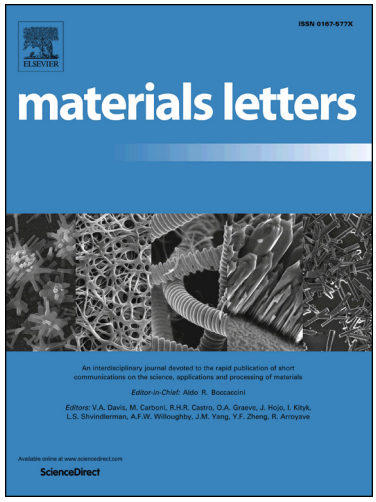

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PII: S0167-577X(17)31126-6
DOI: http://dx.doi.org/10.1016/j.matlet.2017.07.082
Reference: MLBLUE 22924

To appear in: *Materials Letters*

Received Date: 25 May 2017
Revised Date: 12 July 2017
Accepted Date: 19 July 2017

Please cite this article as: J. Hu, Y. Chu, Q. Tian, S. Guo, M. Yang, X. Wang, L. Zhao, Y. Zhu, Electrochemical properties of the $NiCl_2$ cathode with nickel foam substrate for thermal batteries, *Materials Letters* (2017), doi: http://dx.doi.org/10.1016/j.matlet.2017.07.082

Electrochemical properties of the $NiCl_2$ cathode with nickel foam substrate for thermal batteries

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Abstract

In this study, The $NiCl_2$ cathode with nickel foam substrate is prepared by screen printing. The $NiCl_2$-based single cell with nickel foam substrate exhibits a 2.55 V discharge voltage and a specific capacity of 684.61 A s g^{-1} with the cut-off voltage of 1.5 V. For comparison, the $NiCl_2$ cell with stainless steel substrate also discharged, demonstrating a 2.43 V discharge voltage and a specific capacity of 299.39 A s g^{-1}. These significant improvements can be attributed to the excellent impregnation of $NiCl_2$ into the high-porosity nickel metal foam wherein the nickel metal foam acts as conductive agent and substrate. Due to their excellent electrochemical properties, the nickel foam substrate is suitable for use in high power $NiCl_2$-based thermal batteries.

Keywords: Thermal batteries; Nickel foam; Porous materials ; $NiCl_2$ cathode; Screen printing; Electrical properties

1. Introduction

Due to their high level of reliability, mechanical robustness and long shelf life, thermal batteries are mainly used for many military applications [1, 2]. Thermal batteries employ inorganic salt as the electrolyte, which can be activated by the solid electrolyte into molten salt at high temperature (500 ^{o}C) [3]. In these decades, lithium alloy and disulfide (especially FeS_2 and CoS_2) are the typical anode and cathode materials used in thermal batteries, respectively. Although the development of disulfide-based

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