

Supporting Information for

Enhanced removal of dissolved Hg(II), Cd(II) and Au(III) from water by *Bacillus subtilis* bacterial biomass containing an elevated concentration of sulfhydryl sites

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Figure S1. Reaction of qBBr with sulfhydryl binding sites within bacterial cell envelopes.

Figure S2. Langmuir model fits to the measured extents of Hg(II), Cd(II) and Au(III) sorption onto HSBS (blue dash lines) and LSBS (pink dash lines) as a function of metal concentration.

Table S1. Characteristics of the Dowex[®] Marathon C cation exchange resin provided by the manufacturer. The value of total exchange sites is in terms of dry weight of the resin.

Matrix	Functional Group	Total Exchange Sites	Operating pH	Resin Diameter
Polystyrene divinylbenzene	—SO ₃ ⁻ Na ⁺	≥1810 μmol/g	0-14	0.6 mm

Table S2. Sulfhydryl site and total binding site concentrations within the cell envelopes of *B. subtilis* biomass that was grown in the TSB medium with (HSBS) or without (LSBS) the addition of 50 g/L of glucose.^{1,2} Concentrations are reported in terms of dry weight of the biomass.

	Sulfhydryl Sites μmol/g	Total Binding Sites μmol/g
LSBS	108±33	1205±80
HSBS	436±38	1290±47

Table S3. Langmuir modeling results for the sorption isotherms for Hg(II), Cd(II) and Au(III) onto HSBS and LSBS. The Langmuir model is expressed as $q_e = bq_m C_e / (1 + bC_e)$, where q_e is the equilibrium sorption concentration for each metal (μmol/g), C_e is the equilibrium concentration of each metal, and q_m is the maximum monolayer sorption capacity (μmol/g).

Metal	Sorbent	q_m μmol/g	R^2
Au	HSBS	605	0.9779
	LSBS	368	0.9402
Cd	HSBS	111	0.9818
	LSBS	61	0.9901
Hg	HSBS	59	0.6079
	LSBS	11	0.9623

Table S4. Summary of the calculated percentage of each major species for each metal in sorbent-free systems at pH 6.0 and in the presence of 0.1 M NaCl. The speciation calculations for the Hg(II), Cd(II) and Au(III) systems were conducted using FITEQL³ considering all pertinent aqueous metal-ligand complexes.^{4,5} The relative percentages of the dominant aqueous species do not vary significantly over the metal concentration range that was used in sorption experiments (10 to 500 μ M).

Metal	Major Species (percentage)
Hg	HgCl ₂ ⁰ (41%), HgCl ₃ ⁻ (35%), HgCl ₄ ²⁻ (23%)
Cd	CdCl ⁺ (64%), Cd ²⁺ (18%), CdCl ₂ ⁰ (18%)
Au	Au(OH) ₂ Cl ₂ ⁻ (51%), Au(OH)Cl ₃ ⁻ (44%)

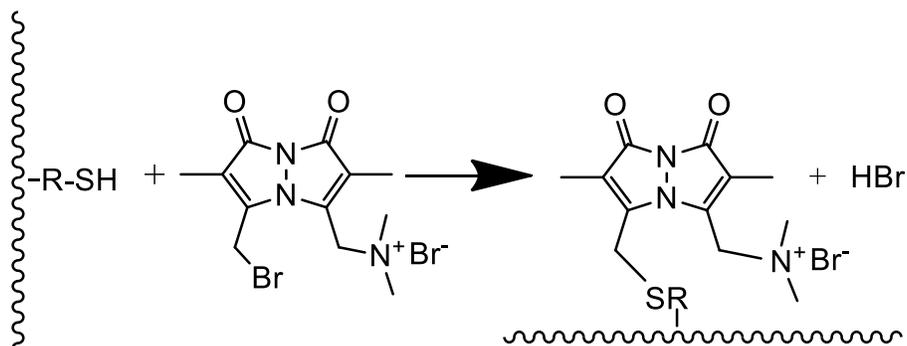


Figure S1. Reaction of qBBr with sulfhydryl binding sites within bacterial cell envelopes.^{1,6}

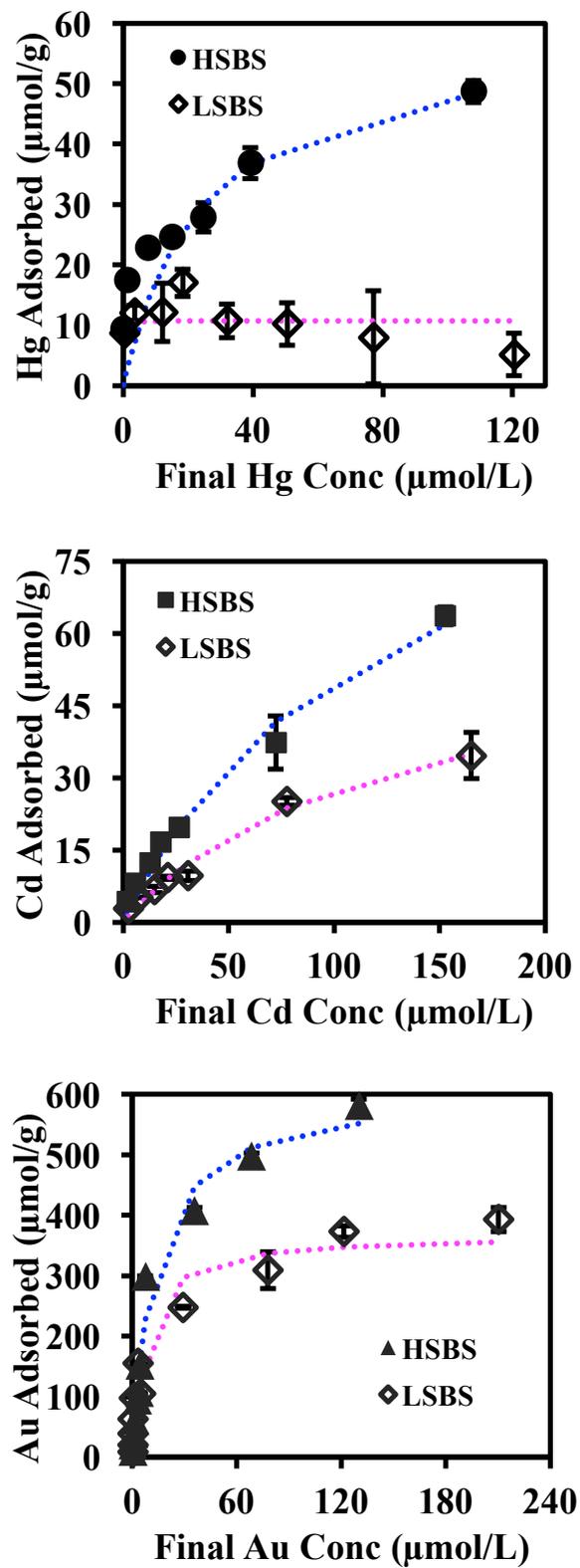


Figure S2. Langmuir model fits to the measured extents of Hg(II), Cd(II) and Au(III) sorption onto HSBS (blue dash lines) and LSBS (pink dash lines) as a function of metal concentration.

References

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