

## Electrochemical Characterization of Poly(ethylene oxide)-Zinc Chloride System and its Application in Rechargeable Batteries

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The system  $\text{PEO}_n\text{ZnCl}_2$  with  $n=4-16$  was studied in view of its potential application in a solid state rechargeable zinc battery. A.c. conductivity and cationic transference number measurements, in the temperature range 20-150°C, were performed and the electrochemical stability window was established for the polymer electrolyte with  $n=4$  composition. The ionic conductivity,  $\sigma$ , of this film, follows a VTF behaviour, with an activation energy of  $3.3 \pm 0.2 \text{ kJ mol}^{-1}$  and  $\sigma$  values were found between  $2.50 \times 10^{-7} \text{ S cm}^{-1}$  at 24°C and  $4.81 \times 10^{-4} \text{ S cm}^{-1}$  at 145°C. Acceptable zinc ion transference numbers of 0.36 (medium value) and decomposition voltage values between 3.19V (20°C) and 1.44V (150°C) were estimated. Cyclic voltammetric studies using  $\text{Zn}/\text{PEO}_4\text{ZnCl}_2/\text{Zn}$  cell indicated reversibility of the  $\text{Zn}/\text{Zn}^{2+}$  couple at the electrode/electrolyte interface. Several cells  $\text{Zn}(-)/\text{PEO}_4\text{ZnCl}_2/\text{Nb}_2\text{O}_5(+)$  were assembled and studied at 55°C, with several discharge current densities. Results of cell's discharge profiles, capacity values, charge-discharge cycles behaviour and stability are reported.