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Film cathode for thermal batteries using a screen-printing process

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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)/FeS₂ (or CoS₂), where a Li-based

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