Supplementary information

Microalgae: A sustainable adsorbent with high potential for upconcentration of indium(III) from liquid process and waste streams

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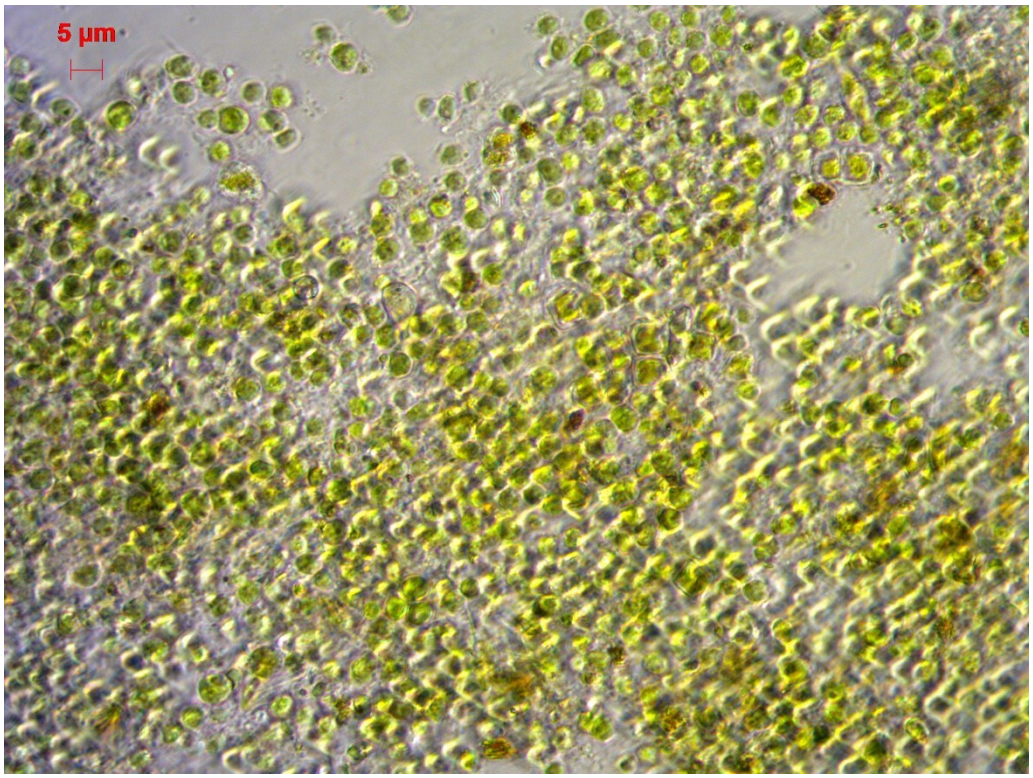
5 µm

