

Advances in Material Research and Technology

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Solid State Batteries

Design, Challenges and Market
Demands

 Springer

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Chapter 1

Basic Aspects of Design and Operation of All-Solid-State Batteries



P. Priyanka, B. Nalini, and P. Nithyadharseni

1.1 Introduction

Portable electronics, automobile sectors and grid-scale storage systems have revolutionized today's world and battery technology plays a vital role in bringing out the key aspects of energy storage and supply. Commercially, Lithium-ion Batteries (LIBs) have been considered to be the hopeful solution in meeting the demand for energy storage systems. In the present commercial batteries, the electrolyte used is 1 M LiPF₆ in EC-DMC at 27 °C which has got excellent conductivity of 12 mS/cm which is the goal set for solid-state electrolyte if one wants to replace the present-day batteries with all-solid-state batteries [1]. The electrolyte used in LIBs exist as a liquid, either aqueous/non-aqueous. The use of liquid electrolytes in the traditional LIBs with the presence of organic solvents cause issues on safety problems, thermal runaway and risk of leakage of electrolyte which in turn leads to short circuit and failure of the battery [1].

In 2016, 92 Samsung Note 7 cell phones caught fire which resulted in a large product recall [2]. Notebook computers [2, 3], hoverboards [3] and other Li-ion battery-powered gadgets have also been referenced in fire-related accidents. These accidents are more prone due to the dendrite formation in batteries. The interfacial dendrites formed on the anode create the possibility of an internal short circuit, catching fire and even explosion [4]. The highly flammable nature of the liquid electrolyte leads to dangerous or disastrous consequences due to the leakage

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