Accepted Manuscript

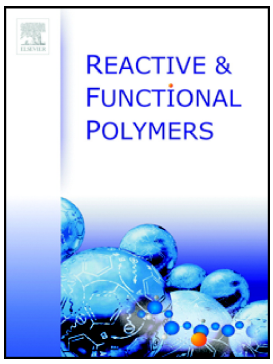

Photo-crosslinked mechanically strong PCL4-PDMAEM hydrogels

Deniz Ceylan Tuncaboylu

PII: S1381-5148(18)30227-X
DOI: doi:10.1016/j.reactfunctpolym.2018.03.001
Reference: REACT 4008

To appear in: *Reactive and Functional Polymers*

Received date: 15 November 2017
Revised date: 26 January 2018
Accepted date: 4 March 2018

Please cite this article as: Deniz Ceylan Tuncaboylu , Photo-crosslinked mechanically strong PCL4-PDMAEM hydrogels. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. React(2018), doi:10.1016/j.reactfunctpolym.2018.03.001

Photo-Crosslinked Mechanically Strong PCL_4-PDMAEM Hydrogels

Deniz Ceylan Tuncaboylu* dtuncaboylu@bezmialem.edu.tr

Bezmialem Vakif University, Department of Pharmaceutical Biotechnology, Faculty of Pharmacy, 34093 Istanbul, Turkey

*Corresponding author at: Adnan Menderes Bulvarı (Vatan Cad), Fatih, 34093 Istanbul, Turkey.

ABSTRACT

In this study, a series of thermo-responsive hydrogels based on *N'N*-dimethylaminoethyl methacrylate (DMAEM) and methacrylate functionalized poly(caprolactone) (PCL_4-IEMA) were prepared by bulk photo-polymerization method. Poly(caprolactone) (PCL) was modified with 2-isocyanatoethylmethacrylate (IEMA) to form a macro-crosslinker due to its excellent biocompatibility to generate high-strength smart hydrogels with pH and temperature responsivity. The synthesized macro-crosslinker and PCL_4-PDMAEM hydrogel were characterized by ^{1}H NMR, GPC and FT-IR analyses. Sol-gel transitions were examined by oscillatory measurements in Rheometer under UV light. Swelling kinetics as a function of time, swelling ratios at different pH values and temperatures were studied. pH responsive swelling behavior of PCL_4-PDMEAM hydrogels was demonstrated with a highest swelling value at pH=2. Temperature responsivity was also proved with a LCST around 40 ^oC between the shrunken and swollen state. Young modulus of the sample was also calculated around 0.3 MPa. The results indicated that using PCL_4-IEMA as a macro-crosslinker is an effective way to obtain mechanically strong - tough - hydrogels by means of dissipating the applied energy through flexible crosslink units. In addition, swelling and mechanical properties of the hydrogels could be tailored by varying the amount of the crosslinker.

Keywords: *N'N*-dimethylaminoethyl methacrylate (DMAEM); swelling; pH responsive; thermo-responsive; macro-crosslinker.

1. Introduction