

Determination of Conductivities and Transference Numbers of NaBr and NaJ in *n*-Propanol at 25 °C by Use of the Radioisotope Method

G. Marx and M. Mirza

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

(Z. Naturforsch. **32a**, 185 [1977];
received December 31, 1976)

In *n*-propanol the limiting ionic conductance of Na⁺ was found to be 10.36 cm² Ω⁻¹ mol⁻¹ at 25 °C from conductivity- and transference measurements of NaBr and NaJ by use of the radioisotope method.

In order to split up equivalent conductivities of actinides into the corresponding ionic mobilities in nonaqueous solutions, transference numbers of Na⁺ were determined in the systems NaBr/*n*-propanol and NaJ/*n*-propanol at 25 °C within a concentration range of 10⁻¹ *n* to 2 · 10⁻³ *n*. Using these data the variety of conductance data of tetraalkylammonium- and alkalihalides in *n*-propanol¹⁻³ were split up into limiting single ion conductances.

Using Co as indicator the boundaries at higher concentrations were localized by the ordinary optical version of the moving boundary method, those at lower concentrations by use of our radioisotope method⁴, the following indicator solution being labelled with Co-60.

Reprint requests to Prof. Dr.-Ing. G. Marx, Forschungsgruppe Radiochemie, WE 1-Institut für Anorganische Chemie, Freie Universität Berlin, Fabeckstraße 34–36, D-1000 Berlin 33.

The data of the transference numbers of Na⁺ in the NaBr/*n*-propanol system are in accordance with Longworth- and Stokes-functions within the concentration range from 10⁻² *n* to 2 · 10⁻³ *n*.

The limiting value of the transference number of Na⁺ at 25 °C is:

$$(t_{\text{Na}^+}^0)_{\text{NaBr}/n\text{-prop.}}^{\text{NaBr}} = 0.4561 \pm 0.0001.$$

Since the equivalent conductivity at infinite dilution of NaBr in *n*-propanol, calculated by Justice's equation, is

$$(\Lambda_{\text{NaBr}}^0)_{n\text{-prop.}}^{25^\circ\text{C}} = 22.78 \text{ cm}^2 \Omega^{-1} \text{ mol}^{-1},$$

the association constant being $K_{\text{A}}^{\text{NaBr}} = 317 \text{ l} \cdot \text{mol}^{-1}$, the limiting ionic conductance of Na⁺ calculated from these data is

$$\lambda_{\text{Na}^+}^0 = (10.39 \pm 0.03) \text{ cm}^2 \Omega^{-1} \text{ mol}^{-1}.$$

To confirm these results, the transference numbers of Na⁺ in NaJ/*n*-propanol and their corresponding conductance data were determined. These data, also fitting Longworth- and Stokes functions within the same concentration range, are:

$$(t_{\text{Na}^+}^0)_{\text{NaJ}/n\text{-prop.}}^{\text{NaJ}} = 0.4261 \pm 0.0001,$$

$$\Lambda_{\text{NaJ}}^0 = 24.23 \text{ cm}^2 \Omega^{-1} \text{ mol}^{-1},$$

$$\lambda_{\text{Na}^+}^0 = (10.33 \pm 0.03) \text{ cm}^2 \Omega^{-1} \text{ mol}^{-1},$$

$$K_{\text{A}}^{\text{NaJ}} = 173 \text{ l mol}^{-1}.$$

The limiting single ion conductance of Na⁺ is in accordance with the previous one within the error limit, delivering an average value of

$$(\bar{\lambda}_{\text{Na}^+}^0)_{n\text{-prop.}}^{25^\circ\text{C}} = (10.36 \pm 0.03) \text{ cm}^2 \Omega^{-1} \text{ mol}^{-1}.$$

¹ D. F. Evans and P. Gardam, J. Phys. Chem. **72**, 3281 [1968].

² J. Barthel, M. Knerr, G. Schwitzgebel, and R. Wachter, Z. physik. Chem. N.F. **72**, 222 [1970].

³ G. Wikander and U. Isacson, Z. physik. Chem. N.F. **81**, 57 [1972].

⁴ G. Marx and D. Hentschel, Talanta **16**, 1159 [1969].



Dieses Werk wurde im Jahr 2013 vom Verlag Zeitschrift für Naturforschung in Zusammenarbeit mit der Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V. digitalisiert und unter folgender Lizenz veröffentlicht: Creative Commons Namensnennung-Keine Bearbeitung 3.0 Deutschland Lizenz.

Zum 01.01.2015 ist eine Anpassung der Lizenzbedingungen (Entfall der Creative Commons Lizenzbedingung „Keine Bearbeitung“) beabsichtigt, um eine Nachnutzung auch im Rahmen zukünftiger wissenschaftlicher Nutzungsformen zu ermöglichen.

This work has been digitalized and published in 2013 by Verlag Zeitschrift für Naturforschung in cooperation with the Max Planck Society for the Advancement of Science under a Creative Commons Attribution-NoDerivs 3.0 Germany License.

On 01.01.2015 it is planned to change the License Conditions (the removal of the Creative Commons License condition "no derivative works"). This is to allow reuse in the area of future scientific usage.