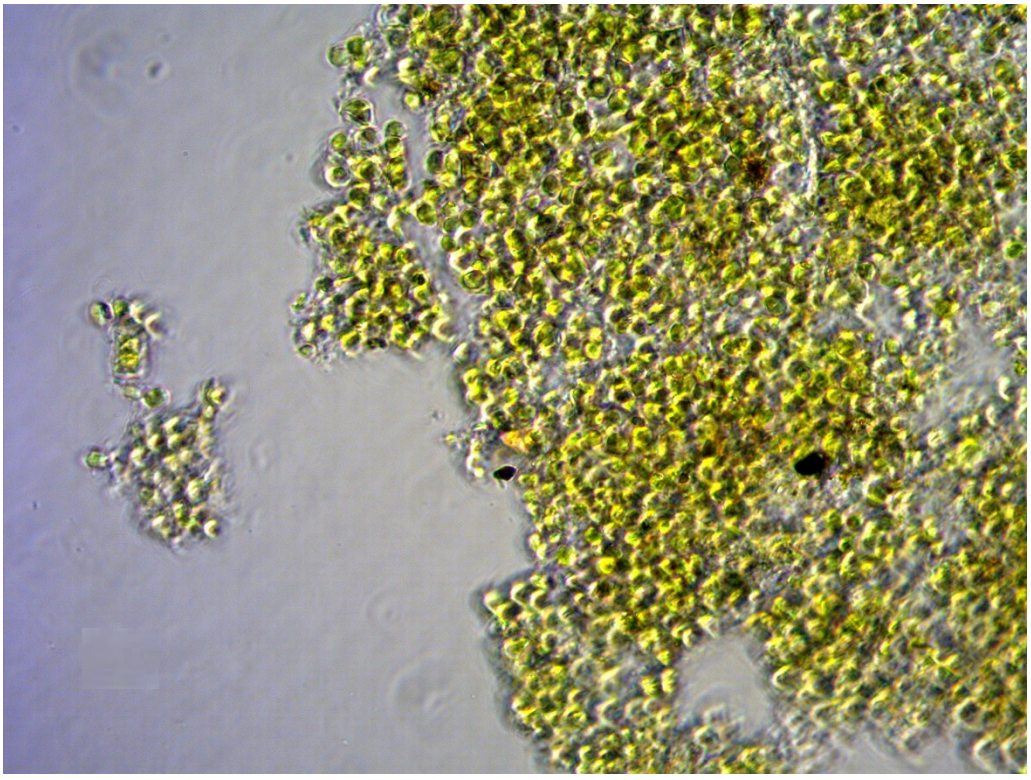

Figure S1. Light microscope images of the microalgal biomass before grinding (top) and after grinding (bottom).

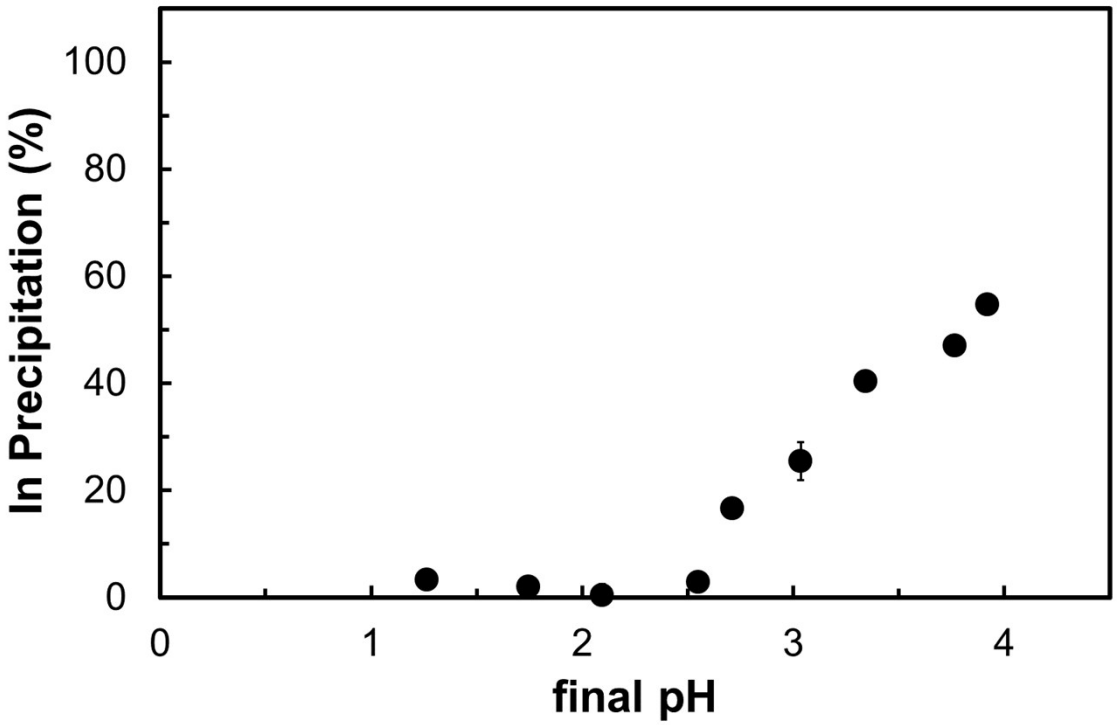

Figure S2. Percentage of indium precipitation as a function of pH. Experimental conditions: initial In(III) concentration = 0.15 mM; contact time = 24 hours; room temperature.

