Accepted Manuscript

Construction of conductive and flexible composite cathodes for room-temperature solid-state lithium batteries

Minghui He, Zhonghui Cui, Feng Han, Xiangxin Guo

PII: S0925-8388(18)31974-1

DOI: 10.1016/j.jallcom.2018.05.255

Reference: JALCOM 46231

To appear in: *Journal of Alloys and Compounds*

Received Date: 31 March 2018

Revised Date: 18 May 2018

Accepted Date: 21 May 2018

Please cite this article as: M. He, Z. Cui, F. Han, X. Guo, Construction of conductive and flexible composite cathodes for room-temperature solid-state lithium batteries, *Journal of Alloys and Compounds* (2018), doi: 10.1016/j.jallcom.2018.05.255.

Construction of Conductive and Flexible Composite Cathodes for Room-temperature Solid-state Lithium Batteries

Minghui He [a,b], Zhonghui Cui [a,*], Feng Han [c,*], and Xiangxin Guo [a,d]

[a] *State Key Laboratory of High Performance Ceramics and Superfine Microstructure, Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai 200050, China.*

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

[c] *Institute of Engineering Thermodynamics, German Aerospace Center (DLR), Stuttgart 70569, Germany.*

[d] *College of Physics, Qingdao University, Qingdao 266071, China*

* Corresponding author: cuizhonghui@mail.sic.ac.cn (Z. Cui) and feng.han@dlr.de *(F. Han)*

ABSTRACT

Interfacial issues arising from the poor interface contact and poor interface stability between the stiff solid-state electrolytes (SSEs) and the electrodes have restricted the development of successful solid-state batteries (SSBs). Herein, we demonstrate that constructing flexible composite cathodes by introducing conductive frameworks consisting of succninonitrile and lithium salt significantly improves the contact performance and interface stability between garnet solid electrolyte and $LiFePO_4$ cathode, enabling the resulted SSBs cycling steadily with high capacity even at room temperature. The introduction of such flexible frameworks not only enables close contacts between the cathode and the stiff SSE, but also bridges every electrode and electrolyte particles together forming interconnected three-dimensional ionic conductive paths, reducing the total resistance to one-half of the batteries without such frameworks. On the other hand, the network is flexible enough to accommodate the volume change of $LiFeO_4$ during cycling. These advantages endow that the