

**Effect of Gamma Irradiation on Blends
Based on Thermoset or Thermoplast
Polymers for Using in Some Useful
Applications**

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By

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**In the name of Allah, most gracious, most
merciful.**

**All praise and glory to Allah the almighty who
alone made this small objective to be accomplished.
I feel honored to glorify his name in the sincerest
way through this small accomplishment and ask
him to accept my efforts. Peace be upon the
prophet, his companions and all who followed him
until the day of judgment.**

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Eman M. Shehata

DEDICATION

To

My lovely parents,

brother and sister

Thanks for being a part of my life

ABSTRACT

Modification of polymers via blending and gamma irradiation crosslinking opens the door for solving many industrial problems and broad the application and markets for the products of modified materials. From this point of view, the present work is divided into two main parts. **The first part** is dealing with the preparation and characterization of alkaline polymer electrolyte membrane based on polyethylene oxide and polyvinylpyrrolidone. The alkaline polymer electrolyte membranes were prepared by two different techniques: immersing the irradiated prepared membranes in different concentration of KOH solutions, and addition of various amounts of KOH to (PEO/PVP) mixture solution during the preparation step. Exposing the prepared membranes to different gamma irradiation doses causes an improvement in the membranes properties such as water solubility and thermal properties. The structure and morphology of the prepared polymer membranes were studied by FTIR spectroscopy and scanning electron microscope. Furthermore, the ionic conductivity of alkaline (PEO/PVP) electrolyte membranes was calculated from Ac impedance spectra. The results obtained showed that the membranes prepared by immersion

technique have better properties than the membranes prepared by addition technique.

Concerning **the second part**, urea formaldehyde (UF) as a thermoset amino resin, was modified by exposing to different gamma irradiation doses and blending with various amounts of vinyl acetate versatic ester latex (VAcVe). Gamma irradiation induced the crosslinking of pure UF and (UF/VAcVe) blends. The change in the structure of pure UF and (UF/VAcVe) blends before and after irradiation was investigated by FTIR spectroscopy. Moreover, physical properties such as insoluble fraction percent, water absorption behavior, and effect of dilute acid and alkali were studied. Thermal and mechanical properties were investigated in terms of thermogravimetric analysis and compacting strength measurement. The results obtained showed an improvement in the thermal stability and a decrease in compressive strength that is related to the amount of VAcVe added.

Keywords: Polyethylene oxide, polyvinylpyrrolidone, Urea formaldehyde, Radiation, thermal properties.

Aim of the work

This work is divided into two main parts:

The first part aims at:

- Preparation of a cost effective alkaline polymer electrolyte membrane using solution casting method.
- Improving the membrane properties via gamma irradiation.
- Evaluation of the prepared alkaline polymer electrolyte membrane as a carrier for hydroxyl transport, with high ionic conductivity and good thermal stability.

And the second part aims at:

- Studying the effect of gamma irradiation on urea formaldehyde (UF) resin.
- Improving the performance of UF film by the addition of vinyl acetate versatic ester (VAcVe).
- Evaluation of UF/VAcVe blends to ensure that it can be used as joint filler in the flooring.

CONTENTS

CHAPTER I

INTRODUCTION AND LITERATURE REVIEW

1.1. Classification of Polymers	2
1.1.1. Thermosets.....	2
1.1.1.1. Types of Thermosets and Areas of Applications	4
I . Phenolic Resins	4
.....	
I I . Epoxy Resins	6
.....	
I I I . Amino Resins	7
.....	
Ureaformaldehyde	9
1.1.2. Thermoplastics	16
1.1.2.1. Crystalline Polymers	18
1.1.2.2. Amorphous Polymers	18
1.1.2.3. Semi-Crystalline Polymers	19
1.2. Polymer Blends	19
1.3. Effect of Radiation on Polymer Blends	20
1.4. Polymeric Membrane in Fuel Cells	22

CHAPTER II

MATERIALS AND EXPERIMENTAL TECHNIQUES

2.1. Materials	39
2.2. Experimental Methods	41
2.2.1. Preparation of (PEO/PVP) Polymer Membrane	41
2.2.2. Preparation of (PEO/PVP)(70/30) Alkaline Polymer Electrolyte Membrane	42
2.2.3. Preparation of (UF/ VAcVe) Blends	42
2.3. Analysis and Measurements	43
2.3.1 Gamma Irradiation Source	43
2.3.2. Determination of Gel Fraction	43
2.3.3. Swelling Measurements	43
2.3.4. Water Content Measurements	44
2.3.5. Chemical Stability towards Acids and Alkali	44
2.3.6. FT-IR Spectroscopy	44
2.3.7. Thermogravimetric Analysis	45
2.3.8. Differential Scanning Calorimetry	45
2.3.9. Scanning Electron Microscope	45
2.3.10. Electrochemical Impedance Spectroscopy	46

2.3.11. Transference Number Study	47
2.3.12. Compacting and Compressive Strengths Measurements	47

CHAPTER III

RESULTS AND DISCUSSION

3.1. Preparation and Characterization of Gamma Crosslinked Polymer Electrolyte Membrane for Alkaline Fuel Cell.....	49
3.1.1. (PEO/PVP) Polymer Membrane.....	50
3.1.1.1. Fourier-Transform Infrared (FTIR) Spectroscopy...	50
3.1.1.2. Effect of Gamma Irradiation Doses on Gel Fraction	53
3.1.1.3. Swelling Behavior of (PEO/PVP) Membranes in Water.....	57
3.1.1.4. Thermal Analysis (TGA).....	59
I . Initial TGA Thermograms and Weight Loss.....	59
I I . Differential Scanning Calorimetry (DSC).....	65
3.1.1.5. Impedance Analysis	70
3.1.1.6. Ionic Conductivity.....	71

3.1.1.7. Structural Morphology.....	72
3.1.2. Immersed PEO/PVP Membrane.....	76
3.1.2.1. FTIR Analysis.....	76
3.1.2.2. Swelling Behavior of Irradiated (PEO/PVP) (70/30) Membrane in KOH Solution.....	78
I . Swelling (%) as a function of different KOH solution concentrations.....	78
I I . Swelling (%) in 2M KOH solution as function of immersion time.....	81
3.1.2.3. Ionic Conductivity Measurements	83
I . Effect of Immersion Time on the Ionic Conductivity of Irradiated PEO/PVP (70/30) Membrane Immersed in 2M KOH	88
3.1.2.4. Thermal Analysis.....	91
I . Thermogravimetric Analysis (TGA).....	91
I I . Differential Scanning Calorimetry (DSC).....	95
3.1.2.5. Structural Morphology.....	98
3.1.3. PEO/PVP/KOH Membrane.....	100
3.1.3.1. FTIR Analysis.....	100
3.1.3.2. Structural Morphology.....	102