



DEVELOPMENT OF POLY(VINYL ALCOHOL)/POLY(VINYL PYRROLIDONE) BLEND'S PROPERTIES BY NANO ALUMINA FOR SOLID ELECTROLYTE APPLICATION IN ZINC-AIR BATTERIES

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Abstract

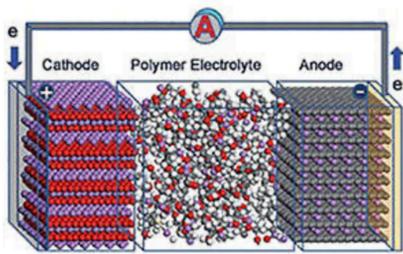
The development of innovative batteries to meet the growing energy demands is a crucial aspect of current technology, particularly the development of polymer electrolytes. This research aims to develop a solid polymer electrolyte for zinc-air batteries by preparing a polymer blend of poly(vinyl alcohol) (PVA) and poly(vinyl pyrrolidone) (PVP) filled with nano alumina and crosslinked with 1 %wt of glutaraldehyde. The resulting material is then immersed in a 7 molar of potassium hydroxide (KOH) solution. The properties are studied through structural and electrochemical tests by SEM, XRD, FTIR, alkaline absorption, tensile test, EIS, and battery test. The results show that the addition of nano alumina affects the structure and physical properties of the polymer. The alkaline solution absorption test demonstrates the improved KOH solution retention, which enhances ionic conductivity. This makes the solid electrolyte as a highly promising for applications in zinc-air batteries

Introduction

Limitations of Liquid Electrolytes

- Safety Concerns
- Limited Electrochemical Stability
- Design Constraints

Replace by Solid electrolytes

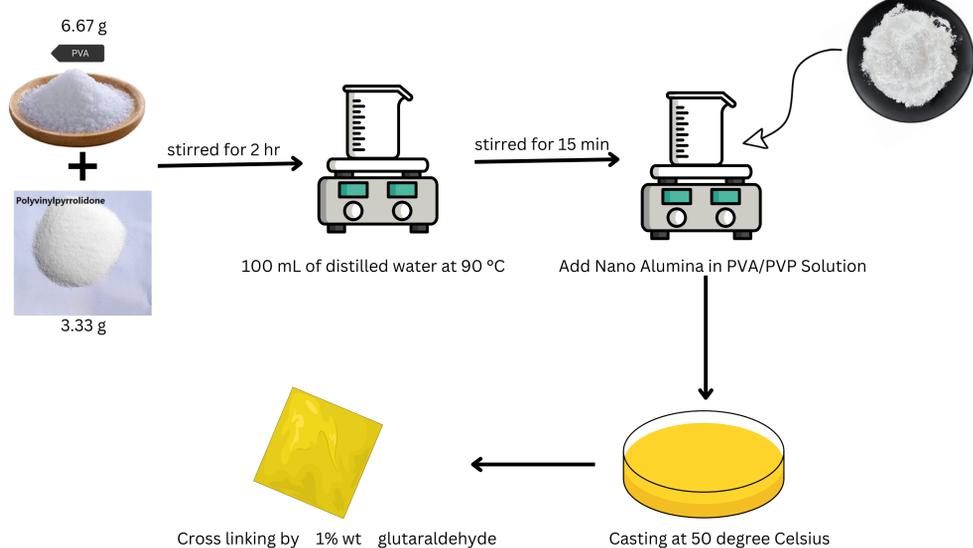


Composition of solid electrolytes batteries

Objective

- To investigate the effect of nano alumina incorporation on the structural, morphological and electrochemical properties of the poly(vinyl alcohol)/poly(vinyl pyrrolidone) blend.

Methodology

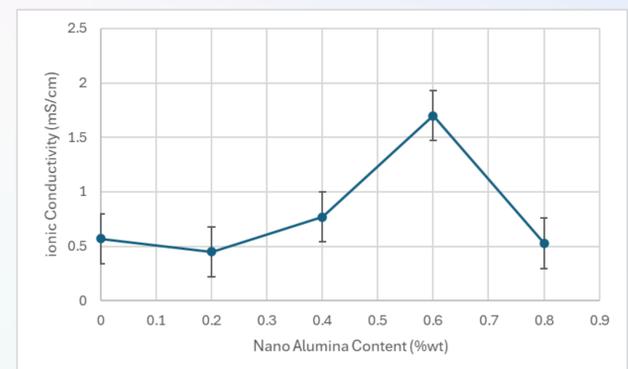


Conclusion

- The addition of nano alumina can enhance both the physical and electrochemical properties of the PVA/PVP blend
- PVA and PVP filled with nano alumina 0.4% wt exhibits the highest power density and highest Stress.

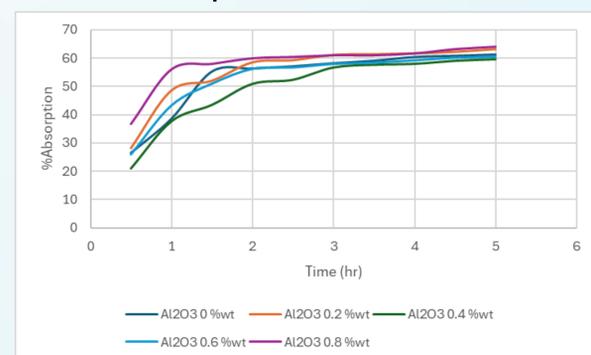
Results

Ionic conductivity



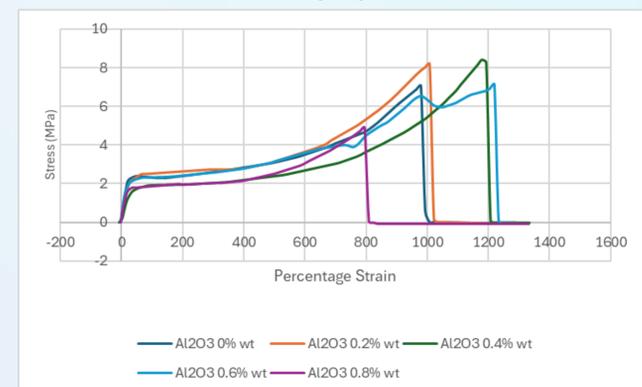
The manifest ionic conductivity was observed at a nano alumina content of 0.6 % wt

Absorption of Alkaline solution



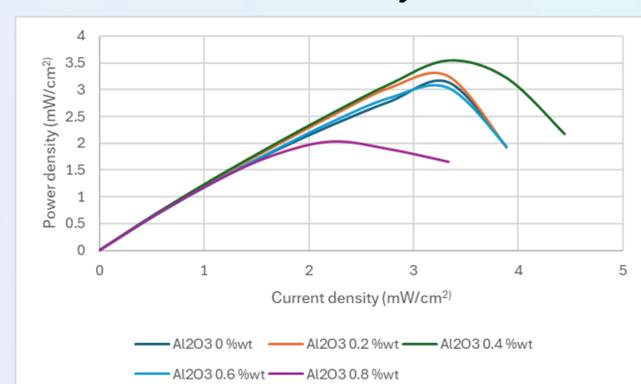
Nano alumina content of 0.8 % wt sample exhibiting the highest absorption value

Mechanical properties



The addition of nano alumina influenced the mechanical properties of the PVA/PVP blend

Power density



The concentration of nano alumina 0.4% wt give the manifest in power density