Sorption of arsenic (V) by titanium oxide loaded poly(hydroxamic acid) resin

ABSTRACT

The sorption process for removal of As(V) by titanium oxide-loaded poly(hydroxamic acid) chelating resin (TiO2-PHA) was assessed with various parameters including effect of pH, contact times, initial As(V) concentrations, temperatures and existence of foreign anions. The loaded resin was tested for removal of arsenic anions from industrial wastewater samples. The maximum sorption capacity of As(V) was found in acidic conditions at pH 1.5. Kinetics study shows that As(V) sorption followed the second order kinetic rate equation with the rate constant of 2.9x10-2 g mg-1min-1 at room temperature and increase with increasing temperature. The sorption capacity of As(V) which increases as temperature increases indicates that the sorption was an endothermic process. The free energy change, æGo was negative, showing that the sorption of As(V) onto TiO2-PHA resin is spontaneous and thermodynamically favorable. In addition the values of æHo are positive, confirming that the sorption process is endothermic in nature. Negative values of æSo indicate the increase of order after the sorption of As(V) on the TiO2-PHA. Sorption isotherm of As(V) by TiO2-PHA could be interpreted by Langmuir equation with sorption capacity 12.72 mg/g at room temperature and increase with increasing temperature. The selectivity study showed that the sorption of As(V) was affected by the presence of phosphate but not affected by sulphate, chromate, carbonate, bromide and nitrate anions. The resin was found effective for the removal of arsenic anion in wastewater samples from electronic and wood treatment industries.

Keyword: Titanium dioxide-loaded poly(hydroxamic acid); Arsenate sorption; Thermodynamic; Kinetics; Industrial wastewater