The Influence of Oxide on the Electrodeposition of Niobium from Alkali Fluoride Melts

Electrodeposition of niobium metal from K2NbF7-LiF-NaF-KF-Na2O melts at 700-degrees-C has been investigated. It was found that the equilibrium oxidation state of niobium was four for initial O2-/Nb(V) ratios of up to at least one. On the other hand when a niobium metal sheet was used for the reduction, average oxidation states close to five were obtained. Cyclic voltammetry showed that NbF72- is reduced in two steps. A mechanism Nb(V) → Nb(IV) → Nb(0) is proposed. When oxide is present, new waves due to reduction of niobium mono-oxofluoro and dioxafluoro complexes are observed at -0.6 and -0.74 V, respectively. In addition plating experiments were also performed. The substrates in our work were low-carbon steel, the anodes niobium metal, and the current density was around 90 mA/cm2. It was found that the presence of at least 1 mole percent of oxide was necessary to obtain current efficiencies higher than 30%. The highest current efficiencies obtained were around 95%. For oxide/Nb(V) molar ratios equal to or higher than one, partially nonmetallic surface layers were deposited.

General information
Publication status: Published
Organisations: Energy and Materials, Department of Chemistry, Department of Chemistry
Contributors: Christensen, E., Wang, X., Barner, J. H. V., Østvold, T., Bjerrum, N.
Pages: 1212-1220
Publication date: 1994
Peer-reviewed: Yes

Publication information
Journal: Journal of The Electrochemical Society
Volume: 141
Issue number: 5
ISSN (Print): 0013-4651
Original language: English
Electronic versions:
Xindong.pdf
DOIs: 10.1149/1.2054898
URLs: http://dx.doi.org/10.1149/1.2054898

Bibliographical note
Copyright The Electrochemical Society, Inc. [1994]. All rights reserved. Except as provided under U.S. copyright law, this work may not be reproduced, resold, distributed, or modified without the express permission of The Electrochemical Society (ECS).
Source: orbit
Source ID: 248397
Research output: Contribution to journal › Journal article – Annual report year: 1994 › Research › peer-review