

Supplementary Material

Removal of Zn(II), Cu(II) and Pb(II) from Rainwater by White Bean Peel: Optimization by Response Surface Methodology

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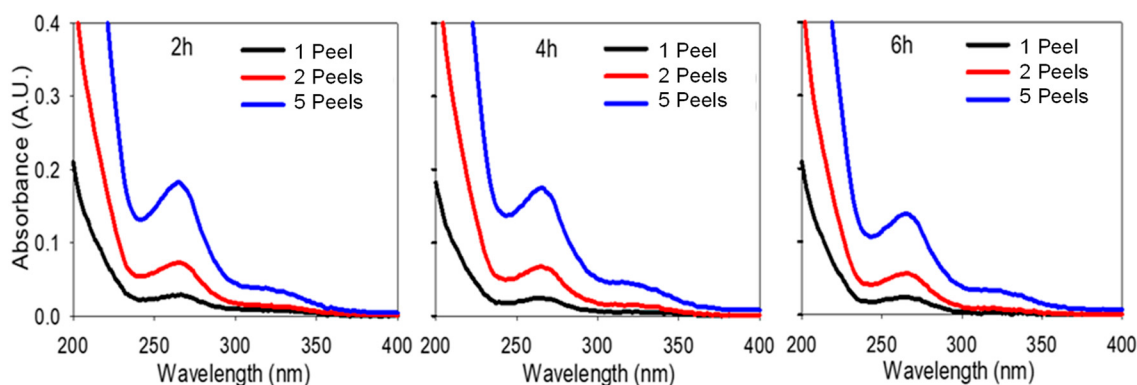


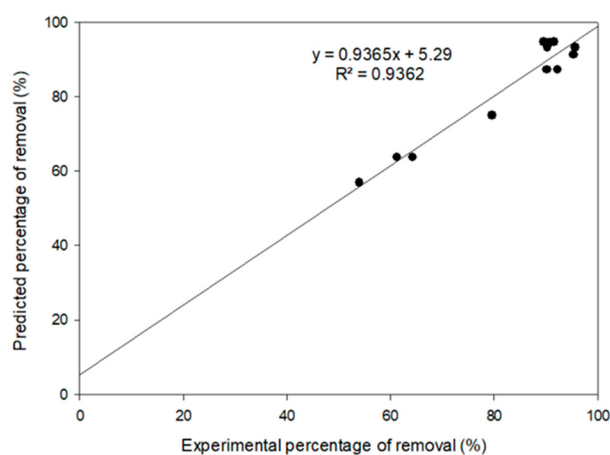
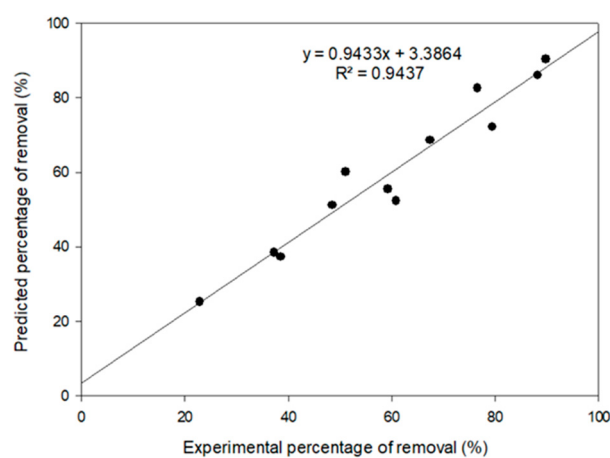
Figure S1. UV-Vis spectra of aqueous solutions from organic matter released by 1, 2 and 5 bean peels to ultrapure water (50 mL), after 2h, 4h and 6h.

Table S1. Models obtained by application of best subsets regression for Zn(II) removal.

Model	Predictors	<i>p</i> -value	R ²	R ² _{adj}	Cp Mallow's	<i>p</i> -value of predictors in the model								
						[Ci]	<i>t</i>	<i>pH</i>	[Ci] ²	<i>t</i> ²	<i>pH</i> ²	[Ci]* <i>t</i>	[Ci]* <i>pH</i>	<i>t</i> * <i>pH</i>
1	<i>t</i>	0.001	0.675	0.643	10.7	--	0.001	--	--	--	--	--	--	--
2	<i>t</i> , <i>t</i> ²	<0.001	0.839	0.804	3.3	--	0.004	--	--	0.014	--	--	--	--
3	<i>t</i> , <i>t</i> ² , [Ci] ²	<0.001	0.888	0.845	2.5	--	0.004	--	0.101	0.015	--	--	--	--
4	[Ci], <i>t</i> , <i>t</i> ² , [Ci]* <i>t</i>	<0.001	0.936	0.900	1.7	0.021	<0.001	--	--	0.005	--	0.052	--	--
5	[Ci], <i>t</i> , <i>t</i> ² , [Ci]* <i>t</i> , <i>t</i> * <i>pH</i>	0.001	0.938	0.887	3.6	0.032	0.002	--	--	0.009	--	0.071	--	0.679
6	<i>t</i> , [Ci] ² , <i>t</i> ² , [Ci]* <i>t</i> , [Ci]* <i>pH</i> , <i>t</i> * <i>pH</i>	0.005	0.946	0.881	5.1	--	0.006	--	0.430	0.024	--	0.082	0.310	0.293
7	[Ci], <i>t</i> , [Ci] ² , <i>t</i> ² , [Ci]* <i>t</i> , [Ci]* <i>pH</i> , <i>t</i> * <i>pH</i>	0.020	0.947	0.854	7.1	0.816	0.016	--	0.786	0.050	--	0.126	0.497	0.448
8	[Ci], <i>t</i> , <i>pH</i> , [Ci] ² , <i>t</i> ² , [Ci]* <i>t</i> , [Ci]* <i>pH</i> , <i>t</i> * <i>pH</i>	0.071	0.948	0.809	9.0	0.791	0.046	0.811	0.817	0.093	--	0.190	0.709	0.560

Table S2. Models obtained by application of best subsets regression for Cu(II) removal.

