

The Performance of Ni-Nb Cathode for MCFCs

HONG CHEN, YONG XIE, HONG XIANG,
SHAORYAN TANG, JIANXIN TANG

*Key Lab of New Packaging Material & Technology,
Zhuzhou Engineering College, 412008 Hunan, P. R.
China*

In this study the performance of a novel candidate material for the cathode of MCFCs pre-oxidized nickel-niobium surface alloy was investigated. The stability of the pre-oxidized nickel-niobium surface alloy electrode under various MCFC cathode conditions was examined by the determination of the equilibrium solubility of nickel ions in the carbonate melt. The following conclusions can be drawn: (1) under a cathode atmosphere of $p(\text{CO}_2) / p(\text{O}_2) = 0.67 \text{ atm} / 0.33 \text{ atm}$, the equilibrium solubility of nickel ions in $(\text{Li}_{0.62}, \text{K}_{0.38})_2\text{CO}_3$ melt at 650°C is about 17 ppm for the nickel oxide electrode and 8 ppm for the pre-oxidized nickel-niobium alloy electrode, (2) under the selected MCFC cathode atmospheres with partial pressure of CO_2 varying from 0.1 atm to 0.7 atm the dissolution reaction of NiO can be expressed as follows: $\text{NiO}(\text{s}) + \text{CO}_2(\text{g}) = \text{Ni}^{2+}(\text{l}) + \text{CO}_3^{2-}$ and (3) temperature has less influence on the equilibrium solubility of the pre-oxidized nickel-niobium surface alloy electrode than on that of the NiO electrode. The polarization curve measurements indicate that the polarization performance of the NiO cathode was improved by electrodeposition of niobium. As far as the thermal stability and the polarization performance are concerned, the pre-oxidized nickel-niobium alloy can be considered as a candidate material for the cathode of MCFCs.