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# Selective Adsorption of Uranium Ionsin High Concentration of Chemical Salts

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A study on the selective adsorption of uranium(VI) from a high concentration of chemical salts has been performed to investigate the uranium removal mechanisms and the application conditions of the electrosorption technique using the activated carbon fiber(ACF) as a good conductive electrosorption adsorbent. Electrosorption test were carried out using an electrochemical cell. A negative DC charge in the range of -0.3 to -0.9V was applied onto the ACF electrode using potentiostat(EG&G Model 273). The measurements of electrical double layer capacitance were performed by the galvanostatic pulse method (0.1 5mA). X ray analysis of uranium adsorbed onto ACF was made on an XRD unit (Siemens D5000) using CuKα single crystal. The surface morphology of ACF after electrosorption was examined by scanning electron microscopy (JEOL Co. JSM 5410).

The selective adsorption of U ions in the $Na^+$, $Ca^{2+}$, and $NH_4^+$ cations could be obtained when a potential of -0.9V is applied to the ACF electrode. For a feed concentration of 100mg/L, the concentration of U(VI) in the cell effluent is reduced to less than 1mg/L. The selective adsorption of U ions is due to their higher charge density than that of the $Na^+$, $Ca^{2+}$ and $NH_4^+$ cations. It shows that the external negative potential applied on the ACF electrode has a great impact on the adsorption capacity of the ACF and controls the uranium sorption rate.

One gram of ACF used for this study with a specific surface area of 1536 $m^2/g$ and a double layer capacitance of 30F/g can adsorb and desorb about 74mg U/g ACF with a changed potential of 1V. This value is rather small compared to the observed capacity of 690mg U/g ACF. Therefore it is expected that some reactions other than adsorption by the double layer charging may occur during electrosorption of the uranium.

A sample of uranium adsorbed was examined by X ray diffraction and SEM analysis. From SEM analysis of ACF after electrosorption, uranium precipitate having a yellow color on the ACF has been observed. This uranium precipitate may be identified as metaschoepite in the form of $UO_3$ $2H_2O$ by identification of the diffraction peaks using a combination of computer and manual searches of JCP2. This electrochemically induced uranium precipitation may explain the high electrosorption capacity.

Based on the above results, electrosorption behaviors for U(VI) at negative potentials is considered to be the result of a double layer charging, ion exchange sorption and an electrochemical precipitation of the uranyl ions.

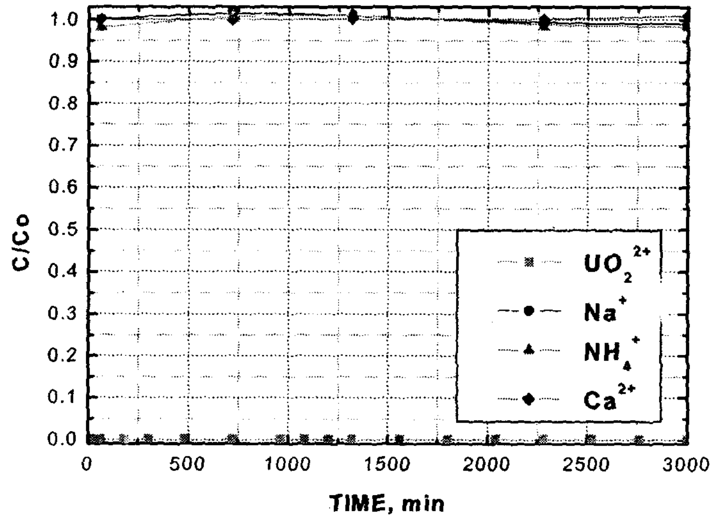

Figure 1. Electrosorption of U(IV) in multi-component salts medium at −0.9V.

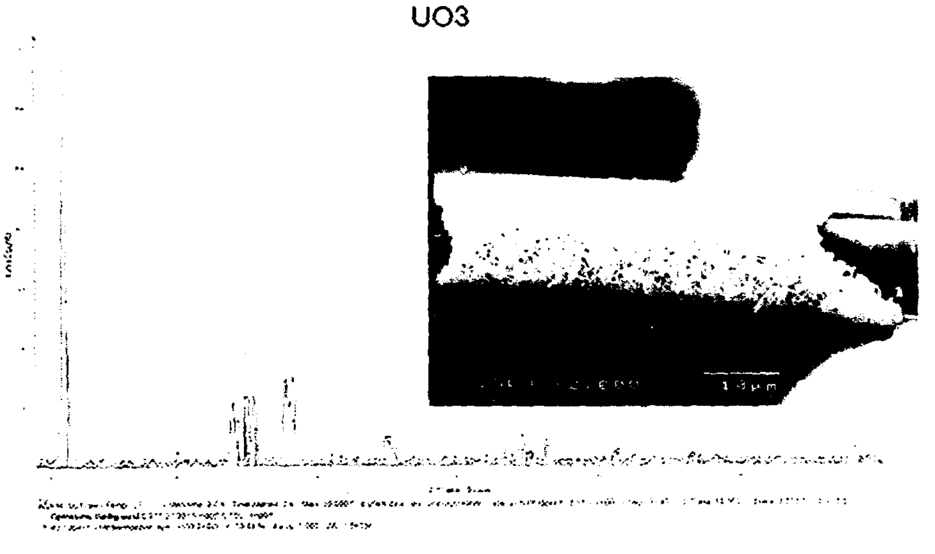

Figure 2. XRD and SEM analysis for adsorbed uranium on the ACFs.