



Preparation and characterization of mesoporous silica (Ms) supporting lanthanum carbonate (Ms-La) for the defluorination of aqueous solutions

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ABSTRACT

In this paper, the mesoporous silica (denoted as Ms) was modified by lanthanum and the optimal preparation conditions were investigated for lanthanum loaded mesoporous silica materials (denoted as Ms-La). The Ms-La material was characterized by scanning electron microscopy (SEM), X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR) and Thermogravimetric analysis-differential temperature analysis (TG-DTA). The results show that lanthanum is successfully loaded onto the surface of the Ms, and the structure of the Ms did not change during the loading process. The Ms-La had good defluorination performance due to its large surface area and good dispersive effect. The defluorination by the Ms-La can reach 81% before optimization and can reach 90% under optimum conditions ($n\text{NaHCO}_3/n\text{La} = 3.0$, $n\text{La}/n\text{Si} = 0.08$ and 90°C drying temperature). The results of isotherm experiments showed that the maximum adsorption capacity was 19.85 mg/g, and the adsorption was in accordance with Langmuir isotherm adsorption model and the adsorption process was mainly based on the replacement of CO_3^{2-} from $\text{La}_2(\text{CO}_3)_3$ by F^- to form $\text{La}(\text{CO}_3)\text{F}$.

Keywords: Mesoporous silica; Lanthanum carbonate; Fluoride removal

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