Determination of Ionic Mobilities of Uranium in *n*-Propanol and *n*-Butanol at 25 °C

G. Marx and H. Nitsche

Institut für Anorganische Chemie, Abteilung Radiochemie, der Freien Universität Berlin

Z. Naturforsch. **33a**, 251 (1978); received January 7, 1978

In the system $UO_2(NO_3)_2 \cdot 6\,H_2O$/*n*-Propanol the limiting ionic conductance of $(1/2\,UO_2^{2+})$ was found to be 12.31 $cm^2\,\Omega^{-1}\,mol^{-1}$ at 25 °C, its association constant being $3.6 \cdot 10^9\,l^2\,mol^{-2}$. The corresponding values in the system $UO_2(NO_3)_2 \cdot 2\,H_2O$/*n*-Butanol are:
$\lambda^\circ = 23.57\,cm^2\,\Omega^{-1}\,mol^{-1}$ and $K_A = 1.5 \cdot 10^{11}\,l^2\,mol^{-2}$.

In continuing the investigation of transport phenomena of actinides in aqueous and nonaqueous solutions [1] the equivalent conductivities at 25 °C of $UO_2(NO_3)_2 \cdot 6\,H_2O$ in *n*-propanol and $UO_2(NO_3)_2 \cdot 2\,H_2O$ in *n*-butanol were determined, the accuracy being $\Delta\Lambda_{rel} = 0{,}05\%$. The concentration ranges where

$$4 \cdot 10^{-5}\,n \leqq c \leqq 1.4 \cdot 10^{-4}\,n \quad \text{(propanol)},$$
$$4 \cdot 10^{-5}\,n \leqq c \leqq 8 \cdot 10^{-5}\,n \quad \text{(butanol)}.$$

By use of the Fuoss-Kraus-equation, modified for 2:1-electrolytes, the limiting equivalent conductivities at infinite dilution were calculated to be

$$\Lambda^\circ_{(1/2\,UO_2(NO_3)_2 \cdot 6H_2O)} = 25.92\,cm^2\,\Omega^{-1}\,mol^{-1} \quad \text{(propanol)},$$

$$\Lambda^\circ_{(1/2\,UO_2(NO_3)_2 \cdot 2H_2O)} = 33.13\,cm^2\,\Omega^{-1}\,mol^{-1} \quad \text{(butanol)},$$

the corresponding association constants being

$$K_A^{\text{prop.}} = 3.6 \cdot 10^9\,l^2\,mol^{-2}\,,$$
$$K_A^{\text{but.}} = 1.5 \cdot 10^{11}\,l^2\,mol^{-2}\,.$$

Using the value of the limiting ionic conductance of NO_3^- in *n*-propanol and *n*-butanol and applying Kohlrausch's rule the limiting ionic conductances of $\frac{1}{2}\,UO_2^{2+}$ were calculated in these solvents, the results being:

n-propanol, $UO_2(NO_3)_2 \cdot 6\,H_2O$, 25 °C
$$\lambda^\circ_{(1/2\,UO_2^{2+})} = 12.31\,cm^2\,\Omega^{-1}\,mol^{-1}\,,$$
n-butanol, $UO_2(NO_3)_2 \cdot 2\,H_2O$, 25 °C
$$\lambda^\circ_{(1/2\,UO_2^{2+})} = 23.57\,cm^2\,\Omega^{-1}\,mol^{-1}\,.$$

In the butanol-system the $\lambda^\circ_{NO_3^-}$ value was obtained by conductivity measurements of $NaNO_3$ in this solvent and four different measurements of transference numbers of LiJ, NaJ, KJ and $(C_2H_5)_4NJ$ in butanol, which $\lambda^\circ_{J^-}$ could be gained from with high accuracy.

The use of the unmodified Fuoss-Kraus-function results in delivering negative Λ° values in both systems.

Therefore at low concentration in both systems the electrolyte cannot be considered to be of 1:1typ. Since there wasn't any minimum of the conductivity-concentration curve to be seen, tiplett-ions also can be excluded in the low concentration range of these media.

Reprint requests to Prof. Dr.-Ing. G. Marx, WE 1 — Institut für Anorganische Chemie, Abteilung Radiochemie, FU Berlin, Fabeckstraße 34—36, D-1000 Berlin 33.

[1] G. Marx and H. Nitsche, Z. Naturforsch. **32a**, 187 (1977).