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微等离子体气体电极在熔盐电解中的应用

摘要

基于辉光放电的微等离子体可以作为非接触气体电极，在基础研究和应用中都受到了广泛的关注。本文以微等离子体为阳极，系统地研究了一系列金属及其合金在熔盐中的电沉积过程。Ag+、Ni2+、Cu2+、Fe3+ 4 种不同价态的金属阳离子均能在固体阴极上以较高的电流效率进行还原且产物纯度高。同时，在微等离子体阳极电解过程中同样存在欠电位沉积现象，可以成功地在活性铝阴极表面得到 Al-Ln 合金。结果表明，基于非接触直流辉光放电的微等离子体阳极是一种很有前途的新型熔盐电解气体电极。

关键词

微等离子体；电解阳极；熔盐；电沉积；Al-Ln 合金

Abstract

Microplasma based on glow discharge could act as non-contact gaseous electrode and have attracted much attention in both fundamental research and application. Herein, with microplasma as the anode, the electrodeposition process of a series of metal and metal alloys in molten salt have been systemically studied. Four metal cations with different valence states, Ag+, Ni2+, Cu2+, and Fe3+, could all be reduced on the solid cathode with high current efficiency and the corresponding metal products were of high purity. The electrodeposition of Al-Ln alloy on the aluminum cathode was also successfully carried out with microplasma as the anode, and the same alloy was obtained by using the conventional anode electrode. These results indicated that microplasma anode based on non-contact direct-current (DC) glow discharge is a promising electrode to be applied in molten salt electrolysis.

Keywords

Microplasma; Anode; Molten Salt; Electrodeposition; Al-Ln alloy

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