

Debye–Hückel equation

The chemical potential or activity of ions cannot be determined on a purely thermodynamic basis. This is due to the fact that the effects of an ion cannot be separated from the effects of the accompanying counter-ion, or in other terms, the electrochemical potential of the ion cannot be separated into the chemical and the electrical component. Such a separation must necessarily be based on a non-thermodynamic convention. The present convention is based on the assumption that the molal activity coefficient of the chloride ion in dilute aqueous solutions ($I < 0.10 \text{ mol kg}^{-1}$) can be estimated by means of the Debye–Hückel equation:

$$-\lg \gamma_{\text{B}} = z_{\text{B}}^2 A I^{1/2} / (1 + a_{\text{B}} B I^{1/2})$$

where I is ionic strength, z is the charge number of the ion, a is ion size parameter and A and B are temperature-dependent constants.

According to the Bates–Guggenheim convention a_{B} is taken to be $1.5 (\text{mol kg}^{-1})^{1/2}$ at all temperatures and for all compositions of the solutions.

See also [pH](#).

1984, 56, 569