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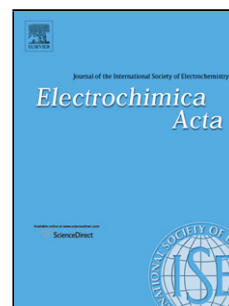
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Epoxy-silica hybrid organic-inorganic electrolytes with a high Li-ion conductivity

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Abstract

Organic-inorganic hybrid electrolytes were prepared by co-hydrolysis and co-condensation of 3-glycidoxipropyltrimethoxysilane (GPTMS) and tetraethyl orthosilicate (TEOS) doped with lithium acetate as self-supported materials and thin-films. The effects of the relative molar content of LiAc on the physicochemical properties of electrolytes, such as morphology, thermal, chemical and electrochemical properties were investigated. Two and four probes test cells were designed for comparative studies of ionic conductivity of hybrid electrolytes using electrochemical impedance spectroscopy (EIS). Similar ionic conductivities were obtained using both measurement methods, reaching a maximum ionic conductivity value of around 10^{-6} S/cm at 25°C. The conductivity mechanism presents Arrhenius behaviour with the increase of the temperature from 25°C to 120°C. The electrochemical stability window is found to be in the range of 0-5V, which ensures that hybrid organic-inorganic materials are potential electrolytes for solid-state rechargeable lithium ion batteries.

Keywords: microbatteries; all-solid-state; organic-inorganic hybrid materials; ionic conductivity; sol-gel.

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