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Radiation Processing of Natural and Synthetic Polymers for Potential Applications

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Abstract:

The effect of ionizing radiations on the cross-linking and degradation of some natural polymers such as CMC-Na, chitosan, carrageenan, alginates and starch was investigated. Trials were made to control and reduce the irradiation dose required for the CMC-Na degradation by the addition of some additives and controlling the irradiation conditions. The possibility to cross-link CMC-Na/PAAm and starch/PAAm blends using electron beam irradiation to obtain good adsorbent materials of unique properties for possible practical uses were also investigated. The end product of irradiated natural products such as carboxy-methylcellulose, chitosan and Na-alginate may be used as food additive or benefited in agricultural purposes. From an economic point of view these doses are not accepted, it was significantly reduced by the addition of APS, KPS and H_2O_2. The addition of such additives to chitosan or Na-alginate during irradiation process accelerates their degradation. Degraded Na-alginate and chitosan could be used as growth promoter for plants in agriculture purposes. The growth and other responses of Zea maze and bean plants that treated with irradiated Na-alginate or chitosan of different Mw's were investigated. The test field results showed that the treatment of the zea plant with irradiated Na-alginate or chitosan enhanced the plant growth and increases its productivity.

Chemically cross-linked, pH-sensitive PVP/PAAc hydrogel nanoparticles were successfully prepared in a high yield via γ-radiation-induced polymerization of acrylic acid in aqueous solution of poly(vinylpyrrolidone) (PVP) as a template polymer. The particle sizes of the PVP/PAAc nanogels at different pH values were evaluated using dynamic light scattering (DLS) and the morphology was assessed using atomic force microscopy (AFM) and transmission electron microscopy (TEM). Smaller and more stable nanogel particles can be produced by irradiating a feed solution of 50–75 mol% AAc and using PVP of high molecular weight. Factors affecting size and encapsulation efficiency were optimized to obtain nanogel sufficient to entrap drug efficiently. The use of PVP/PAAc nanogels prepared at different compositions and irradiation doses was evaluated for dry eye syndrome application.

Country/Organization invited to participate

Egypt

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