**Abstract**

The use of adsorbent pellets of natural bentonite, kaolin and zeolite is analyzed in this work to study the removal capacity of heavy metals from wastewaters. Adsorbent pelets made with different aluminosilicates and zeolite proportions, and treatments were compared in an adsorption column system. The adsorbent with the highest removal efficiency had a proportion of 67% zeolite, 29% bentonite and 4% kaolin and no chemical treatment. Contrary to the expected acid activation reduced the adsorption capacity of the adsorbents due to the aggressiveness of the process that collapsed the internal structure. Using the adsorbent with the highest adsorption efficiency the surface response analysis with a central composite rotatable design was applied to define optimal operating conditions. The four factors evaluated were contact time, adsorbent dose, pH value and heavy metals initial concentration; for lead, copper and cadmium these values are; 150,150 and 240 min; 25, 25, 25 g/mL; 4.3, 4.3, 4.3; and 4, 7, and 2 mg/L respectively. Equilibrium adsorption was analyzed with the Langmuir, Freundlich, Temkin and Dubinin-Radushkevich models. Type I linearization of the Langmuir isotherm had the better fit for lead, copper and cadmium predicting maximum adsorption capacities of 7.27 mg/g, 1.45 mg/g and 0.28 mg/g respectively. The kinetics showed that after 300 minutes removal efficiency begins to stabilize for all three metals. Lead and copper data fitted better with the Pseudo second order model and cadmium with the Pseudo first order model. The rate limiting step of the adsorption for lead and copper is the film diffusion and for cadmium the intraparticular diffusion. Main adsorption mechanisms are cation exchange and physical processes such as Van der Waals forces. The comparison between the obtained results and other researches highlights the need to improve the pelets adsorption capacity. The latter could be done optimizing acid activation conditions and a thorough analysis of both thermal and chemical treatment effects