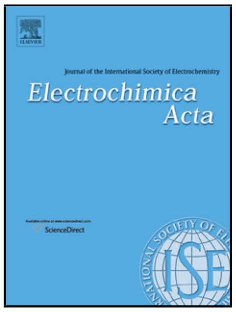
Accepted Manuscript



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PII: S0013-4686(17)30829-0
DOI: http://dx.doi.org/doi:10.1016/j.electacta.2017.04.071
Reference: EA 29328

To appear in: *Electrochimica Acta*

Received date: 19-12-2016
Revised date: 12-4-2017
Accepted date: 14-4-2017

Please cite this article as: S.K. Sahu, B. Chmielowiec, A. Allanore, Electrolytic Extraction of Copper, Molybdenum and Rhenium from Molten Sulfide Electrolyte, *Electrochimica Acta* (2017), http://dx.doi.org/10.1016/j.electacta.2017.04.071

Electrolytic Extraction of Copper, Molybdenum and Rhenium from Molten Sulfide Electrolyte

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Abstract

The validity of the electrochemical series for metal sulfides decomposition in their standard state has been tested experimentally at 1500 K for La_2S_3, Cu_2S, MoS_2, and ReS_2 in a molten electrolyte with the following molar composition: $(BaS)_{54}$-$(Cu_2S)_{31}$-$(La_2S_3)_{15}$ (electrolyte B). Voltammetry measurements indicated the presence of faradaic reactions in the investigated electrolyte with and without the addition of MoS_2 and/or ReS_2. Electrolysis experiments showed that the addition of La_2S_3 to BaS-Cu_2S increases the faradaic efficiency for liquid copper production with respect to a previously studied $(BaS)_{54}$-$(Cu_2S)_{46}$ electrolyte, and enabled isolation of elemental sulfur as the anodic product. Electrochemical measurements suggested the need to take into account the activity of dissolved Cu_2S in order to explain the observed cell voltage during electrolysis. Electrolysis in the presence and absence of ReS_2 and/or MoS_2 confirmed their relative stability as predicted by assuming decomposition in their standard states. Analysis of the metal products electrowon from an electrolyte containing Cu_2S, MoS_2, and ReS_2 indicates that simultaneous production of solid and liquid phases with nonequilibrium compositions.