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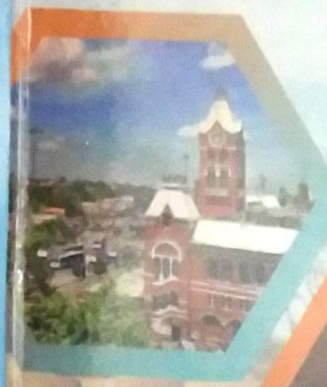

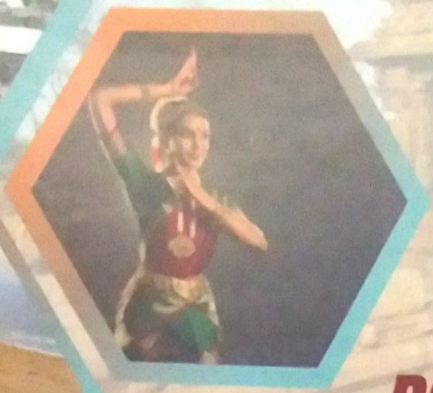

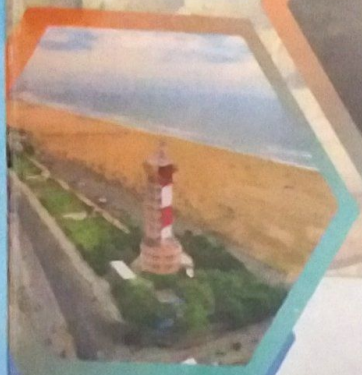

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Development of Magnesium Ion Conducting Biomaterial Electrolyte Based on Centella Asiatica for Electrochemical Devices

C1-PP04

M. Megaraj Begam[a,b]*, M.V. Leena Chandra[a], S.Selvasekarapandian[b,c], R. Meera Naachiyar[a,b], S. Aafrin Hazaana[a,b] and N. Muniraj @ Vignesh[b,d]

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Abstract

Solid biomaterial electrolytes have been prepared by using Centella Asiatica (CA) as biomaterial with various compositions of magnesium nitrate hexahydrate ($Mg(NO_3)_2.6H_2O$) salt by solution casting technique using double distilled water as solvent. The amorphous nature and crystallinity percentage of the biomaterial electrolyte have been studied by X-ray diffraction analysis. The thermal behavior and glass transition temperature for pure and the prepared biomaterial electrolyte membranes have been determined by Differential Scanning Calorimetric analysis.

Electrical conductivity of the biomaterial electrolyte is measured by AC impedance analysis. The maximum magnesium ionic conductivity of biomaterial membrane is 2.976×10^{-3} Scm^{-1} for 1g CA+ 0.5 M wt% $Mg(NO_3)_2.6H_2O$ at room temperature. Transference number measurements are calculated from Wagner's and Evan's DC polarization techniques. The dielectric behavior of the biomaterial electrolyte is also analyzed. The electrochemical stability window for biomaterial membrane with maximum magnesium ionic conductivity is 3.26 V, obtained by Linear Sweep Voltammetry technique. The electrochemical reversibility of the biomaterial membrane is studied by Cyclic Voltammetry technique for 100 cycles. The primary Mg-ion battery is constructed with maximum magnesium ionic conductivity membrane as electrolyte, magnesium metal of diameter 12mm and thickness 1mm as anode and MoS_2 as cathode. Open-circuit voltage (OCV) of the constructed Mg-ion primary battery is 1.92 V. The performance of the primary Mg-ion battery is evaluated with different loads. The Mg-ion primary battery is attached to the 100 kΩ, then the voltage drops to 1.78V for a current of 18 μA observed for 24 hrs. Energy of the primary Mg-ion battery is calculated as 123mAh.

Keywords: Centella Asiatica, Magnesium battery, AC Impedance, $Mg(NO_3)_2.6H_2O$.

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