

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

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Submitted To  
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**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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# 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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## **ABSTRACT**

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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 intercalated 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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