Electronic Supplementary Material (ESI) for RSC Advances.
This journal is © The Royal Society of Chemistry 2014

Supporting information

Ionic liquid-doped and *p*-NIPAAm-based copolymer (*p*-NIBIm): extraordinary drug-entrapping and -releasing behaviors at 38-42 °C

*Jae-Won Seo, Ji-Young Hwang, Ueon Sang Shin**

Institute of Tissue Regeneration Engineering (ITREN), Dankook University, South Korea

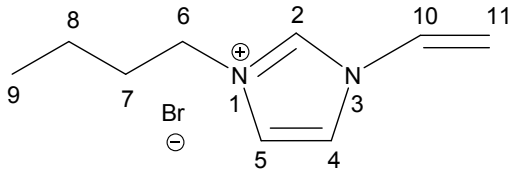
Department of Nanobiomedical Science & BK21 PlUS NBM Global Research Center for Regenerative Medicine, Dankook University, Cheonan, 330-714, Republic of Korea

*Corresponding author: E-mail: usshin12@dankook.ac.kr; tel) +82 41 550 3691; fax) +82 41 559 7911

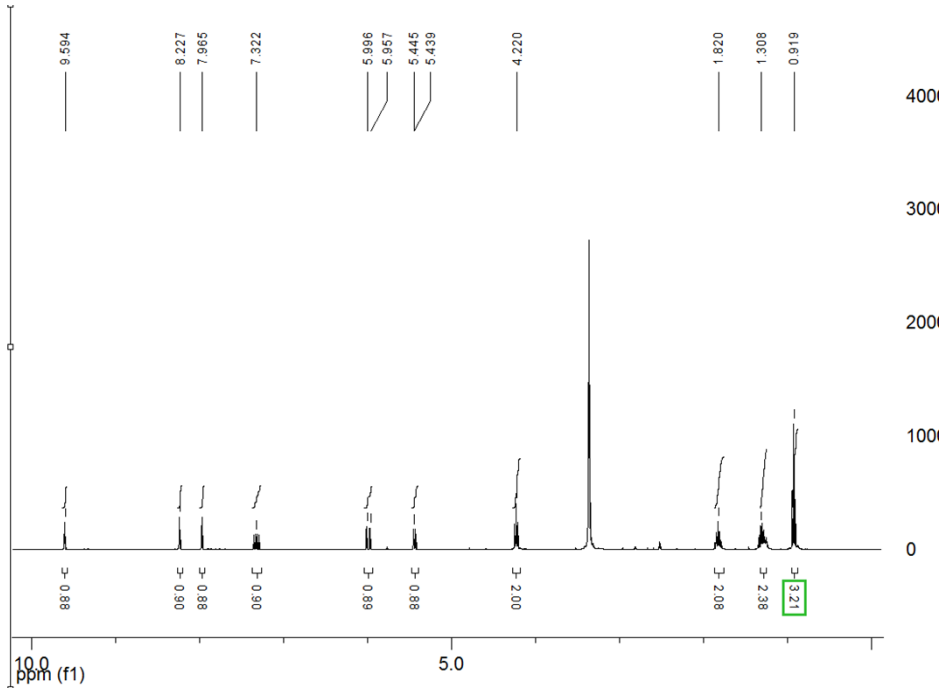
Experimental data

Fig. S1 ^{1}H-NMR spectra of [BVIm]Br, *p*-NIBIm, *p*-BVIm, and *p*-NIPAAm.

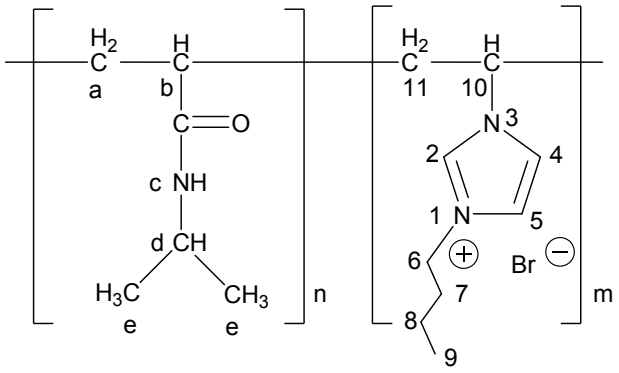
a) ^{1}H-NMR spectrum of [BVIm]Br showed characteristic peaks as follows:



