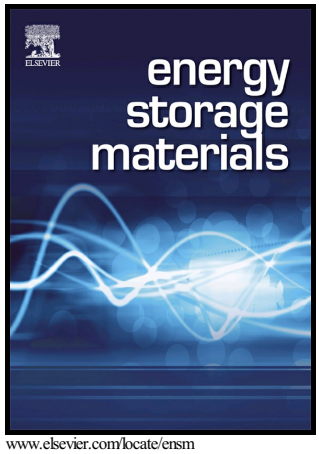

www.elsevier.com/locate/ensm

Mechanisms and properties of ion-transport in inorganic solid electrolytes

Bingkai Zhang, Rui Tan, Luyi Yang, Jiaxin Zheng, Kecheng Zhang, Sijia Mo, Zhan Lin, Feng Pan

PII: S2405-8297(17)30068-5
DOI: http://dx.doi.org/10.1016/j.ensm.2017.08.015
Reference: ENSM209

To appear in: *Energy Storage Materials*

Received date: 21 February 2017
Revised date: 30 August 2017
Accepted date: 30 August 2017

Cite this article as: Bingkai Zhang, Rui Tan, Luyi Yang, Jiaxin Zheng, Kecheng Zhang, Sijia Mo, Zhan Lin and Feng Pan, Mechanisms and properties of ion-transport in inorganic solid electrolytes, *Energy Storage Materials,* http://dx.doi.org/10.1016/j.ensm.2017.08.015

Mechanisms and properties of ion-transport in inorganic solid electrolytes

Bingkai Zhang[1], Rui Tan[1], Luyi Yang[1], Jiaxin Zheng[1], Kecheng Zhang[1], Sijia Mo[1], Zhan Lin[2*], Feng Pan[1*]

[1]School of Advanced Materials, Peking University Shenzhen Graduate School, Shenzhen 518055, People's Republic of China

[2]College of Chemical and Biological Engineering, Zhejiang University, Hangzhou 310058, People's Republic of China

0013131@zju.edu.cn

panfeng@pkusz.edu.cn

***Corresponding authors.**

Abstract:

Compared with conventional lithium-ion batteries, all-solid-state lithium batteries (ASSLBs) based on inorganic solid electrolytes (ISEs) are relatively new research hotspots, which can overcome tough challenges in conventional lithium-ion batteries, such as potential combustion accidents resulted from flammable liquid electrolyte solvent, low energy density, and fussy manufacturing process. In this review, we focus on the ionic conductivity and stability of ISEs by discussing defect chemistry, ion-doping or elemental substitution, ion-transport mechanism, phase stability, and interfacial stability in representative ISEs (e.g., LISICON-like, NASICON-like, perovskite/anti-perovskite, and garnet electrolytes). The general illustration of structures and fundamental features being important to ionic conductivity or stability are examined, including ion occupancies, ion migration paths and dimensionalities, carrier types, point defects, ion-doping sites, and interfacial structures. Experimental and theoretical studies are discussed in parallel to give a deep and comprehensive understanding on ion transport, ion doping, and stability in ISEs. The common features of Li-ion transport mechanism and several possible research directions are also suggested