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Mg++ ion conducting polyethylene oxide/magnesium triflate quasi-solid state electrolyte for rechargeable Mg++ battery application

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Abstract

In this study, we demonstrate the potential of a gel polymer electrolyte based on polyethylene oxide (PEO), complexed with magnesium triflate [$Mg(CF_3SO_3)_2$] and plasticized with ethylene carbonate (EC) and propylene carbonate (PC), for use in rechargeable magnesium batteries. The optimized composition, PEO (12.20 wt%), $Mg(CF_3SO_3)_2$ (14.6 wt%), EC (36.6 wt%), and PC (36.6 wt%) achieves a notable ionic conductivity of 2.52×10^{-3} S cm^{-1} at room temperature, which increases with temperature according to Arrhenius behavior. The electrolyte demonstrates a high Mg^{2+} ion transference number ($t_{Mg}++ = 0.51$) and a high total ionic transference number ($t_{ion} = 0.98$) highlighting its excellent performance as an Mg^{2+} ion conductor. Preliminary battery tests with the cell configuration $Mg/PEO:EC:PC:Mg(CF_3SO_3)_2/TiO_2$-C show a discharge capacity of 65 mA h g^{-1} at a 0.015C rate, with an open-circuit voltage of 1.85 V. These results suggest that the $PEO:EC:PC:Mg(CF_3SO_3)_2$ gel polymer electrolyte is a promising candidate for application in magnesium-based electrochemical devices.

About the Journal

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Inventions / Patents

DPST

Inventions / Patents

Title of the Invention: Novel and Low-Cost Method for Converting Natural Ilmenite Present in Mineral Sands to Pure Titanium Dioxide Nanomaterials Under Mild Conditions

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About the Patent

Patent office - National Intellectual Property Office of Sri Lanka
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DPST

Inventions / Patents

Title of the Invention: Preparation of Iron Oxide Nanoparticles from Natural Ilmenite

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About the Patent

Patent office - National Intellectual Property Office of Sri Lanka

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