Model	Predictors	<i>p</i> -value	R ²	R ² _{adj}	<i>C_p</i> Mallow's	<i>p</i> -value of predictors in the model								
						[Ci]	<i>t</i>	<i>pH</i>	[Ci] ²	<i>t</i> ²	<i>pH</i> ²	[Ci]* <i>t</i>	[Ci]* <i>pH</i>	<i>t</i> * <i>pH</i>
1	<i>pH</i>	0.011	0.488	0.437	39.0	--	--	0.011	--	--	--	--	--	--
2	<i>t</i> , <i>pH</i>	<0.001	0.857	0.825	7.2	--	0.001	<0.001	--	--	--	--	--	--
3	<i>t</i> , <i>pH</i> , [Ci] ²	<0.001	0.944	0.923	1.2	--	<0.001	<0.001	0.008	--	--	--	--	--
4	<i>t</i> , <i>pH</i> , [Ci] ² , [Ci]* <i>t</i>	<0.001	0.965	0.945	1.2	--	<0.001	<0.001	0.010	--	--	0.078	--	--
5	<i>t</i> , <i>pH</i> , [Ci] ² , <i>t</i> ² , [Ci]* <i>t</i>	<0.001	0.967	0.939	3.1	--	0.075	<0.001	0.022	0.604	--	0.121	--	--
6	<i>t</i> , <i>pH</i> , [Ci] ² , <i>t</i> ² , [Ci]* <i>t</i> , <i>t</i> * <i>pH</i>	0.001	0.967	0.928	5.0	--	0.113	0.047	0.038	0.635	--	0.159	--	0.794
7	[Ci], <i>t</i> , <i>pH</i> , [Ci] ² , <i>t</i> ² , [Ci]* <i>t</i> , <i>t</i> * <i>pH</i>	0.008	0.967	0.910	7.0	0.935	0.220	0.079	0.396	0.681	--	0.234	--	0.817
8	[Ci], <i>t</i> , <i>pH</i> , [Ci] ² , <i>t</i> ² , [Ci]* <i>t</i> , [Ci]* <i>pH</i> , <i>t</i> * <i>pH</i>	0.037	0.967	0.880	9.0	0.926	0.297	0.192	0.471	0.727	--	0.311	0.951	0.845

**Figure S2.** Percentage of Zn(II) removal predicted by model in function of the experimental percentage of removal.**Figure S3.** Percentage of Cu(II) removal predicted by model in function of the experimental percentage of removal.

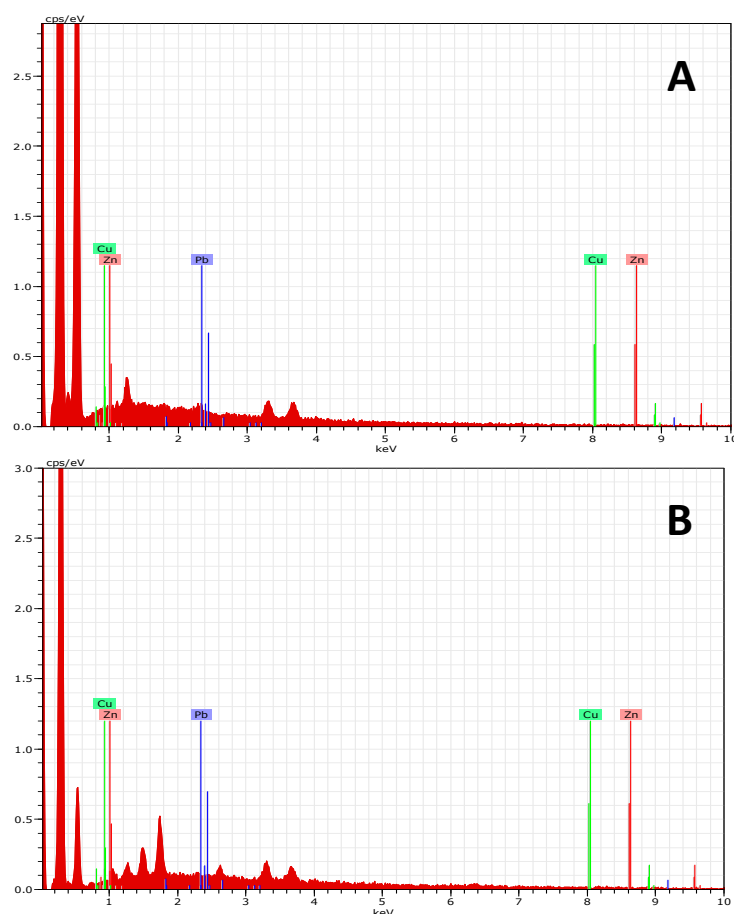


Figure S4. EDX spectra of interior (A) and exterior (B) surface of the white bean peel, after 6h of contact with PTEs solution 500 µg/L, at pH 4.0.

Table S3. Characterization of rainwater samples regarding pH and concentrations of Zn(II), Cu(II) and Pb(II).

Sample	pH	Concentration (µg/L)		
		Zn(II)	Cu(II)	Pb(II)
1	6.1	14	1.2	0.90
2	5.8	8.7	1.6	0.80
3	5.9	5.3	1.6	0.40
4	6.0	7.6	3.3	6.1
5	6.3	7.2	1.7	2.8
6	6.1	22	2.1	1.3