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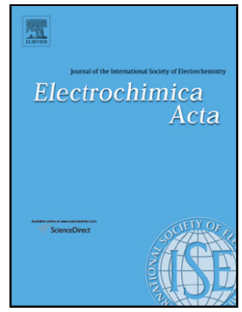

Title: Polymer electrolytes- some principles, cautions, and new practices

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Review article
Polymer electrolytes- some principles, cautions, and new practices.

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Abstract
We give a short review of the basics of ionic dynamics in simple ionic liquids and their solutions (liquid fragility, conductivity-viscosity relations, limiting high conductivity, decoupling of conductivity from viscosity, conductivity maxima in solutions, and ionicity), and then summarize how these conceptual underpinnings must change when the ionic liquid becomes an ionic polymer or salt-in- polymer solution - the field of polymer electrolytes. We discuss the generation of rubbery plateaus, segmental relaxation and its control of thermodynamics, ionicity, and gelation), and revisit some of the key equations needed to provide quantitative accounts of the observed behavior. Finally we describe two alternative approaches to preparing flexible solid electrolytes, both higher-dimensional and one of them all-inorganic.

Keywords: Simple ionic liquid electrolytes; Polymer electrolytes; gelelectrolytes; g-MOF electrolytes

1. Introduction

The field of polymer electrolytes is commonly thought of as (i) the study of ionic transport in materials made of chain polymers acting as electrolyte solvents, or alternatively (ii) the study of polymers that are polyionic and ion-conducting themselves - in either case providing tough flexible ion transporting materials. More recently the advantages of using chain polymers to support gel structures, within which a higher-conducting solution component can be supported, has been found successful. Indeed, it is now incorporated in the current lithium ion battery electrolyte technology.

Here, in this short review, we revisit[1] some of the key ideas and the equations that quantify them before giving a brief account of two novel sorts of polymer + electrolyte materials, one a gel polymer that is all inorganic in character and might easily be developed as a general vehicle for ionic-conducting membranes, and the other a glassy (or rubbery) metal-organic framework that enhances the ionicity of occluded electrolyte solutions.

2. Phenomenology and equations

The non-Arrhenius character of the equations describing the temperature dependence of the conductivity of the various classes of polymer electrolytes is