

表面与界面工程

## 碱性溶液中硼氢化钠在铜阳极上的氧化行为

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摘要

关键词

[铜阳极](#) [硼氢化物](#) [氧化反应](#) [极化曲线](#) [反应动力学](#)

分类号

## Kinetic performance of $\text{BH}_4^-$ oxidation on Cu anode

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### Abstract

Polarization data of  $\text{BH}_4^-$  oxidation on Cu anode in alkaline solution were measured at steady state by a self-made experimental cell. The experimental polarization curve showed three regions: the region at lower over-potential  $\eta$  (below 0.4 V approximately), the region at higher  $\eta$  (above 0.6 V approximately) and the transitional region at medium  $\eta$ . It was found that the limiting current density is caused by the limiting elemental step rather than the external mass transport. The apparent reaction order with respect to  $\text{BH}_4^-$  changes from 0 to 1. The active energy is about  $40 \text{ kJ}\cdot\text{mol}^{-1}$  in both regions with lower and higher  $\eta$ , and is higher than  $40 \text{ kJ}\cdot\text{mol}^{-1}$  in the transitional region. With the experimental temperatures and NaOH concentration, the hydrogen production rates released by the electrode reaction were measured at  $[\text{BH}_4^-] / [\text{OH}^-]$  ratios of 1:40, 1:20, 1:6.7 and 1:4, which is strongly dependent on the over-potential. The apparent number of released electron  $n$  by the reaction was calculated by using the measured amounts of hydrogen and coulomb. Higher value of  $n$  was obtained at lower  $[\text{BH}_4^-] / [\text{OH}^-]$  ratio, higher temperature as well as higher over-potential. Under the experimental conditions, the value of  $n$  varies from 0 to 7, while in the transitional region it is just in the range of 3 to 5. The experimental results indicate that the limiting current density or  $n$  value will increase by virtue of proper experimental conditions. However, to considerably increase the current density at lower over-potential requires a modified anode with higher activity.

### Key words

[Cu anode](#) [borohydride](#) [oxidation reaction](#) [polarization curve](#) [kinetics](#)

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