxidation by MR-1. The discovery of the ability to oxidize [Fe(CN)₆]⁴⁻ by MR-1 broadens our horizon of the role that dissimilatory metal reduction bacteria play in the environment.

References

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