Due to the inherent advantage of mg metal,

Due to the tremendousprogress of energy storage systems, rechargeable power sources from renewableresources with smart energy environment having good electrochemical propertiesof high safeties are highly demanded 1. Among various power sources lithiumion batteries based on solid polymer electrolytes have many advantages whichcan improve the safety and stability of batteries due to their non-leakage andnon-reactive characteristics. Eventhough it is unrivalled in its performance, there are additional worries such as high cost, low energy and power density, highly explosive, etc.,. The formation of dendrite during cycling in lithiumbatteries causes a fatal short circuit 2.

Therefore it is desired to developea new type of green and safer, less expensive, non dendrite rechargeablebattery system. Owing to the inherent advantage of Mg metal, magnesium (Mg) batteryhas been emerged as an attractive alternate for next level batteries. Magnesiumcan be electro deposited smoothly without any dendrite growth 3 and it canalso provide a higher theoretical volumetric capacity (3832 mAhcm-3)due to the divalent nature of Mg2+ than Li (2062 mAhcm-3). This makes the Mg battery more competitive for energy storage devices 4.

Inthe Earth’s crust Mg is more abundant and more widely available than Li. Thepreparation of electrode with oxygen rich environment is possible with Mgmetal. These merits makes the door opened for magnesium batteries for futuregeneration energy storage.

In working state of abattery the solid polymer electrolyte (SPE) serves as the separator for theelectrodes in open state as well as the ion conductor medium between theelectrodes. Due to their potential applications such as suitable for flexibletype, leak proof and light weight, novel materials for the fabrication of ionconducting devices SPE have been widely studied for the past two decades 5. For the preparationof SPE’s the synthetic polar polymers namely; poly(ethylene oxide) (PEO), poly(methylmethacrylate) (PMMA), poly(vinyl alcohol) (PVA), poly(acrylonitrile)(PAN), poly(vinyl pyrrolidone) (PVP) etc. are frequently used as host matrixfor the preparation of SPE’s. Traditionally, the conduction mechanism of polymerelectrolytes is based on the transport of the metal ion which is closelycoupled to the polymer chains. The ionic transport of SPE occurs only in theamorphous polymer regions than in crystalline region and is often governed bythe segmental motion of the polymer chain6. The SPE forms the complexes ofpolymer with the ions of the added salt which have high amorphicity. The lowionic conductivity at ambient temperature limits the SPE’s for severaltechnological applications in which the dynamics of polymer chains is criticalfor the ions transportation.

The ionic conductivity of the SPE can be increasedby number of approaches such as (i) use of conventional plasticizers like EC, PC, DEC etc. (ii) dispersion of inorganic filler like SiO2, Al2O3, CNT, TiO2 etc. (iii) copolymerization (iv) blending etc. Amongvarious approaches, concerning with the wide variety of application prospects, polymer blending technique has been used for developing and designing newpolymeric materials7.

The two main advantages of polymer blending are (i)suitable control of physical properties by compositional changes and (ii)simplification of synthesis conditions. Recently Hema et. al synthesized asingle Li-ion polymer for polyvinyl alcohol (PVA) which was blended with PVdFand LiCF3SO3& TiO2 as nano filler to formLi-ion electrolyte with conductivity as high as 3. 7 x 10-3 Scm-1at room temperature 8.

When compared to pure PVA (2 x 10-10 Scm-1)the PVA/PAN blend polymer electrolyte (BPE) with 3M LiClO4 wasreported to have an improved conductivity of 3. 76 x 10-3 Scm-19. Anji etal.

, has reported that the polymer electrolyte having 30 wt.% of Mg(NO3)2with PVA–PVP polymer blend has high ionic conductivity of 3. 44×10? 5 S/cm10. Further to accomplish better conductivity many blend electrolytes havebeen reported based on PVC/PEO 11, PVA/PMMA 12 , PVdFHFP/PAN13 and so on. Among various polymers Poly vinyl alcohol (PVA) is abiodegradable, biocompatible, and non-toxic inexpensive synthetic polymer withexcellent film forming properties.

In aqueous blending PVA with long rangehydrogen bond forming ability results into better complex formation withenhanced physical and chemical properties. The preparation and characterizationof PVA based BPE membranes were assessed for the battery applications 14, 15. By changing various crystallization conditions and the blend component ratioscomposed by PVA and other crystalline polymers can modulate the crystallinestructure of the blend. In this order PAN is a suitable candidate to create ablend with PVA. PAN is a semicrystalline, synthetic resin prepared by thepolymerization of acrylonitrile. PAN is a special conjugate polymer which canpermit faster ionic mobility and it is easily soluble in DMF. Hai-Kuan Yuan etal., studied about the dehydration of ethyl acetate solution by pervaporationusing PVA/PAN hollow fiber composite membrane 16, The effect of the reactionof epichlorohydrin with hydrolyzed starch-g-PAN (HSPAN)/PVA blend films hasbeen reported by Dae Hyun Kim et al.

17, Xiao-Hua Maa et al. 18 studied thepreparation and characterization of PFSA–PVA–SiO2/PVA/PAN difunctional hollow fibercomposite membranes. When PVA and PAN are mixed the interactions between themwere expected to occur through interchain hydrogen bonding. PVA-PAN having goodcharge storage capacity and their electrical and optical properties makes it tobe a good potential material when added with salt19. It has been optimizedthat the system comprising 92. 5PVA: 7. 5PAN has the highest conductivity 1. 2×10-7 S cm-120.

Based on ammonium and lithium salts there have been some studies on thisoptimized blend composition 19, 21-23. Literature survey reveals that onlyvery little attention has been given to the polymer electrolytes based onPVA–PAN blend in which multivalent cations are the mobile species. Girish Kumarand Munichandraiah 24, 25 have successfully constructed working magnesiumcells for the gel polymer electrolytes and manganese oxide (MnO2) ascathode by using poly(vinylidenefluoride) (PVDF) and poly(methylmethacrylate)(PMMA) as polymer hosts. Osman et al.

has reported that 15 % Mg(ClO4)2 and 20 % Mg (CF3SO3)2 could coordinate with PMMA gel polymerelectrolyte system to give the maximum ionic conductivity of 3. 31 x 10-3Scm-1 and 1. 27 x 10-3 Scm-1 respectively26.