Removal of Aqueous Cyanide with Strongly Basic Ion-Exchange Resin

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ABSTRACT

The removal of cyanide (CN^-) from aqueous solutions using a strongly basic ion-exchange resin, Purolite A-250, was investigated. The effects of contact time, initial CN^- concentration, pH, temperature, resin dosage, agitation speed, and particle size distribution on the removal of CN^- were examined. The adsorption equilibrium data fitted the Langmuir isotherm very well. The maximum CN^- adsorption capacity of Purolite A-250 was found to be 44 mg CN^- g^{-1} resin. More than 90% CN^- adsorption was achieved for most CN^- solutions (50, 100, and 200 mg CN^- L^{-1}) with a resin dose of 2 g L^{-1}. The equilibrium time was ~20 min, optimum pH was 10.0-10.5, and optimum agitation speed was 150 rpm. An increase in adsorption of CN^- with increasing resin dosage was observed. Adsorption of CN^- by the resin was marginally affected (maximum 4% variation) within an environmentally relevant temperature range of 20-50 ^oC. Fixed-bed column (20.5 mm internal diameters) experiments were performed to investigate the effects of resin bed depth and influent flow rate on breakthrough behavior. Breakthrough occurred in 5 min for 0.60 cm bed depth while it was 340 min for 5.40 cm bed depth. Adsorption capacity was 25.5 mg CN^- g^{-1} for 5 mL min^{-1} flow rate and 3.9 mg CN^- g^{-1} for 20 mL min^{-1} flow rate. The research has established that the resin can be effectively used for CN^- removal from aqueous solution.

Key Words: Cyanide, adsorption, ion exchange resin, industrial pollution control.

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