A comparative study of the adsorption efficiency of typical adsorption materials for wastewater containing cesium

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In this paper, six typical adsorption materials (activated carbon, kaolin, montmorillonite, bentonite, zeolite, and attapulgite) were used to investigate the effects of adsorption time, initial concentration, pH, and temperature on the adsorption of cesium (Cs) contained in wastewater. A combination of kinetics and isotherms was used. The results revealed that, for the same adsorption time, the adsorption efficiencies of the six materials for Cs were as follows: zeolite > attapulgite > bentonite > montmorillonite > activated carbon > kaolin. The adsorption rate of zeolite to Cs ions was almost independent of the initial concentration and temperature. The removal effect of other materials improved in alkaline environments at 30℃. Attapulgite, montmorillonite, activated carbon, and kaolin could be used for the removal of Cs at low initial concentrations. The adsorptive processes utilized by the six adsorption materials were the result of a combination of various adsorption mechanisms. Among the six typical adsorption materials, zeolite, attapulgite, and bentonite had clear removal effects and could be used in practical application in which radioactive wastewater containing Cs needs to be disposed of. Our results suggest that zeolite is the best adsorption material for this purpose.