Study on the Reaction Behaviors for the Treatment of Multi-component Chelated Metals Wastewater in Aqueous Solution by I

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ABSTRACT

The adsorption behaviors of the reaction of single/multi component chelated metals wastewater in aqueous solution by ion-exchange process were studied. The experiments were carried out under various the contacting times, rotation times, resin types, resin dosages, solution pH values, initial concentrations of organic, chelation types, concentration molar ratios, mixed chelations to investigate the above effects on the pollutant removal efficiencies and separation effectiveness. The species distribution model and equilibrium exchange kinetic model of chelation heavy metals in aqueous solution were set up to discuss the decomposition behaviors and to be as reference for further study and application. The jar test on the treatment of single component chelated metals wastewater in aqueous solution by ion exchange process (IRA910 Cl- resin) was studied. The equilibrium data obtained in this study have been found to fit the Langmuir adsorption isotherms, except pH 2. It is found the values of the maximum saturated adsorbent amount increase with increaseing pH value that was attained pH 10. From the experimental data of the run of initial concentration and temperature, it was found that an increase in initial concentration and temperature would lead to an increase in ion exchange capacity. Based on the calculation of the values of ΔHapp, ΔGapp, and ΔSapp, it was determined that the ion exchange process was endoergic reaction and spontaneous. In the batch kinetic study on the the treatment of single component chelated metals wastewater by ion exchange (IRA910 Cl- resin) process, it was found that the kinetic behaviors of pollutants at different pH value can be well described by the specie distribution of the chelation of heavy metals systems. The results of the specie distribution show that oxalic acid almost have a single species during all pH value. In order to avoid errors of simulation, it must consider the precipitation reaction of the chelated heavy metals during the ion-exchang reaction. The results of simulation for different chelated heavy metals show a different tendency. It ’ s not directly dependent on the kind of heavy metals. Simulated results of NTA system is the worst, however, those of EDTA and Citric Acid are found to be good. The exchange equilibrium kinetics model was used to discuss the forward and backward rates indicating that the rates of the chelation of Cu2+ is the largest among various systems. In the jar test study on the treatment of mixed component chelated metals wastewater in aqueous solution by ion exchange process, the resins of PA312, IRA910 and WA30 were used to explore the removal efficiency and selectivity of chelated metal. The resin dosage effect on increasing of removal efficiency was found be not consistent. The heavy metal removal efficiency increased with increasing initial heavy metals concentration. The removal efficiency of the treatment result of Citric Acid was the best, and those of NTA were the worst. Removal of the heavy metals was found to be limited by increasing the chelation concentration. Based on the results of these experiments, it showed that the selectivity of Cu2+ was better than Ni2+ and Zn2+. In the batch kinetic study on the treatment of mixed component chelated metals wastewater in aqueous solution by ion exchange process (WA30 Cl- resin), it was found that the reaction rate did not almost affect by the rotation speed, but increased with increasing the resin dosage and decreased with increasing initial concentration of chelated metals. Reaction rates of the oxalic acid was the largest among chelated metals. The best molar ratio of chelated metals for removal of the metals was found to be 1:2.

Keywords : Ion Exchange Process, Chelated Metals Wastewater, Selectivity, Species Distribution Model, Equilibrium Exchange Kinetics Model

Table of Contents

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