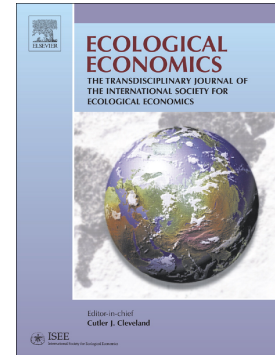


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Polycarbonates as alternative electrolyte host materials for solid-state sodium batteries

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Abstract

This paper describes the first implementation of the aliphatic polycarbonate PTMC – that has previously been successfully applied to lithium polymer batteries – as a non-polyether host matrix in solid-state sodium batteries. Despite higher glass transition temperatures of PTMC–NaTFSI and PTMC–NaClO₄ electrolytes than their Li-containing counterparts, the ionic conductivities were found to be similar to the equivalent Li salt electrolytes. Finally, the functionality of PTMC–NaTFSI was demonstrated through cycling of Na/Prussian Blue half-cells displaying high discharge capacities and limited polarization at C/10 and 60 °C.

Keywords: Na battery; polymer electrolyte; polycarbonate; Prussian blue

1. Introduction

During the last two decades the provision of portable energy has been increasingly entrusted to lithium primary and secondary batteries, principally because of the favorable power and capacity characteristics of these systems [1]. In view of the enormous range of capacities that portable energy sources must provide in devices that range from wristwatches to energy storage facilities, a variety in the chemistries of power sources is necessary and beneficial. In addition, the excessive dependence on lithium-based batteries has led to concerns regarding the future availability of mineral resources to provide a sustainable response [2], particularly in the light of the predicted surge in demand stemming from larger-scale energy storage needs such as grid balancing and electric vehicles [3] – even with implementation of improved

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