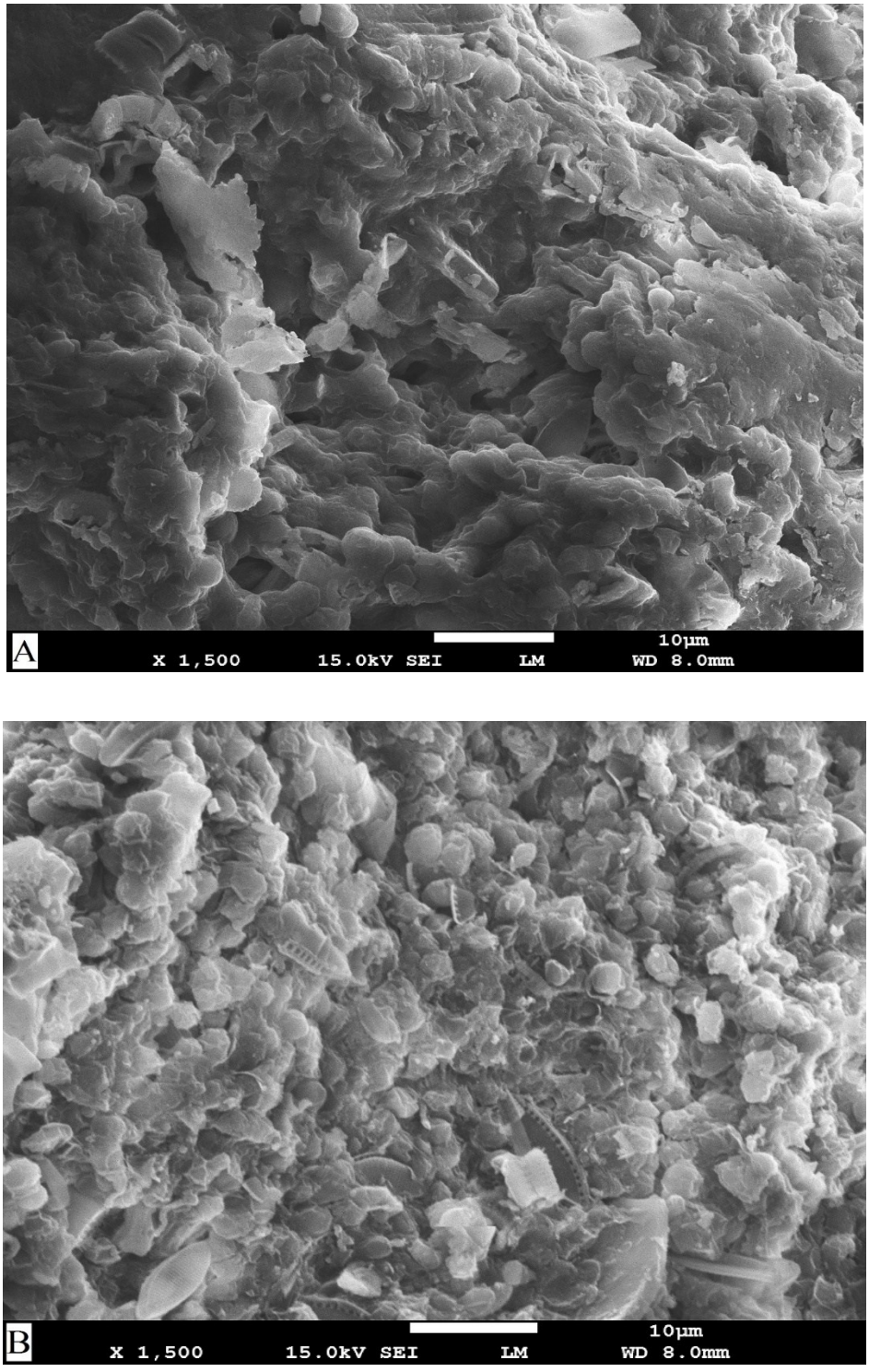

Figure S3. SEM images of the microalgal biomass surface (A) before and (B) after In(III) biosorption.

