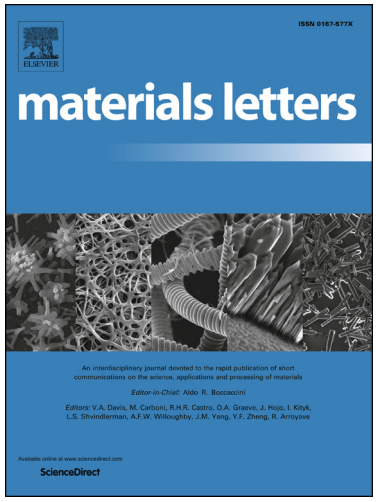

Film cathode for thermal batteries using a screen-printing process

Jing Hu, Ying Chu, Qianqiu Tian, Jianyong Wang, Yunwei Li, Qibing Wu, Lili Zhao, Yongping Zhu

PII: S0167-577X(17)31881-5
DOI: https://doi.org/10.1016/j.matlet.2017.12.114
Reference: MLBLUE 23612

To appear in: *Materials Letters*

Received Date: 21 October 2017
Revised Date: 15 December 2017
Accepted Date: 24 December 2017

Please cite this article as: J. Hu, Y. Chu, Q. Tian, J. Wang, Y. Li, Q. Wu, L. Zhao, Y. Zhu, Film cathode for thermal batteries using a screen-printing process, *Materials Letters* (2017), doi: https://doi.org/10.1016/j.matlet.2017.12.114

Film cathode for thermal batteries using a screen-printing process

Jing Hu[a,b], Ying Chu[b], Qianqiu Tian[c], Jianyong Wang[c], Yunwei Li[c], Qibing Wu[c], Lili Zhao[b,*] and Yongping Zhu[b,**]

[a] *University of Chinese Academy of Sciences, Beijing, 100039, PR China*

[b] *State Key Laboratory of Multiphase Complex Systems, Institute of Process Engineering, Chinese Academy of Sciences, Beijing, 100190, PR China*

[c] *State Key Laboratory of Advanced Chemical Power Sources（SKL-ACPS), Guizhou,563003, PR China*

Abstract

In this study, the film cathode for thermal batteries with wonderful reproducibility and homogeneity is fabricated and investigated. The film cathode is prepared by screen printing process. A single cell with a 50 μm film cathode using screen printing process exhibited a specific capacity of 2092.61 As g^{-1}. For comparison, a single cell with a 600 μm pellet cathode is also discharged, demonstrating a specific capacity of 1076.65 As g^{-1}. These significant improvements can be attributed to the optimal thickness of cathode. The film cathode also exhibited excellent utilization of the electrode material and excellent mechanical strength making it applicable to thermal batteries.

Keywords: Thermal batteries; Thick films; Film cathode; Screen printing; Electrical properties

1. Introduction

The thermal battery is an important primary battery that adopts an ionically non-conductive solid electrolyte and employs an internal pyrotechnic source to bring the battery stack to the operating temperature [1, 2]. Because of their excellent mechanical robustness, high level of reliability and long storage life of more than 25 years [3], the thermal battery has been used widely as a power source for missiles, torpedoes, guided bombs, and radar since the Second World War [4]. Similar to other batteries, thermal batteries are composed of an anode, a cathode and an electrolyte. The most commonly used electrochemical system in thermal batteries is Li-Si (or Li-B)/FeS_2 (or CoS_2), where a Li-based

* Corresponding author.
E-mail address: llzhao@ipe.ac.cn (L. Zhao).
** Corresponding author.
E-mail address: ypzhu@home.ipe.ac.cn ((Y. Zhu).