THE DEPENDENCE OF THERMAL AND CONCENTRATION MEMBRANE POTENTIALS ON THE EXTERNAL SALT CONCENTRATION

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Summary

(1) Thermal membrane potential is interesting because the quantities of the entropy of matter transported can be estimated from the experimental data. However, the heat flux across the membrane is so high that it is difficult to get reproducible experimental data. Then, we tried to make an improved cell for thermal membrane potential measurements. In the new cell the membrane was used as a ribbon with the two contacts to the external solutions on opposite sides and separated by 0 to 10 mm. Thermal membrane potential across anion-exchange Aciplex test membranes STA-1 to 5, of which the thickness is about 0.1 mm, was measured using the new cell. Thermal membrane potentials across STA-2 to 5 were nearly equal to each other regardless of the differences in the water content, the ion- exchange capacity and the DVB content. However, the difference between the transported entropy of counterions and the partial molar entropy of the ions in the external solutions, which corresponds to the stability of counterions in the membrane, decreases roughly with the decrease of water content or molality of fixed charges in the membrane. The absolute values of thermal membrane potentials across STA-3 increased in the order CH_3COO^-, F^-, IO_3^-, Cl^- for counterions.

(2) Concentration membrane potential across two cation-exchange membranes was measured at high concentrations of KCl, NaCl and LiCl with silver/silver chloride and calomel electrodes and the effective concentration of fixed charges and the mobility ratio of cations and anions were determined.