

**PREPARATION AND CHARACTERIZATION OF RADIATED
POLYMERS FOR VARIOUS ELECTROCHEMICAL
APPLICATIONS**

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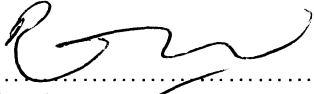
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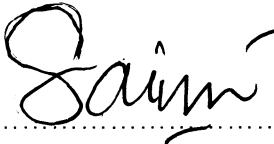
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ABSTRACT

In this study, the high density polyethylene (HDPE) and low density polyethylene (LDPE) sheets were prepared by compression moulding technique. Both sheets were irradiated by electron beam irradiation at 100 to 800 kGy of irradiation dose. Unfortunately, the HDPE sheet showed degradation above 700 kGy of irradiation dose. On the other hand, LDPE can withstand higher irradiation dose up to 800 kGy without showing any degradation. Both sheets became harder after irradiation due to the formation of crosslinking in the polymer structure. This has been confirmed from the thermal gravimetric and differential scanning calorimetry analysis in which the decomposition and the melting temperatures of these irradiated systems were higher than in their un-irradiated systems. The formation of crosslinking in these irradiated HDPE and LDPE system were further confirmed from the formation of interpenetrating structure which were observed from the electron micrograph of these irradiated polymers. From the hot-point probe measurement, both irradiated HDPE and LDPE were *p*-type semiconductors. The presence of charge carriers in these systems were due to the delocalization of electrons from the conjugated C=C bonds that formed in these irradiated systems. The formation of these conjugated C=C bonds in these irradiated HDPE and LDPE systems has been confirmed from the FTIR analysis in which the C=C bonds of *trans*-vinylene and *end*-vinyl were detected at 965 cm^{-1} and 888 cm^{-1} respectively. However, it was found that irradiated HDPE system exhibited higher concentration of conjugated bonds than LDPE due to the closer chain arrangement in the HDPE system that in turn enhance the electrons delocalization along the HDPE chain hence giving lower band gap energy of 2.75 eV compared to LDPE which was 3.97 eV. Interestingly, it was found that the band gap of irradiated HDPE was lower than the polyphenylene and silicon carbide semiconductor.

TABLE OF CONTENTS

	Page
ABSTRACT	i
ACKNOWLEDGEMENT	ii
TABLE OF CONTENTS	iii
LIST OF TABLES	v
LIST OF FIGURES	vi
LIST OF PHOTOGRAPHS	x
LIST OF SCHEMES	xi
LIST OF ABBREVIATIONS	xii
LIST OF PUBLICATIONS	xiii
CHAPTER 1 INTRODUCTION	
1.1 Classification of Conducting Polymers	1
1.2 Preparation of Electronic Conducting Polymers	3
1.3 Problem Statement	4
1.4 Objectives	5
1.5 Research Scope	5
1.5.1 Selection of Materials	5
1.5.2 Selection of Material Characterizations	6
1.6 Expectations	6
1.7 Technical Challenge and Limitations	7
CHAPTER 2 LITERATURE REVIEW	
2.1 Irradiated Polymers Background	8
2.2 Basic Irradiation Process	8
2.3 Possible Transformations in Irradiated Polymers	9
2.4 The Applications of Irradiated Polymers	13
2.5 Polyethylene	13
2.6 Material Characterization	15
CHAPTER 3 RESEARCH METHODOLOGY	
3.1 Samples Preparation	29
3.1.1 Materials Selection	29
3.1.2 Preparation of HDPE and LDPE Sheets	30
3.1.3 Preparation of Irradiated HDPE and LDPE Sheets by Electron Beam Irradiation	31
3.2 Material Characterizations	31
3.2.1 Field Emission Scanning Electron Microscope Analysis	31

3.2.2	Fourier Transform Infrared Analysis	31
3.2.3	Thermal Gravimetry Analysis	32
3.2.4	Differential Scanning Calorimetry Analysis	32
3.2.5	Hot-point Probe Measurement	33
3.2.6	UV-vis spectroscopy	33
CHAPTER 4 PREPARATION AND CHARACTERIZATION OF IRRADIATED HDPE SEMICONDUCTOR		
4.1	Formation of Irradiated HDPE Sheets	35
4.2	FESEM Study on the Morphology of Irradiated HDPE Sheets	36
4.3	FTIR Study of Irradiated HDPE Sheets	39
4.4	Thermal Gravimetry Analysis of Irradiated HDPE Sheets	45
4.5	Differential Scanning Calorimetry Analysis of Irradiated HDPE Sheets	46
4.6	Determination of Type of Irradiated HDPE Semiconducting Material	48
4.7	Band Gap Energy Analysis of Irradiated HDPE Sheets	49
4.8	Conclusion	51
CHAPTER 5 PREPARATION AND CHARACTERIZATION OF IRRADIATED LDPE SEMICONDUCTOR		
5.1	Formation of Irradiated LDPE Sheets	52
5.2	FESEM Study on the Morphology of Irradiated LDPE Sheets	53
5.3	FTIR Study of Irradiated LDPE Sheets	56
5.4	Thermal Gravimetry Analysis of Irradiated LDPE Sheets	59
5.5	Differential Scanning Calorimetry Analysis of Irradiated LDPE Sheets	61
5.6	Determination of Type of Irradiated LDPE Semiconducting Material	62
5.7	Band Gap Energy Analysis of Irradiated LDPE Sheets	63
5.8	Conclusion	65
CHAPTER 6 CONCLUSION AND RECOMMENDATIONS		66
REFERENCES		68