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Amberlite IRA-400 and IRA-743 chelating resins for the sorption and recovery of molybdenum(VI) and vanadium(V): Equilibrium and kinetic studies.

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ABSTRACT

In this study, commercial polymers containing *N*-methyl-D-glucamine-quaternary ammonium ion-exchange ligands were subjected to a series of sorption tests. Mo(VI) and V(V) sorption were performed using strong (Amberlite IRA-400) and weak (Amberlite IRA-743) ion-exchange resins as adsorbents under equilibrium and kinetic conditions. The tests involved evaluating the influence of the adsorbent dose, pH, and temperature. The adsorbed Mo(VI) and V(V) levels reached maximum values at fixed pHs of 6.0 and 4.0 for IRA-400 and IRA-743, respectively. The maximum Mo(VI) and V(V) batch uptakes were determined to be 208 and 177 $mg \cdot g^{-1}$ for IRA-743 and IRA-400, respectively. The increase in temperature resulted in increasing Mo(VI) and V(V) sorption capacities for both resins, indicating the endothermic nature of the process. The most rapid adsorption equilibrium was achieved after 30 min during sorption of Mo(VI) on the IRA-400 resin, which resulted in the removal of nearly all metal from the solution. Molybdenum and vanadium adsorption/desorption cycles were performed to estimate the adsorbent lifetime, and good efficiency was observed during three cycles of elution and reuse. FTIR analysis confirmed the presence of Mo and V species within the structures of the IRA-400 and IRA-743 resins after the sorption process.

Keywords: *molybdenum, vanadium, adsorption, isotherm, kinetics, N-methyl-D-glucamine*