Controlled release from polyDMAEMA gels prepared by Gamma radiation

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Abstract

In recent years, the research and development of intelligent drug delivery systems (DDS) have been very active, so synthesized all kinds of hydrogels and behavior studying were widely investigated[1~5]. The polyDMAEMA hydrogels synthesized by γ-irradiation technology showed a combined temperature and pH-sensitivity and electric responsive behaviors. The hydrogels were transparent and elastic and displayed good swelling behavior in water, so they can be used as a kind of carrying material in drug delivery systems.

In this work, using the polyDMAEMA hydrogels which were prepared by γ-rays from ^{60}Co source in controlling release was studied.

1. *The characteristic of polyDMAEMA hydrogels*

The polyDMAEMA hydrogels synthesized by γ-rays from ^{60}Co source at room temperature showed good mechanical property and high swelling capacity in water. The equilibrium degree of swelling was nearly 900. They also displayed a temperature and pH-sensitivity at a temperature range of 38~40°C and pH=2.5. To electric responsive behaviors, they can be observed at a field voltage of approximately 3.0, although it was not clear.

2. *Release studies*

For the release studies, Methylene Blue (MB) solution (~1g/l) was prepared first. Then the polyDMAEMA hydrogels were put in it. The release studies would begin after they got equilibrium swelling.

2.1 *MB release at different pH values*

MB release experiments were performed in deionized water with ph=1.24 and 10.56 at room temperature. The release rate of MB in pH=1.24 was faster than that in pH=10.56. The release rate of MB in pH=1.24 leveled off after about 13 h while in 10.56 it did after about 60 h.

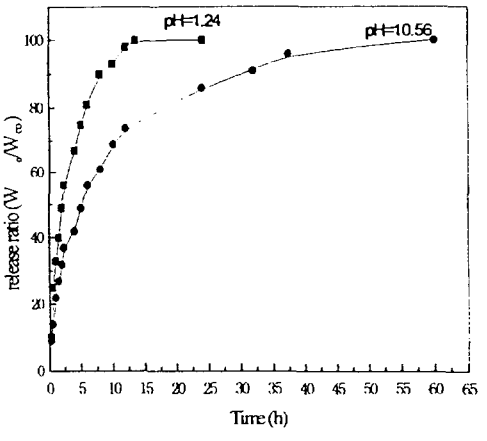

Fig.1. MB release at different pH

2.2 *MB release at different temperature*

Since the polyDMAEMA hydrogel showed a temperature sensitivity at a range of 38~40°C, the release experiments were conducted at 20°C and 52°C, respectively. It was found that the release rate at 52°C was faster than at 20°C, which attributed to quicker rate of the MB molecular movement at high temperature and the shrinking of the gel.

2.3 *MB release in electric field*

The release rate at a field voltage of 5.0 was much faster than that of no electric field. For example, it took the release rate 3h to reach equilibrium at a field voltage of 5.0, while 13h without the electric field. Fig. 2 showed the release result under the on-off switching of electric field in distilled water at alternative voltages o and 5.0.

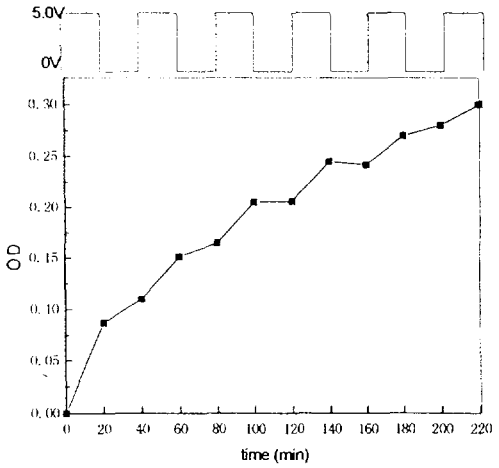

Fig.2 Pulsatile electric field as the function of MB release

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