In situ spectral kinetics of Cr(VI) reduction by *c*-type cytochrome in a suspension of living *Shewanella putrefaciens* 200

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Although *c*-type cytochromes (*c*-Cyts) mediating metal reduction have been mainly investigated with *in vitro* purified proteins of dissimilatory metal reducing bacteria, the *in vivo* behavior of *c*-Cyts is still unclear. Here, *c*-Cyts in living *Shewanella putrefaciens* 200 (SP200) were successfully quantified using diffuse-transmission UV/Vis spectroscopy, and the *in situ* spectral kinetics of Cr(VI) reduction by *c*-Cyts were examined. A brief kinetic model was established with two predominant reactions, redox transformation of *c*-Cyts and Cr(VI) reduction by reduced *c*-Cyts, but the fitting curves were not well-matched with the experimental data from *c*-Cyts. The Cr(III)-induced toxic effect was then added to the model, resulting in substantially improved fitting curves to the experimental data. The Cr-induced toxic effect to the cellular function of redox transformation of *c*-Cyts was further confirmed by 16S rRNA analysis. This study provides a molecular-level insight into *in situ* microbial metal reduction processes and toxic effects of heavy metals under physiological conditions.