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Adsorptive transport of chromate by suspended solids in Kelani river

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Intensive industrial development during the past decades along the river banks has lead to environmental and health impacts due to discharge of contaminated effluents. The discharge of industrial effluent has lead to a substantial increase of metal availability in revering, estuarine and marine sediments. Depending on their solubility, these metals may eventually become associated to suspended particulate matter and/or accumulate in the bottom sediments.

This preliminary study was conducted to determine the distribution of chromate in water and suspended solids (SS) and to see the adsorption pattern of chromate at different ionic strengths and pH through the complexation process in the Kelani River SS.

Concentrations of heavy metals in river sediments and water were determined using flame and graphite furnace atomic adsorption spectrometry. It shows that most of the heavy metals are associated with the SS.

The mineralogy of SS was determined by powder X-ray diffraction method. The results showed that the river SS mainly consisted of kaolinite and silica. In addition, some other types of aluminosilicates and titanium containing minerals are present.

The surface charge of the river SS was determined by potentiometric titrations. These acid base titrations make it possible to determine the pH of 'point of zero charge' for river SS and the titrations were carried out on the natural SS and acid treated SS separately. The pH values of 'point of zero charges' are very close to those of kaolinite, which indicates that the SS surface processes, can be modeled mimicking pure-phased kaolinite.

Chromium adsorption on Kelani river SS was examined in batch experiments as a function of pH with background electrolyte concentrations of 0.001mol dm^{-3}, 0.010 mol dm^{-3}, 0.100 mol dm^{-3} NaCl by varying the initial Cr(VI) concentration from 0.1 - 50µmol. Adsorption density decreases with increase of ionic strength and it increases with the initial concentration.

Adsorption edges for Cr(VI) in Kelani River SS were studied in a background solution of 0.010 mol dm^{-3} NaCl. The pH was varied from 2.5 to 11.0 with total Cr(VI) concentration of 100 µmol. The adsorption site density was examined using the fluoride adsorption onto SS in the same ionic strength and pH by varying the initial fluoride concentration from 0.2-10 mmol. The chromium adsorption density of SS increased with the pH and there is a significant variation at high pH. The thermodynamic modeling of the SS Cr(IV) speciation is in progress.

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