

Surface Tension Calculation of Molten Salts $\text{ReCl}_3\text{-ACl}$ ($\text{Re}=\text{Y, La, Ce, Pr}$; $\text{A}=\text{Na, K}$)

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The electrolysis of molten salts containing rare earth chlorides has been widely used for production of rare earth metals and their alloys. Information about the surface tension of molten salts is essential for understanding the structure of the systems and for upgrading the technology of the electrolytic production of rare earth metals. In this paper, the method for calculating the surface tension of molten salts containing rare earth chlorides based on Butler's original treatment was described. A new approach to estimating the partial excess Gibbs energy in the surface phase of molten salts using thermodynamic data obtained from the CALPHAD (calculation of phase diagram) technology in the bulk phase was proposed in order to improve the accuracy and applicability of the above method for surface tension calculation. Model parameters are dependent on temperature and composition of molten salts in our treatment, which are supposed to be more reasonable in contrast to earlier work. As examples for illustration, surface tensions of molten salts $\text{ReCl}_3\text{-ACl}$ ($\text{Re}=\text{Y, La, Ce, Pr}$; $\text{A}=\text{Na, K}$) were calculated using the method proposed in the present work. The calculations of surface tension of $\text{LaCl}_3\text{-ACl}$ ($\text{A}=\text{Na, K}$) systems from our method agree better with the experimental data than those from the method in previous work. It's believed that our method has better applicability for predicting the surface tensions of various molten salts containing rare earth halides.