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Response behavior of ion-sensitive hydrogel based on crown ether

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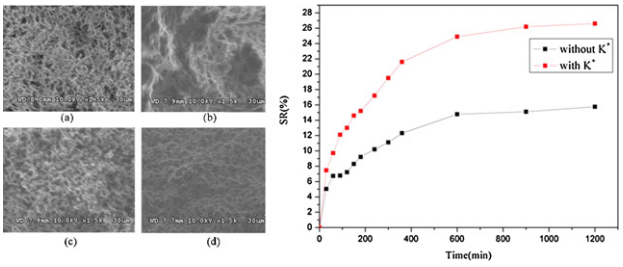
HIGHLIGHTS

- A new preparation route of ion-sensitive hydrogel based crown ether.
- Impacts of crown ether units on morphology of hydrogel were firstly demonstrated.
- Response behaviors of ion-sensitive hydrogel were optimized.
- A promising candidate material for environment inspection, sensors and drug delivery systems.

GRAPHICAL ABSTRACT

A type of ion-sensitive hydrogel based on crown ether is synthesized. Impacts of crown ether unit on temperature-sensitivity and ion-sensitivity of hydrogel are detailed investigated. Result shows that crown ether units would contribute good ion-recognition to the hydrogel network. The hydrogel would be a promising candidate material for environment inspection, sensors and drug delivery systems.



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ABSTRACT

A type of poly(*N*-isopropylacrylamide) (PNIPAM) hydrogel with specific ion-sensitivity originating from crown ether unit is synthesized. The impacts of crown ether unit on temperature-sensitivity and ion-sensitivity of hydrogel are investigated. The result showed that crown ether units in the hydrogel network contributed to the ion response though they would reduce temperature-sensitivity of the hydrogel compared with traditional PNIPAM. Furthermore, the thermo-sensitivity and ion-recognition behaviors of the hydrogel are detailedly demonstrated which showed its potential as a promising candidate material for environment inspection, sensors and drug delivery systems.

1. Introduction

For reversible volume change responding to environmental physical or chemical stimuli, such as temperature, pH, light, and electric, intelligent hydrogel have attracted great interests and considerable research in recent years [1–8]. Among these materials, poly(*N*-isopropylacrylamide) (PNIPAM) was widely studied and used in temperature-responsive polymers, which exhibits a reversible temperature-dependent phase transition in aqueous solution at a lower critical solution temperature (LCST). Recently, study of multiple response of hydrogel systems have confirmed that response nature of PNIPAM hydrogels can be modified by introduction of comonomers [9–13]. In this paper, we introduced Dibenzo-18-crown-6 comonomer into PNIPAM system, which exhibited both thermo-sensitive and ion-sensitive properties originated from selective complexation with ion of crown ether unit. Furthermore, dynamic character of the hydrogel was studied in detail. Experimental results showed that though introduction of crown ether units would reduce swelling ratio (SR) of the hydrogel compared with the unmodified PNIPAM system due to break of

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