

Supplementary materials for:

Critical evaluation of the performance of rhamnolipids as surfactants for (phyto)extraction of Cu, Cd, Fe, Pb and Zn from copper smelter-affected soil

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The sorption results are summarised in Table S1. From these it can be seen that there was negligible sorption of Fe(II), of which there was the highest amount (335.5 mg), while no sorption of heavy metals was observed. This can be explained by the fact that the microplastic analysed had a low BET surface area (0.2 m²/g) and a low total pore volume (0.001 mL/g).

Table S1. Sorption of heavy metals onto microplastic

Metal	Cu	Zn	Pb	Fe
Initial metal concentration [mg]	39.3 ± 3.1	21.4 ± 1.7	2.63 ± 0.2	335.5 ± 26.8
Metal concentration adsorbed [mg]	0.0 ± 0.0	2.6 ± 0.5	0.0 ± 0.0	4.5 ± 0.4
Sorption [%]	0.0 ± 0.0	0.6 ± 0.1	0.0 ± 0.0	1.3 ± 0.2

A Thermo Jarrel-Ash Iris HR (Franklin, MA, USA) ICP optical emission spectrometer, equipped with an argon purged Echelle monochromator (175–900 nm) and charge coupling device (CCD) detector was employed for simultaneous determination of Cd, Cu, Fe, Pb and Zn. The real samples were introduced as an aerosol into the ICP plasma, using the Meinhard-type concentric nebulizer and cyclonic spray chamber. The operating conditions of the ICP OES technique are listed in a Table S2. The determinations were made using the calibration curve technique.

Table S2. Operating conditions for ICP OES

RF generator frequency [MHz]	27.12
RF power [W]	1350
Spectral range [nm]	175-900
Argon gas flow rate [L min ⁻¹]	
Outer	14.0
Intermediate	0.5
Nebulizer	0.4
Sample flow rate [mL min ⁻¹]	1.85
Replicates	3
Integration time [s]	20
Analytical wavelengths [nm]	Cd 226.502, Cu 224.700, Fe 259.940, Pb 220.356, Zn 202.548

46 Table S3. Bioconcentration factor (BCF), translocation factor (TF) and enrichment factor (EF) of maize (*Zea mays* L.) in respect to metals present in soil.

47

Metal	Control			CMC _{soil}			1.5×CMC _{soil}			2×CMC _{soil}		
	BCF	EF	TF	BCF	EF	TF	BCF	EF	TF	BCF	EF	TF
Zn	0.20±0.1	0.17±0.05	0.85±0.08	0.29±0.04	0.25±0.07	0.87±0.4	0.34±0.1	0.41±0.05	1.21±0.3	0.56±0.2	0.85±0.2	1.50±0.7
Cu	0.12±0.1	0.03±0.01	0.28±0.03	0.39±0.06	0.08±0.01	0.21±0.02	0.60±0.12	0.09±0.05	0.15±0.04	0.93±0.1	0.11±0.1	0.11±0.05
Cd	0±0.01	0.01±0.01	0±0.01	0±0.01	0.01±0.01	0±0.01	0±0.01	0.01±0.01	0±0.01	0±0.01	0.01±0.01	0±0.01
Pb	0.15±0.1	0.03±0.01	0.01±0.01	0.19±0.05	0.15±0.01	0.80±0.02	0.35±0.4	0.19±0.05	0.53±0.01	0.49±0.8	0.22±0.1	0.44±0.01
Fe	1.2±0.3	0.08±0.03	0.07±0.04	1.51±0.4	0.19±0.04	0.13±0.3	1.78±0.5	0.24±0.1	0.13±0.05	1.85±0.8	0.26±0.4	0.14±0.04