

Biosorption of Cr(VI) and As(V) at high concentrations by organic and inorganic wastes

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The potential reutilization of several wastes as biosorbents for As(V) and Cr(VI) has been assessed in batch-type experiments. The materials studied were one inorganic: mussel shell, and three organic: pine bark, oak ash and hemp waste. Batch experiments were performed in order to determine the removal capacity of the wastes under conditions of high As(V) and Cr(VI) loads. For this, 3 g of each waste material were added with 30 mL NaNO₃ 0.01 M dissolutions containing 0, 0.5, 1.5, 3 and 6 mmol As(V) L⁻¹ or Cr(VI) L⁻¹, prepared from analytical grade Na₂HAsO₄ or K₂Cr₂O₇. The resulting suspensions were shaken for 24 h, centrifuged and filtered. Once each batch experiment corresponding to the sorption trials ended, each individual sample was added with 30 mL of NaNO₃ 0.01 M to desorb As(V) or Cr(VI), shaken for 24 h, centrifuged and filtered as in the sorption trials. Oak ash showed high sorption (>76%) and low desorption (<7%) for As(V), which was lower on mussel shell (<31%), hemp waste (<16%) and pine bark (<9.9%). In turn, pine bark showed the highest Cr(VI) sorption (>98%) with very low desorption (<0.5%), followed by oak ash (27% sorption), and hemp waste and mussel shell, that presented very low Cr(VI) sorption (<10%). Sorption data for both elements were better described by the Freundlich than by the Langmuir model. The variable results obtained for the removal of the two anionic contaminants for a given sorbent suggest that different mechanisms govern removal from the solution in each case. In summary, oak ash would be an efficient sorbent material for As(V), but not for Cr(VI), while pine bark would be the best sorbent for Cr(VI) removal.