Chinese Chemical Letters Vol. 15, No. 10, pp 1253-1254, 2004 1253
http://www.imm.ac.cn/journal/ccl.html

The Preparation and Properties of Thermosensitive Hydrogels Based on Chitosan Grafted N-isopropylacrylamide *via* γ-Radiation

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Abstract: Thermosensitive hydrogels were prepared by graft polymerization of chitosan and N-isopropylacrylamide *via* ^{60}Co γ-radiation. The effects of monomer concentration and total irradiation dose on percent grafting and grafting efficiency were studied. The thermosensitivity and swelling properties of the hydrogels were investigated.

Keywords: Chitosan, N-isopropylacrylamide, thermosensitive, graft, γ-radiation.

Poly-N-isopropylacrylamide (PNIPA) is attracting a great deal of attention because of its thermosensitivity. The volume phase transition is reversible, which lead to some speculated applications, such as temperature sensor, controlled drug-releasing devices, artificial muscle, and enzyme-activity control[1]. It was reported that chitosan (CS) is a nontoxic, biodegradable and biocompatible polysaccharide which had been widely used as an anticoagulant, a wound-healing accelerator, and drug delivery materials[2]. In this paper, hydrogels based on chitosan grafting with N-isopropylacrylamide were prepared by γ-radiation. The thermosensitivity and swelling properties of the hydrogels were investigated [3,4]. The grafting was carried out at room temperature and the total irradiation dose was changed from 3 KGy to 10 KGy.

Figure 1 gives the results of the variation in percent grafting and grafting efficiency with different monomer concentration at 10 KGy. It could be found there is an increase in percent grafting and grafting efficiency with the increase of monomer concentration.

The effect of total irradiation dose on percent grafting and grafting efficiency is presented in **Figure 2**. The graph exhibited an increase in percent grafting and grafting efficiency with the increase in dose of irradiation from 3 KGy to 10 KGy.

Figure 3 shows the effect of percent grafting on the swelling ratios of the different percent grafting hydrogels. It was found the swelling ratios increased with the increase of the percent grafting. A sample its percent grafting is 620% was prepared under the condition of CS/NIPA=1:9 and the total irradiation dose is 10 KGy. Its thermo-sensitivity was characterized by detecting the UV transparency. **Figure 4** presents a sharp decrease in the UV transparency between 25°C-34°C. The LCST of the sample is about 28°C.

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Figure 1 Effect of monomer concentration

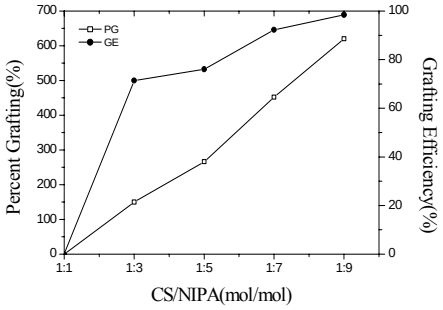


Figure 2 Effect of total irradiation dose

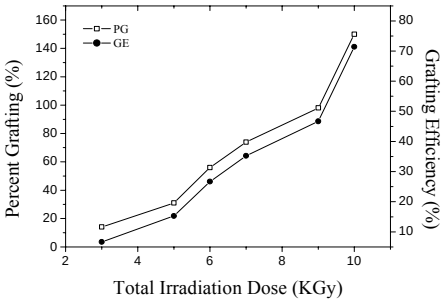


Figure 3 Swelling ratio at different percent grafting

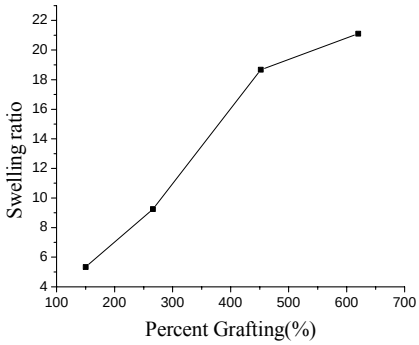
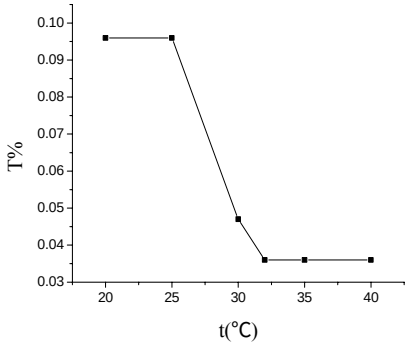


Figure 4 UV transparency at different temperature (λ =500nm)



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Received 17 September, 2003