Synthesis and Characterization Of Nanostructure Polymers by Gamma Irradiation and its Possible Applications

A Thesis
Submitted To
Chemistry Department
Faculty of Science
Ain Shams University

In partial fulfillment of the requirements of the

Master Degree in Chemistry

(M.Sc)

By

Mohamed Salah Abd EL- Rasoul Soliman
B.Sc. Fac. of Science, Assuit University , 2005.

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By

Mohamed Salah Abd EL-Rasoul Soliman

B.Sc. Fac. of Science, Assuit University , 2005.

This Thesis for Ph.D. Degree in Environmental Science has been approved by:

Name: **Signature:**

(1) Prof. Dr. Hisham Foad Aly
Prof. of Radiation Chemistry, National Center for Radiation Research and Technology

(2) Prof. Dr. Mahmoud Ahmed Abed El-Ghaffar
Prof of Polymer, National Center for Research

(3) Prof. Dr. El-Sayed A. Hegazy
Prof. of Radiation Chemistry, National Center for Radiation Research and Technology

(4) Prof. Dr. El-Sayed Ahmed Soliman
Prof of organic chemistry-Ain Shams University

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Department of Chemistry

Faculty of Science

Ain Shams University

Under The Supervision of :

1-Prof. Dr. El-Sayed Ahmed Soliman Abd El-Aziz

Prof. of chemistry., Faculty of Science, Ain Shams University

2- Prof. Dr.. El-Sayed A. Hegazy

Prof. of Radiation Chemistry, National Center for Radiation Research and Technology

3- Prof. Dr.. Magda Borhan El-Din Fahmy El-Arnaouty

Prof. of Radiation Chemistry, National Center for Radiation Research and Technology

تحضير و توصيف البوليمرات النانومترية باستخدام التشعيع الجامي و تطبيقاتها الممكنة

رسالة مقدمة الي

كلية العلوم

جامعة عين شمس

للحصول على درجة

الماجستير

في الكيمياء

مقدمة من

محمد صلاح عبدالرسول سليمان

بكالوريوس علوم- كيمياء و نبات - كلية العلوم- جامعة أسيوط 2005

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صفحة الموافقة علي الرسالة

" تحضير و توصيف البوليمرات النانومترية باستخدام التشعيع الجامي و تطبيقاتها الممكنة"

رسالة مقدمة من الطالب

محمد صلاح عبدالرسول سليمان

بكالوريوس علوم- كيمياء و نبات - كلية العلوم- جامعة أسيوط 2005

للحصول علي درجة الماجستير

في

الكيمياء

وقد تمت مناقشة الرسالة والموافقة عليها
اللجنة:

(1) ا.د./ هشام فؤاد محمد علي
استاذ الكيمياء الاشعاعية- هيئة الطاقة الذرية

(2) ا.د./ محمود احمد عبد الغفار
استاذ البوليمرات- المركز القومي للبحوث

(3) ا.د./ السيد احمد عبد العزيز حجازي
استاذ الكيمياء الاشعاعية- هيئة الطاقة الذرية

(4) ا.د./ السيد احمد سليمان عبد العزيز
استاذ الكيمياء العضوية-كلية العلوم –جامعة عين شمس

تحضير و توصيف البوليمرات النانومترية باستخدام التشعيع الجامي و تطبيقاتها الممكنة

رسالة مقدمة من الطالب

محمد صلاح عبدالرسول سليمان

بكالوريوس علوم- كيمياء و نبات - كلية العلوم- جامعة أسيوط 2005

للحصول علي درجة الماجستير

في

الكيمياء

تحت إشراف :

1- **أ.د/** السيد أحمد سليمان عبدالعزيز

أستاذ الكيمياء العضوية

كلية **العلوم** -جامعة عين شمس

2-**أ.د/** السيد أحمد عبدالعزيز حجازي

أستاذ الكيمياء الإشعاعية

المركز القومي لبحوث وتكنولوجيا الإشعاع

3- **أ.د /** ماجدة برهان الدين فهمي الأرناؤوطي

أستاذ كيمياء البوليمرات

المركز القومي لبحوث وتكنولوجيا الإشعاع

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Abstract

A series of (PVA/PVP) hydrogels were prepared by gamma radiation. The effect of preparation conditions such as copolymer composition ratio and irradiation dose on the gelation percent. The swelling property of the prepared hydrogels in bidistilled water was studied. Highly stable and uniformly distributed silver nanoparticles (PVA/PVP)-Ag have been obtained with hydrogel networks as nanoreactors. The morphology and structure of (PVA/PVP) hydrogel and dispersion of the silver nanoparticles in the polymeric matrix was examined by scanning electron microscopy (SEM) and Infrared spectroscopy (FT-IR). The formation of silver nanoparticles has been confirmed with ultraviolet visible (UV-vis) spectroscopy , Dynamic light scattering (DLS), X-ray diffraction pattern (XRD) and Transmission electron microscope (TEM). The polymer –clay nanocomposite hydrogel wound dressing based on (PVA/PVP) and different contents of reinforcing agent, i.e. calcium bentonite, were prepared by gamma irradiation process. Their physical properties were investigated. The thermal stability studies confirmed that the introduction of clay leads to increase in the thermal stability. The TEM results showed that, the clay nanoparticles are interclated and exfoliated in the polymeric matrix. The improved properties and the antibacterial properties suggest that, (PVA/PVP)-Silver nanoparticles and (PVA/PVP/clay) nanocomposite can be a good candidate as wound dressing.

Keywords: (PVA/PVP)-Ag nanocomposite, (PVA/PVP)-clay nanocomposite, gamma radiation, XRD, UV–vis, DLS, TEM, wound dressing.

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