

**THE EFFECT OF STRUCTURAL AND MECHANICAL PROPERTIES
ON FILLER FROM RICE HUSK ASH ON MG49-AMMONIUM
TRIFLATE POLYMER ELECTROLYTES**

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**Final Year Project Report Submitted in
Partial Fulfilment of the Requirements for the
Degree of Bachelor of Science (Hons.) Physics
in the Faculty of Applied Sciences
Universiti Teknologi MARA**

JULY 2025

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Date: 25 JULY 2025

ABSTRACT

THE EFFECT OF STRUCTURAL AND MECHANICAL PROPERTIES ON FILLER FROM RICE HUSK ASH ON MG49-AMMONIUM TRIFLATE POLYMER ELECTROLYTES

As the world shifts toward more sustainable and efficient energy systems, polymer electrolytes have become essential components in the development of advanced electrochemical devices. However, their low ionic conductivity and insufficient mechanical strength, especially at room temperature, often limit their practical use. Traditional efforts to improve these qualities have generally relied on expensive, sophisticated, and environmentally unfriendly materials. To address these limitations of conventional polymer electrolytes, this study investigates the enhancement of MG49-NH₄CF₃SO₃ by incorporating rice husk ash (RHA) silica, which is considered a promising alternative due to its ability to improve ionic conductivity and mechanical strength through a sustainable and low-cost process. The aim was to evaluate the structural and mechanical effects of RHA on polymer matrices at different concentrations (2-10 wt.%). Solution casting was used to produce polymer films, which were then characterized using tensile testing, optical microscopy (OM), and Fourier Transform Infrared Spectroscopy (FTIR). FTIR analysis revealed a strong interaction between MG49, ammonium triflate, and RHA fillers. Peak shifts at 1031 cm⁻¹ and 639 cm⁻¹ indicate decreased crystallinity and increased complexation. As RHA concentration increased, particularly at 6 wt.%, OM analysis showed better filler dispersion and a more compact film structure. Tensile tests confirmed this, with the MR02 sample (2 wt.% RHA) exhibiting the highest tensile strength of about 1.2 MPa and improved flexibility. In contrast, pure MG49 film has a tensile strength of approximately 0.8 MPa and is more brittle. The findings demonstrate that 2 wt.% RHA offers the best balance of mechanical integrity and structural compatibility. In conclusion, the results indicate that 6 wt.% RHA (MR06) provides the optimal performance to enhance the mechanical and structural properties of the polymer electrolyte.

TABLE OF CONTENTS

ACKNOWLEDGEMENT	Page
ABSTRACT	iii
ABSTRAK	iv
TABLE OF CONTENTS	v
LIST OF TABLES	vi
LIST FIGURES	viii
LIST OF ABBREVIATIONS	ix
CHAPTER 1 INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statement	4
1.3 Research Question	5
1.4 Objectives	5
1.5 Significance of Study	6
1.6 Scope of Study	6
CHAPTER 2 LITERATURE REVIEW	7
2.1 Introduction to Polymer Electrolyte	7
2.1.1 Solid Polymer Electrolyte	8
2.1.2 Gel Polymer Electrolyte	8
2.1.3 Composite Polymer Electrolyte	10
2.2 Polymer Host	10
2.2.1 MG49 as a Polymer Host	11
2.3 Ammonium Triflate as a Dopant	12
2.5 Mechanical Properties of Composite Polymer Electrolyte	14
2.5.1 Tensile Testing in Polymer Electrolyte	16
2.6 Structural Properties of Composite Polymer Electrolyte	17
2.6.1 Fourier Transform Infrared Spectroscopy (FTIR)	18
2.7 Morphological Studies of Polymer Electrolyte System	19
2.7.1 Optical Microscopy	20
CHAPTER 3 METHODOLOGY	22
3.1 Introduction	22
3.2 Materials	23
3.3 Preparation of Polymer Electrolytes	25
3.3.1 Preparation of Solid Polymer Electrolytes	25
3.3.2 Preparation of RHA silica	25
3.3.3 Preparation of Composite Polymer Electrolytes	29

3.4	Sample Characterization	31
3.4.1	Fourier Transform Infrared Spectroscopy (FTIR)	31
3.4.2	Optical Microscopy (OM)	32
3.4.3	Tensile Testing	32
3.5	Experimental designs / Flowchart	34
 CHAPTER 4 RESULTS AND DISCUSSION		 37
4.1	Fourier Transform Infrared Spectroscopy	37
4.1.1	Introduction	37
4.1.2	Structural Studies on RHA	37
4.1.3	Structural Studies on CPEs with different concentrations of RHA	40
4.2	Optical Morphology	42
4.2.1	Introduction	42
4.2.2	Morphological Observation of Composite Polymer Electrolytes	42
4.3	Tensile Testing	46
4.3.1	Introduction	46
4.3.2	Mechanical Properties of Composite Polymer Electrolytes	46
 CHAPTER 5 CONCLUSION AND RECOMMENDATION		 51
5.1	Introduction	51
5.2	Conclusion	51
5.3	Recommendation	52
 REFERENCES		 54
APPENDICES		59
<i>CURRICULUM VITAE</i>		78