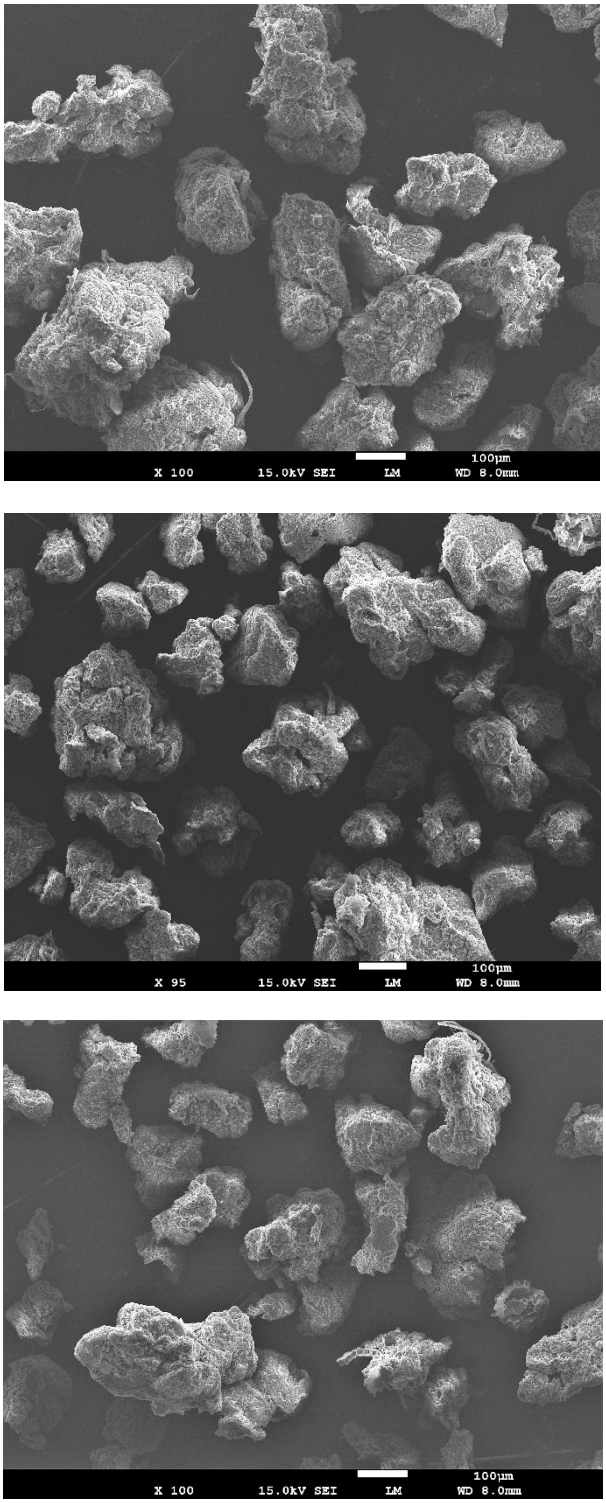

Figure S4. SEM images of the microalgal biomass particles before In(III) adsorption (top), after In(III) adsorption (middle), and after In(III) desorption (bottom).

