UDC 533.9.004.14; 621.039.6

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Properties of dilute weak charged solutions

A neutral donor dissociation into charged fragments typical of electrolytes is one of the reversible reactions satisfying the law of mass action (LMA) [1]. Its application to weak electrolytes results into the formula (Ostwald law) for an important characteristic of the electrolyte, its ionization degree [1, 2].

Key words: Electrolyte solution ionization.

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Свойства разбавленных слабо заряженных растворов

Нейтральный донор диссоциации на заряженные фрагменты типичных электролитов является одним из обратимых реакций, удовлетворяющих закону действия масс (LMA) [1]. Применение в слабых электролитах для получения результатов в формулы (закон Оствальда) является важной характеристикой электролита, его степень ионизации [1, 2].

Ключевые слова: электролит, раствор, ионизация.

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Сұйылтылған әлсіз зарядталған ерітінділердің қасиеттері

Диссоциацияның қарапайым электролиттердің зарядталған бөліктеріне бейтарап доноры масса әрекеттерінің заңын қанағаттандыратын қайтымды реакциялардың бірі болып табылады (LMA) [1]. Әлсіз электролиттерде формуладағы (Оствальд заңы) нәтижені алу үшін электролитті қолдануда маңызды сипаттама оның иондалу дәрежесі болып табылады [1, 2].

Түйін сөздер: Электролит, ерітінді, иондалу.

A neutral donor dissociation into charged fragments typical of electrolytes is one of the reversible reactions satisfying the law of mass action (LMA) [1]. Its application to weak electrolytes results into the formula (Ostwald law) for an important characteristic of the electrolyte, its ionization degree α [1, 2].

$$K(T) = \alpha^2 C/1 - \alpha. \qquad (1)$$

The ionization degree α is defined as the ratio of the number of ionized donors to the total number of neutral donor molecules, $K(T)$ is the ionization constant which does not depend on C, but strongly depends on temperature T.In the extreme case $C \to 0$ Eq.(1) yields

$$\alpha(C)_{C\to 0} \to 1 \qquad (2)$$

Along with Eqs. (1) and (2) which illustrate the tendency of an individual donor towards complete ionization, there also exist alternative statements. One of them, formulated as the Thomas-Fermi approximation for a single many-electron atom, demonstrates the possibility of the existence of statistically equilibrium confinement of Z electrons by a nucleus containing Z protons [3]. This is also confirmed by the well-known statistically equilibrium Yukawa-type solution to the Poisson equation for a single Coulomb center screened within the electrolyte by counter-ions at the Debye length [1]. Both cases address the properties of a single donor (acceptor) in vacuum or within the intrinsic electrolyte, i.e. exactly the limit (2) with quite the opposite behavior of

$$\alpha(C)_{C\to 0} \to 0. \qquad (3)$$

The present paper provides a detailed discussion of the properties of dilute weak charged solutions in the limit C → 0, settling, among others issues, the indicated alternative between (2) and (3).

References

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