شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

HOSSAM MAGHRABY

شبكة المعلومات الجامعية

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

HOSSAM MAGHRABY

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها

علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

HOSSAM MAGHRABY

بعض الوثائق الأصلية تالفة

HOSSAM MAGHRABY

شبكة المعلومات الجامعية

بالرسالة صفحات

لم ترد بالأصل

HOSSAM MAGHRABY

Benha University
Faculty of Science
Chemistry Department

Characterization of Gamma Irradiated Polymer Blends

Thesis
Submitted in parial Fulfilment of the Requirement
For The M. Sc. Degree Chemistry

By

Faten Ismail Abu-El Fadle

B.Sc. Chemistry

To
Chemistry Department
Faculty of Science
Benha University

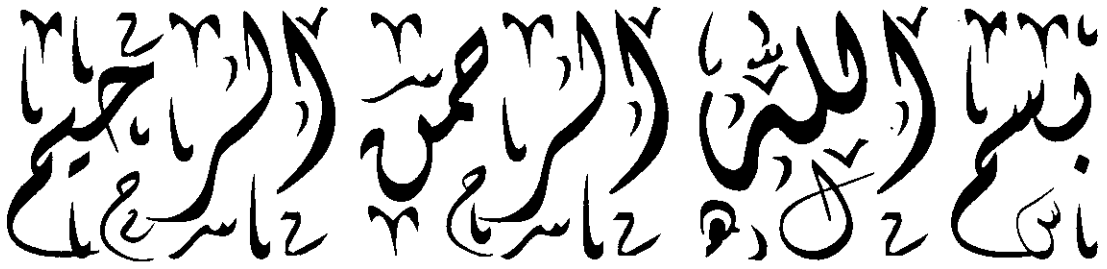
Supervised by

Prof. Dr. Abdel-Wahab Mohamed El-Naggar
Prof.. of Radiation Chemistry
National Center for Radiation
Atomic Energy Authority

Prof. Dr. Abdel-Fattah Fadel
Prof. of chemistry
Faculty of Science
Benha University

Asst.Prof. Horia Mahmoud Mahmoud Nizam EL-Din
Prof. of Polymer Chemistry
National Center for Radiation
Research and Technology
Atomic Energy Authority

2006


بسم الله الرحمن الرحيم

DEDICATION

I dedicate this work to my father and my mother, Gud pless their souls. Also, I dedicate this work to my little kids and my husband. A special dedication to my elder brother

YOURS FAITH

Note

Beside the work carried out in this thesis, the candidate has attended postgraduate courses in the following topics:

(1) Hetero-cyclic Chemistry and Design

(2) Physical Organic Chemistry and Elective Course

(3) Spectroscopic Chemistry and Dyes

(4) Polymers and Carbohydrates

(5) Pericyclic Chemistry, Biochemistry and Natural Products

(6) Photochemistry

(7) Language (Germany)

(8) Language English (from Benha)

(9) Mathematics and Quantum Chemistry

(10) Techniques of Molecular Structure and Advanced Analytical Chemistry

She has successfully passed a written examination in these courses, in partial fulfillment for the degree of Master of Science.

Head of Chemistry Department

Prof. Dr. Hassan Dessouki

CONTENTS

CHAPTER III
RESULTS AND DISCUSION

Acknowledgement

I would like to thank Prof. Dr. Abdel Fatah Fadel, the professor of chemistry, chemistry Department, Faculty of Science (Benha), Benha University, for his great supervision.

Also, deepest thanks is owed to Prof, Dr, Abdel Wahab M. El-Naggar, Radiation Chemistry Department, National Center for Radiation Research and Technology (NCRRT), for suggesting the topic of this work and continuous supervision to complete this work.

Great appreciation Also to, Prof, Dr, Horia M. Mahmoud Nizam El-Din , Polymer Chemistry Department, National Center for Radiation Research and Technology (NCRRT), for suggesting the topic of this work and continuous supervision to complete this work. And for her valuable guidance, great help and useful discussion and supervision through out this work.

I would like to thank the Head of Polymer Chemistry Department, National Center for Radiation Research and Technology and the staff and fellow colleagues of Polymer Chemistry Department.

Finally, I wouid like to thank the Chairman of the National Center for Radiation Research and Technology for his encouragement and facilities.

Aim of The Work

In the present work we concerned with preparation of different miscible polymer blends from a common solvent by the solution casting technique. In this regard the polymers poly(vinyl alcohol) (PVA)/polyacrylamide (PAM), poly(vinyl acetate) (PVAc)/polymethylmethacrylate (PMMA) have been chosen to form polymer blends based on the fact that each of their polymers constitute a wide range of different functional groups. As the effect of high energy radiation is one of our interest, the effect of gamma radiation on the structure property relationship of PVA/PAM and PVAc/PMMA polymer blends was investigated. These polymer blends may fined a promising industrial applications. Polymer blends based on PVA/PAM are highly hydrophilic can be used in the field of absorbing wastes from wastewater such as toxic heavy metals and dye wastes. On the other hand, polymer blends based on PVAc/PMMA can be used in manufacturing medical containers and devices due to the flexible PVAc and the high transparent PMMA.

Abstract

Films of miscible polymer blends based on poly vinyl alcohol (PVA) /polyacrylamide (PAM) and poly(vinyl acetate) (PVAc)/poly(methyl methacrylate) (PMMA) were prepared by the solution casting technique using water and benzene as common solvents, respectively. The thermal, mechanical and morphological properties of these blends before and after exposure to various doses of gamma radiation have been investigated. The visual observation and colour reflectance measurements showed that PVA/PAM blends are compatible over a wide range of composition. Moreover, the DSC thermograms showed the appearance of a single glass transition temperature (Tg) not that of PVA or PAM homopolymers giving further supports to the complete compatibility of such blends and the occurrence of crosslinking. These findings were demonstrated by the SEM micrographs of the fracture surfaces and the tensile mechanical properties. The TGA thermograms showed that the unirradiated PVA possesses higher thermal stability than PAM homopolymer or their blends and this stability was slightly improved after exposure to gamma radiation. Thermogravimetric analysis (TGA) of PVAc/PMMA blends showed that the rate of reaction (T_{max}) occurs and the kinetic parameters of the thermal decomposition. The rate of reaction curves of the individual homopolymers or their blends, before or after γ-irradiation, displayed similar trends, in which the T_{max} corresponding to all the polymers was found to exist in the same position but with different values. These findings and the visual observations of the blend solutions and the transparency of the films give supports to the complete miscibility of these blends. In conclusion, γ-irradiation improved the thermal stability of PVAc/PMMA blends even though PMMA polymer is a γ-irradiation degradable. Also the IR spectra confermed miscibility of PVAc/PMMA blends and that the absorption bands of the different functional groups were affected. Also, the DSC scans of the pure PVAc and pure PMMA and their blends at different compositions. showed the appearance of single glass transition temperature, which is not for either pure PVAc or pure PMMA polymers. .

LIST OF APPREVIATIONS

number	Scientific Terms	Appreviation
1	Differential Scanning Calorimetry	DSC
2	Thermogravemetric Analysis	TGA
3	Scanning Electron Microscopy	SEM
4	Temperature	T
5	Glass Transition Temperature	T_g
6	Melting Temperature	T_m
7	Heat of Fusion	H_f
8	Rate of Reaction	dw/dt
9	Weight Loss	w
10	Activation Energy	E*
12	Gas Constant	R
13	Order of Reaction	n
14	Poly Vinyl Alcohol	PVA
15	Poly Acrylamide	PAM
16	Poly Vinyl Acetate	PVAc
17	Poly Methyl Methacrylate	PMMA