بسم الله الرحمن الرحيم

(قَالُوا سُبْحَانَكَ لا عِلْمَ لَنَا إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنتَ العَلِيمُ الحَكِيمُ)

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Faculty of Science
Ain shams University

Radiation Synthesis, Characterization of Nanocomposites Based on Natural Polymer Blends and their Biomedical Applications

Thesis Submitted for

The Degree of Doctor Philosophy of Science in Chemistry

To

Chemistry Department, Faculty of Science

Ain shams University

By

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Radiation Synthesis, Characterization of Nanocomposites Based on Natural Polymer Blends and their Biomedical Applications

A thesis submitted to Chemistry Department
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ABSTRACT

Three hydrogels were prepared by gamma radiation copolymerization. The first hydrogel was based on different ratios of acrylic acid (AAc) monomer, plasticized starch (PLSt) polymer and Monmorillonite as a nonocomposite.
Second hydrogel was synthesized taking acrylic acid- co- plasticized Starch AAc/(PLSt) with (65/35)% composition ratio as a base , and different ratios of chitosan (Cs) and Monmorillonite as a nonocomposite.
Where the third had based on different ratios of poly (vinyl pyrrolidone) and alginate while introducing silver nitrate to the polymer matrix to act like a nonocomposite .
The hydrogels were characterized by FT-IR spectroscopy, thermogravimetric analysis (TGA), X-ray diffraction (XRD) and transmission electron microscopy (TEM). The effect of irradiation dose and composition ratios on the degree gelation and swelling of formed hydrogels was studied.
The drug uptake-release characters of all copolymers, taking Sulphanilamide and Prednisolone as model drugs were studied.
For PAAc-co-(PLSt/MMT) co-polymer the studies showed that the appropriate dose of gamma irradiation to achieve homogeneous nanocomposite hydrogel films and the highest swelling in water was 15 kGy, regardless of composition. The introduction of MMT up to 5 wt % improved the physical properties and enhanced the drug uptake-release characters.

Keywords: Nanocomposites; Gamma irradiation; Acrylic acid; Plasticized Starch; Montmorillonite clay; Chitosan; Alginate; Polyvinyl pyrrolidone; Silver nitrate.

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