Supplementary Information

Table S1. Main infrared absorption bands and their tentative assignment found in the FTIR spectra of S. bentonitica

(1,2).

| Wavenumber (cm ⁻¹) | Functional group assignment | | | |
|--------------------------------|--|--|--|--|
| 3289 | N-H stretching in Amides (Amide A) of proteins. | | | |
| 2960 | C-H antisymmetric stretching vibrations in -CH ₃ characteristics of fatty acid chains of membranes and amino acid side-chain. | | | |
| 2927 | C-H antisymmetric stretching vibrations in -CH ₂ characteristics of fatty acid chains of membranes and amino acid side-chain. | | | |
| 2874 | C-H symmetric stretching vibrations in -CH ₃ | | | |
| 2855 | C-H symmetric stretching vibrations in -CH ₂ in fatty acids | | | |
| 1657 | Stretching C=O in amides (amide I band) of proteins | | | |
| 1537 | N-H bending and C-N stretching in amides (amide II band) of proteins. Asymmetric stretching for deprotonated COO ⁻ groups | | | |
| 1401 | C=O symmetric stretching vibrations of COO ⁻ functional groups of amino acid side chains or free fatty acids. | | | |
| 1235 | Vibrations of C-O in carboxylic groups. Double bond stretching of >P=O of general phosphoryl groups and phosphodiester of nucleic acids. | | | |
| 1062 | P=O symmetric stretching in nucleic acids. Stretching vibrations of C-OH, C-O-C and C-C of polysaccharides. | | | |

Table S2. Surface composition determined by quantifying XPS survey scans.

| Sample | Na | 0 | In | Ν | С | Se | S | Р | |
|-----------------------------------|------|------|-------|-----|------|-------|------|-------|--|
| Purified SeNPs (2 days n1) | <0.1 | 8.1 | <0.1 | 8.1 | 66.3 | 10.9 | <0.1 | <0.1 | |
| Purified SeNPs (2 days n2) | <0.1 | 8.1 | 1.0 | 7.0 | 65.3 | 11.7 | <0.1 | <0.1 | |
| Purified SeNPs (6 days n1) | <0.1 | 7.3 | <0.1 | 6.1 | 68.6 | 11.3 | <0.1 | <0.1 | |
| Purified SeNPs (6 days n2) | <0.1 | 10.5 | 3.5 | 6.9 | 63.4 | 10.0 | <0.1 | <0.1 | |
| Cell associated SeNPs (2 days n1) | 0.3 | 16.6 | <0.1 | 7.9 | 73.4 | 1.0 | <0.1 | <0.1 | |
| Cell associated SeNPs (2 days n2) | 0.2 | 16.8 | 0.2 | 7.8 | 73.2 | 1.0 | <0.1 | <0.1 | |
| Cell biomass (6 days n1) | 0.2 | 17.5 | 0.1 | 9.7 | 71.4 | < 0.1 | 0.2 | 1.1 | |
| Cell biomass (6 days n2) | 0.2 | 17.4 | 0.2 | 9.6 | 71.2 | <0.1 | 0.4 | 1.0 | |
| Cell associated SeNPs (6 days n2) | 0.2 | 15.9 | <0.1 | 9.0 | 72.4 | 1.5 | <0.1 | <0.1 | |
| Cell associated SeNPs (6 days n1) | 0.2 | 16.0 | < 0.1 | 9.5 | 71.6 | 1.6 | <0.1 | < 0.1 | |

| Binding Energy (eV) | | | % area | Assignment | | |
|---------------------|-----------------------|--------------|----------------|-----------------------|--------------|------------------|
| Purified SeNPs | Cell associated SeNPs | Cell biomass | Purified SeNPs | Cell associated SeNPs | Cell biomass | |
| C 1s | | | | | | |
| 284.9 | 285 | 285 | 51.2 | 52 | 46.1 | С-С, С-Н |
| 286.6 | 286.4 | 286.3 | 30.5 | 27.7 | 32 | C-O, C-N |
| 288.4 | 288 | 287.8 | 14.4 | 15.4 | 14.3 | C=0 |
| 290.1 | 288 | 289.1 | 3.9 | 4.9 | 7.6 | O-C=O |
| O 1s | | | | | | |
| 531.8 | 531.6 | 531.7 | 77.3 | 63.1 | 62.6 | C-O |
| 533.5 | 533.1 | 533.1 | 22.8 | 36.9 | 37.4 | C=O |
| N 1s | | | | | | |
| 400.2 | 400.1 | 400.1 | 79.9 | 91.1 | 83.6 | Amine |
| 402.1 | 401.8 | 401.4 | 20.1 | 9 | 16.4 | Protonated amine |
| Se 3d | | | | | | |
| 55.2 | 55.7 | N/A | 28.9 | 40.5 | N/A | 3d5/2 |
| 56.3 | 57.3 | N/A | 28.8 | 17.2 | N/A | 3d5/2 |
| 56.1 | 56.6 | N/A | 21.2 | 29.7 | N/A | 3d3/2 |
| 57.1 | 58.2 | N/A | 21.1 | 12.6 | N/A | 3d3/2 |

Table S3. Binding energies (eV), % areas and assignment of XPS spectral bands of purified SeNPs, cell associatedSeNPs, and cell biomass of after 144 h of incubation with S. bentonitica

Figure S1. Percentage of viable (A) and active cells (B) of *S. bentonitica* in the presence of different Se^{IV} concentrations (0 and 2 mM) and contact times (24, and 144 h) under aerobic conditions.



Figure S2. XPS survey scan of purified SeNPs (144 h) (A) and cell associated SeNPs (144 h) (B).



Figure S3. XPS high resolution spectra of carbon (C 1s), oxygen (O 1s), and nitrogen (N 1s) from the purified SeNPs, the cell associated SeNPs and the cell biomass of *S. bentonitica* after 144 h of incubation.



References

- Naumann D. Infrared Spectroscopy in Microbiology in: Meyers R. A., (Ed.). Encyclopedia of Analytical Chemistry. Chichester, John Wiley & Sons Ltd. 2000; pp. 102–131.
- 2. Kamnev AA. FTIR spectroscopic studies of bacterial cellular responses to environmental factors, plant-bacterial interactions and signalling. Spectroscopy. 2008;22(2–3):83–95. https://doi.org/10.3233/SPE-2008-0329.