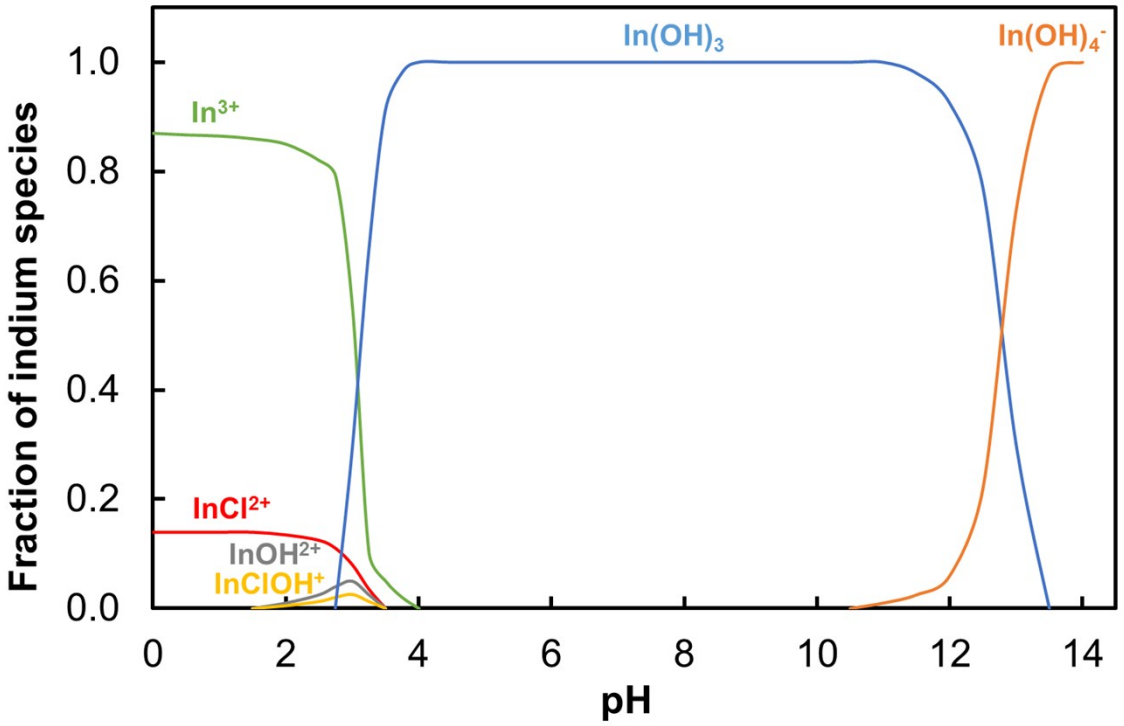

Figure S5. Predicted indium speciation in aqueous solution using the Hydra-Medusa software (indium concentration = 0.15 mM; chloride concentration = 0.30 mM).

