SRI V. S. SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE (A)

Department of Physics

B.Sc. Honours with Research in Physics (2025 Batch)

Student Research Projects Report

Research Project Title: Preparation and Characterization of Polyvinyl Alcohol (PVA)-Based Polymer Electrolyte Films

As part of the **B.Sc. Honours with Research in Physics curriculum**, the student successfully completed and submitted a **research-based project work** titled **"Preparation and Characterization of Polyvinyl Alcohol (PVA)-Based Polymer Electrolyte Films."**

The project was undertaken to provide practical exposure in **polymer physics, materials characterization, and energy-related applications**. The study emphasizes the preparation of **PVA-based polymer electrolyte films** and their evaluation through structural, optical, and electrical analysis.

This work reflects the department's focus on **research-oriented learning, experimental skills, innovation, and advanced materials science applications**.

1. Research Objectives

The major objectives of the project work were:

- To prepare PVA-based polymer electrolyte films using solution casting technique.
- To study the structural and amorphous nature of the films.
- To analyze optical absorption and band gap behavior.
- To evaluate electrical conductivity and dielectric response.
- To examine the suitability of the material for solid-state battery and supercapacitor applications.
- To develop student skills in materials synthesis, characterization, and scientific reporting.

2. Methodology Adopted

The student followed a systematic research methodology consisting of:

- Literature survey on polymer electrolytes and PVA-based film systems.
- Selection of materials and additives/salts.
- Solution preparation under controlled heating and stirring.
- Thin film formation using solution casting method.
- Drying and sample preparation.
- Characterization using XRD, FTIR, UV–Visible spectroscopy, conductivity measurements, and SEM (where available).
- Result interpretation based on crystallinity, conductivity, and polymer interaction.
- Final report writing and viva-voce presentation.

3. Project-Wise Academic Relevance

This project has strong relevance in the areas of:

- Polymer Physics
- Materials Science
- Condensed Matter Physics
- Solid State Ionics
- Electrochemical Energy Storage Devices

The research supports emerging developments in solid polymer electrolytes, flexible electronics, and renewable energy storage technologies.

4. Learning Outcomes Achieved

Through the completion of this project, the student was able to:

- Gain practical knowledge in polymer film preparation techniques.

- Understand advanced characterization methods.
- Improve experimental design and data analysis skills.
- Apply physics principles to materials research.

- Develop technical writing and project presentation competence.
- Enhance readiness for higher studies and research in materials physics and nanoscience.

The project on PVA-based polymer electrolyte films significantly contributed to the student's understanding of functional materials, polymer science, and electrochemical device applications.