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研究论文

278.15～318.15 K下葡萄糖在盐酸中的体积性质

卓克垒*,[1], 张秋芬[2], 轩小朋[1], 张虎成[1], 王键吉[1]

([1]河南师范大学化学与环境科学学院 新乡 453007)
([2]洛阳工业高等专科学校材料工程系 洛阳 471003)

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摘要 测定了278.15～318.15 K(间隔10 K)下葡萄糖＋HCl＋水三元体系的密度, 计算了葡萄糖在盐酸(浓度0.2～2.1 mol•kg^{-1})中的表观摩尔体积$V_{\Phi,G}$、标准偏摩尔体积$V^0_{\Phi,G}$、葡萄糖-HCl在水中的体积对相互作用参数V_{EG}和标准偏摩尔膨胀系数$(\partial V^0_{\Phi,G}/\partial T)_p$. 结果表明: (1)葡萄糖在盐酸中的表观摩尔体积随葡萄糖和HCl的浓度的增加而线性增大; (2)$V^0_{\Phi,G}$随HCl的质量摩尔浓度的增加而线性增大; (3)葡萄糖与HCl在水溶液中的体积相互作用参数$V_{EG}>0$, 但数值对温度变化不甚敏感; (4)葡萄糖在水和盐酸中的$V^0_{\Phi,G}$值随实验温度的变化关系均可表示为: $V^0_{\Phi,G}=a_0+a_1(T-273.15\ K)^{2/3}$; (5) $(\partial V^0_{\Phi,G}/\partial T)_p$为正值且随温度的升高而减小; 在一定温度下, 其值随HCl浓度的增加而稍稍减小. 糖的水化程度随温度的升高和HCl的浓度的增加而减小. 用结构相互作用模型对葡萄糖与HCl之间的体积相互作用进行了解释.

关键词 葡萄糖 HCl 密度 表观摩尔体积 标准偏摩尔等压膨胀系数 结构相互作用
分类号

Volumetric Properties of Glucose in Aqueous HCl Solutions at Tem-peratures from 278.15 to 318.15 K

ZHUO Ke-Lei*,[1], ZHANG Qiu-Fen[2], XUAN Xiao-Peng[1], ZHANG Hu-Cheng[1], WANG Jian-Ji[1]

([1] *School of Chemistry and Environmental Science, Henan Normal University, Xinxiang 453007*)
([2] *Department of Material and Engineering, Luoyang Technology College, Luoyang 471003*)

Abstract Densities have been measured for glucose＋HCl＋water at 10 K intervals from 278.15 to 318.15 K. The apparent molar volumes ($V_{\Phi,G}$), standard partial molar volumes ($V^0_{\Phi,G}$) for glucose in aqueous solution of 0.2, 0.4, 0.7, 1.1, 1.6, 2.1 mol•kg^{-1} HCl have been calculated as well as volumetric interaction parameters (V_{EG}) for glucose-HCl in water and standard partial molar expansion coeffi-cients$(\partial V^0_{\Phi,G}/\partial T)_p$. Results show that (1) the apparent molar volumes for glucose in aqueous HCl solutions increases lineally with increasing molality of glucose and HCl; (2) $V^0_{\Phi,G}$ for glucose in aqueous HCl solutions in-creases lineally with increasing molality of HCl; (3) the volumetric interaction parameters for glucose-HCl pair in water are small positive and vary slightly with temperature; (4) the relation between $V^0_{\Phi,G}$ and temperature exists as $V^0_{\Phi,G}=a_0+a_1(T-273.15\ K)^{2/3}$; (5) values of $(\partial V^0_{\Phi,G}/\partial T)_p$ are positive and increase as temperatures rise, and at given temperatures decrease slightly with increasing molalities of HCl, indicating that the hydration of glucose decreases with increasing temperature and molality of HCl. These phenomena are interpreted successfully by the structure interaction model.

Key words glucose HCl density apparent molar volume standard partial molar isobaric expansion coefficient structure interaction

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通讯作者 卓克垒 klzhuo@263.net