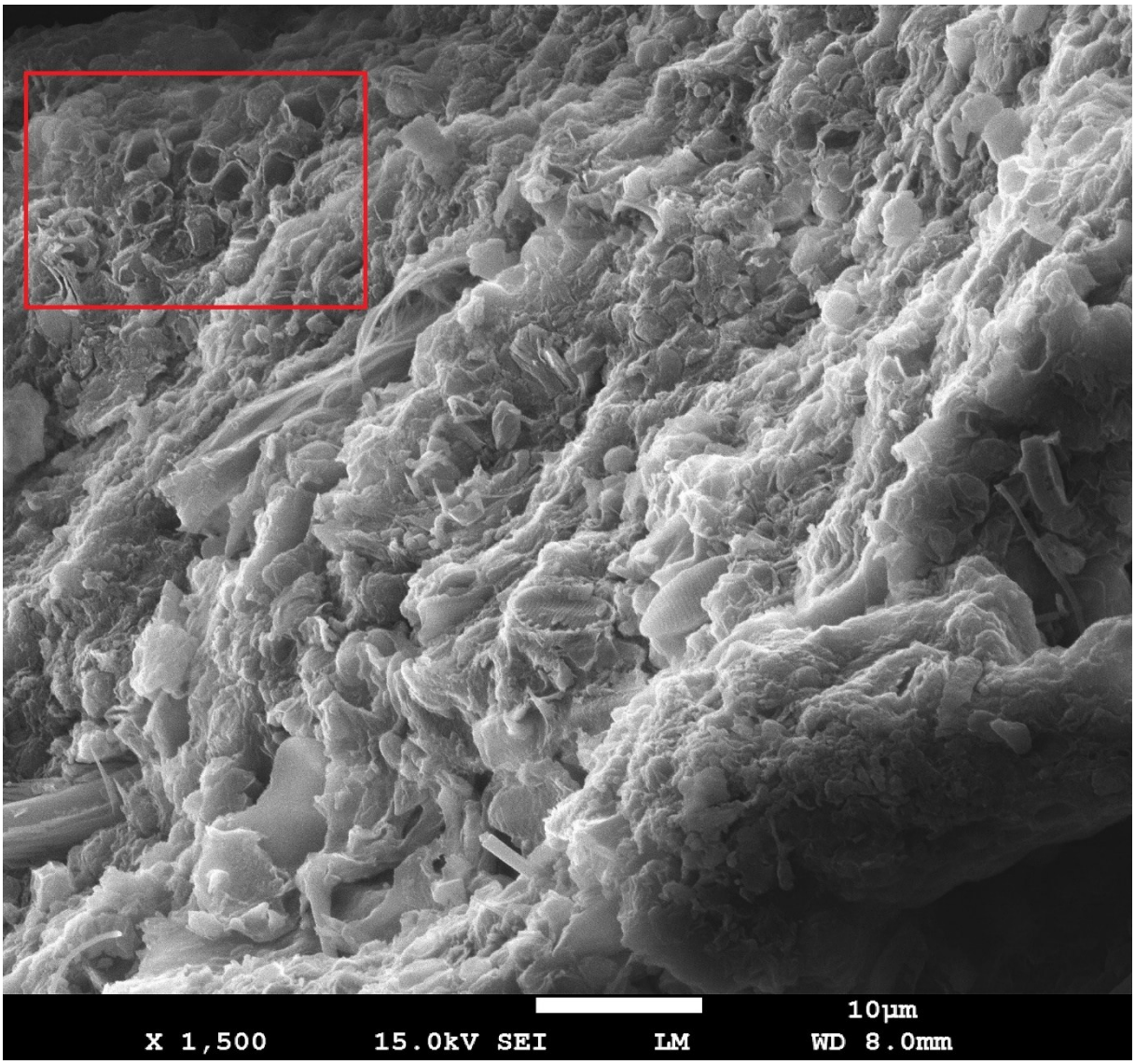

Figure S6. SEM image of the microalgal biomass after In(III) desorption using 0.1 M HCl. The highlighted part in red shows a portion of the surface that was possibly destroyed because of the desorption process.

Table S1. Constants and correlation coefficients of Langmuir isotherm model for Cu(II), Zn(II), Sn(II), Al(III), and Fe(III) biosorption using microalgal biomass at an initial pH of 2.

Langmuir Isotherm model	**Parameter**	**Value**
Cu(II)	q_{max} (mmol/g)	0.05
	b (L/mmol)	0.38
	R^2	0.99
Zn(II)	q_{max} (mmol/g)	0.05
	b (L/mmol)	0.18
	R^2	0.92
Sn(II)	q_{max} (mmol/g)	1.01
	b (L/mmol)	1.06
	R^2	0.95
Al(III)	q_{max} (mmol/g)	0.11
	b (L/mmol)	2.92
	R^2	0.95
Fe(III)	q_{max} (mmol/g)	0.57
	b (L/mmol)	0.51
	R^2	0.95

Note: Sn(II) removal was most likely because of precipitation because of the white insoluble solids formed during the incubation of the samples. This suggests that the actual q_{max} for Sn(II) is lower than the obtained q_{max}.