Conclusion

From the obtained results and discussions we can conclude the following:

1. we success to develop polymer electrolyte based on Poly (vinyl alcohol) (PVA) complexed with ($NaHSO_4$) and ethylene carbonate (EC) as plasticizer ((PVA: 0.5 wt.% $NaHSO_4$) / x wt.% EC) and an addition of Si to the electrolyte with optimized conductivity at 9.9 wt.% EC concentration forming ((PVA: 0.5 wt.% $NaHSO_4$): 9.9 wt.% EC/ y wt.% Si).

2. XRD for the polymer electrolytes illustrated the addition of EC reduces the degree of crystalinity of $NaHSO_4$, where the addition of Si resulted in the formation of new structure (SiOS).

3. The investigation of the Thermographmetric analysis (TGA) illustrated that the optimum thermal stability of our polymer electrolyte reached at 9.9 wt. % EC concentration.

4. The bulk conductivity σ_b reached its optimum value, 4.5×10^{-3} S.cm^{-1}, at 9.9 wt. % EC while it was optimized to 1×10^{-2} S.cm^{-1} at 3.75 wt. % Si in the present polymer electrolyte.

5. The transference number data in these polymer electrolytes have shown that the conduction is predominantly due to ions.

6. The value of dielectric constant ε' for the polymer composites under investigation decreased in general with increasing frequency whereas it was increased with increasing temperature, obeying Debye dispersion equation.

7. Amagnesium battery has been successfully fabricated with composition ((PVA: 0.5 $NaHSO_4$)/ 9.9wt. % EC) and MnO_2 as cathode which gave a real capacity of 249 mAh/g with an internal resistance of 165 Ω.

In addition a magnesium battery has been also fabricated with optimized composition ((PVA: 0.5 $NaHSO_4$): 9.9 wt. % EC / 3.75 wt.% Si) using FeS_2 as cathode which gave real capacity 112 mAh/g with internal resistance of 160 Ω.