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Sorption of uranium in solution by bentonite and kaolinite polysulfone beads

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Various laboratory experiments and sorption model studies were performed to investigate the uranium sorption characteristics and efficiencies using a sorbent made of polysulfone and clay. Batch sorption experiments were conducted to examine the effects of experimental conditions such as clay content in polysulfone (0, 1, 2, 4, 7, 10 wt%), initial uranium concentrations (0.1, 0.5, 1 mg/L), and pHs in solution (4, 7 and 9) on uranium sorption in polysulfone beads with kaolinite (PS-KLT) and bentonite (PS-BNT). The uranium sorption efficiencies of PS-KLT and PS-BNT increased with an increase in the kaolinite and bentonite content in polysulfone. The sorption efficiencies of PS-KLT were less than 91% with the different kaolinite content in polysulfone, whereas PS-BNT maintained over 98% efficiency with the bentonite content of ≥ 4% in polysulfone. When initial uranium concentrations were ≤ 1 mg/L, the sorption of uranium with PS-KLT (4%) and PS-BNT (4%) can be well described by the linear isotherm model with a high correlation coefficient ($R^2 > 0.99$). At pH 4 and 7, PS-BNT (4%) had high sorption efficiency, with 99.3% and 98.1%, respectively, while at pH 9, the efficiency was 55.2%. For PS-KLT (4%), sorption efficiencies showed 41.4% (pH 4), 84.9% (pH 7), and 58.8% (pH 9). The results suggested that PS-BNT might be used as an effective sorbent for removing uranium under neutral to slightly acidic solution.