Supporting Information for

Bacterial Formation of Extracellular U(VI) Nanowires

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Methods

Bacterial growth conditions

Culture medium contained 30 mM $NaHCO_3$, 10 mM sodium lactate as the electron donor, and ~2 mM uranly acetate ($UO_2(CH_3COO)_2 \cdot 2H_2O$)) as the electron accepter for the synthesis of uranium nanowires. The pH was adjusted to 7.0. *S. oneidensis* MR-1 was inoculated into sealed serum bottles with 30 ml N_2 purged culture medium at a final cell density of 2×10^8 cells/ml. All the cultures were incubated anaerobically in the dark at 30°C for 120 hrs.

Measurements of U(VI) and lactate in culture medium

The samples were collected at selected time during incubation for the detection of soluble uranium and lactate consumption in aqueous medium. For measuring the concentration of uranium, the culture supernatants were filtered through a 0.2 μm membrane filter (MFS-25, Advantec MFS, Inc., Dublin, CA), and the filtrates were diluted and acidified with 2% HNO_3 for analysis using inductively-coupled plasma mass spectrometry (ICP-MS, Agilent Technologies 7500ce, Palo Alto, CA). The concentration of lactate was detected by HPLC (Shimazu, Tokyo, Japan), which was equipped with a SPD-10A UV detector (Shimazu, Tokyo, Japan) and a Shodex RSpak KC-811 (8.0mmID*300mm) column (Shodex, Tokyo, Japan). The mobile phase was 5mM sulfuric acid with a flow rate of 0.5 mL/min, and the UV detection was performed at 210 nm.

Characterization of materials

The morphology of the uranium nanostructures was examined by using

transmission electron microscopy (TEM). The TEM images and selected area electron diffraction (SAED) were obtained using a Jeol JEM-2100F (Tokyo, Japan). Cryo-electron microscopy was carried out with culture medium of *S. oneidensis* MR-1 obtained at 12 hr incubation. About 4 μl of the sample was suspended onto non-treated 400 mesh copper lacey carbon grids. These girds were then blotted and plunge-frozen using an FEI Vitrobot, Mark I (FEI, Hillsboro, Oregon) with the setting of 100% humidity, 4^{o}C, and blot time of 2.5 seconds. The vitreous ice sample grids were maintained at around -178^{o}C within electron microscope using a side-entry Gatan 626 cryo holder (Gatan, Pleasanton, CA). Detailed technical procedures of cryo-EM were described in ref[1]. The mineralogical property of the nanostructures was investigated by using X-ray diffraction (XRD, D/MAX Uitima III, Rigaku, Tokyo, Japan) spectra, XANES (X-ray absorption near edge structure) and EXAFS (extended X-ray absorption fine structure) spectra (Pohang Accelerator Laboratory, Pohang, Korea).

Reference

1. R. A. Grassucci, D. Taylor and J. Frank, *Nat. Protoc.*, 2008, **3**, 330-339.

Electronic Supplementary Material (ESI) for Chemical Communications

Figure S1. TEM images of heat-killed *S. oneidensis* MR-1 incubated in the medium with 2 mM uranyl acetate.

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ESI Figure S1.