A MODIFIED METHOD FOR REMOVAL AND STABILIZATION OF CESIUM METAL IN VITRIFIED MATRIX

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Laboratory experiments were designed to investigate the separation and stabilization of cesium metal. Cesium was removed from simulated waste through sorption under certain physicochemical conditions. Silica sand (locally purchased) was used to remove cesium from simulated liquid waste. The range of pH and temperature was optimized and maximum removal (94 – 98 %) of cesium was achieved with pH 10 at temperature 36°C. Under optimized conditions with temperature range of 301–315K ΔH, ΔS and ΔG_{309K} for 150 ppm solution are – 27.22±0.18 KJ/mol, – 74.1± 0.96 J/mol and – 3071±2.1 KJ/mol respectively, and for 200 ppm solution thermodynamic entities are ΔH= – 20.2±0.20 KJ/mol, ΔS = – 47.86±0.66 J/mol and ΔG_{301K} = – 4344±3.7 KJ/mol. The sorbed metal ion has chances of desorption under changed physicochemical conditions in final disposal. To overcome this problem the final "secondary waste (metals on sorbents)" was stabilized by converting it into a stable vitreous borosilicate matrix through vitrification process to prevent leaching. It was found that the sorbed cesium was evaporated during heating at 1250°C. The evaporation of cesium during vitrification was overcome by modifying the process. This modified vitrification process is found excellent to immobilize the sorbed cesium. Stability was tested by desorption attempts at different pH.

Keywords: cesium removal, borosilicate matrix, leachibility physiochemical conditions, sorption and kinetics, stabilization.

Introduction

Cesium is used in industry as a catalyst promoter, boosting the performance of other metal oxides in the capacity and for the hydrogenation of organic compounds. Cesium occurs naturally in the environment mainly from erosion and weathering of rocks and minerals. Cesium salts are used to strength various types of glass. Cesium nitrate is used to make optical glasses. Cesium is sometimes used to remove traces of oxygen from the vacuum tubes and from light bulbs. The chloride is used in photoelectric cells, in optical instruments, and in increasing the sensitivity of electron tubes. Cesium is used in atomic