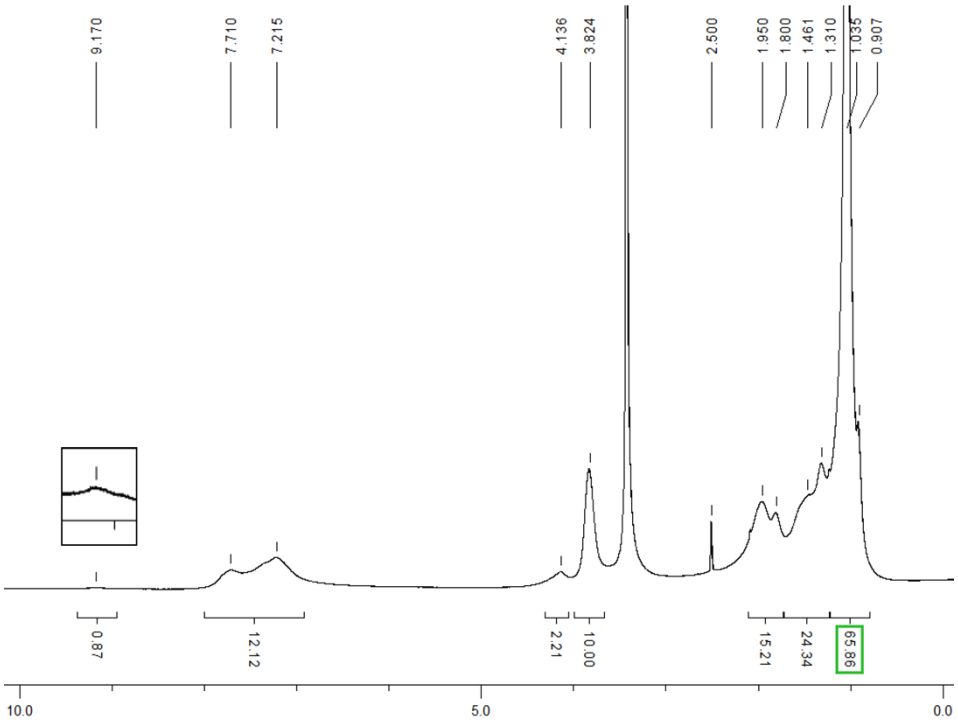
^{1}H-NMR (d_6-DMSO): (ppm) 0.91 (t, 3H-9), 1.30 (m, 2H-8), 1.82 (m, 2H-7), 4.22 (q, 2H-6), 5.43~5.44 (dd, 1H-11), 5.95~5.97 (dd, 1H-11), 7.32 (dd, 1H-10), 7.96 (s, 1H-4), 8.22 (s, 1H-5), 9.59 (s, 1H-2).



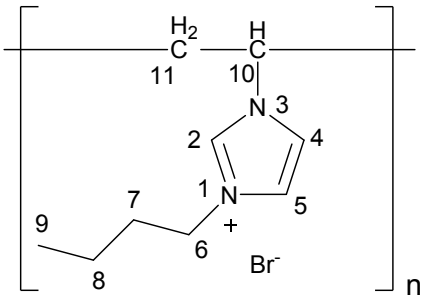
b) ^{1}H-NMR spectrum of the *p*-NIBIm copolymer also showed characteristic peaks as follows:



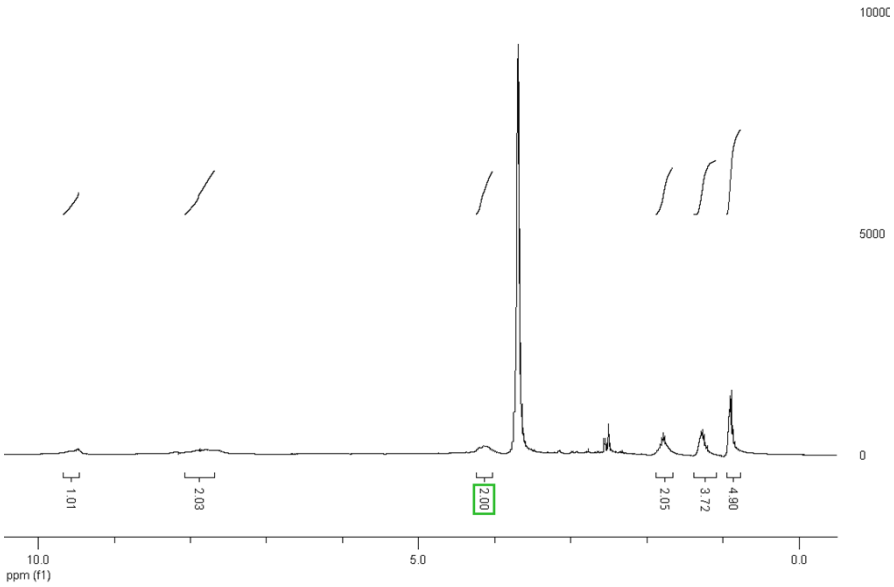
^{1}H-NMR (*d*6-DMSO): (ppm) 0.90 (bt, 3H-9), 0.97~1.17 (bd, 6H-e), 1.28~1.39 (bm + bd, 2H-8 + 2H-11), 1.40~1.71 (bd, 2H-a), 1.73~1.88 (bm + bt, 2H-7 + 1H-10), 1.89~2.45 (bt, 1H-b), 3.84 (bm, 1H-d), 4.15 (bt, 2H-6), 6.90~7.64 (bt, 1H-c or 1NH), 7.65~7.95 (bd + bd, 1H-4 + 1H-5), 9.80 (bs, 1H-2).



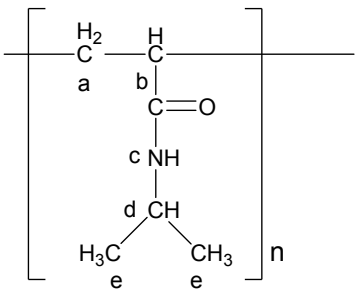
c) ^{1}H-NMR spectrum of the *p*-BVIm showed characteristic peaks as follows:



^{1}H-NMR (d_6-DMSO): (ppm) 0.89 (bt, 3H-9), 1.27 (bm + bd, 2H-8 + 2H-11), 1.79 (bm + bt, 2H-7 + 1H-10), 4.1-4.3 (bt, 2H-6), 7.60~8.25 (bd + bd, 1H-4 + 1H-5), 9.4~9.8 (bs, 1H-2).



d) ^{1}H-NMR spectrum of the *p*-NIPAAm polymer showed characteristic peaks as follows:



^{1}H-NMR (d_6-DMSO): (ppm) 1.05 (m, 6H-e), 1.20~1.71 (bd, 2H-a), 1.96 (bt, 1H-b), 3.85 (m, 1H-d), 6.95~7.65 (bt, 1H-c or NH).

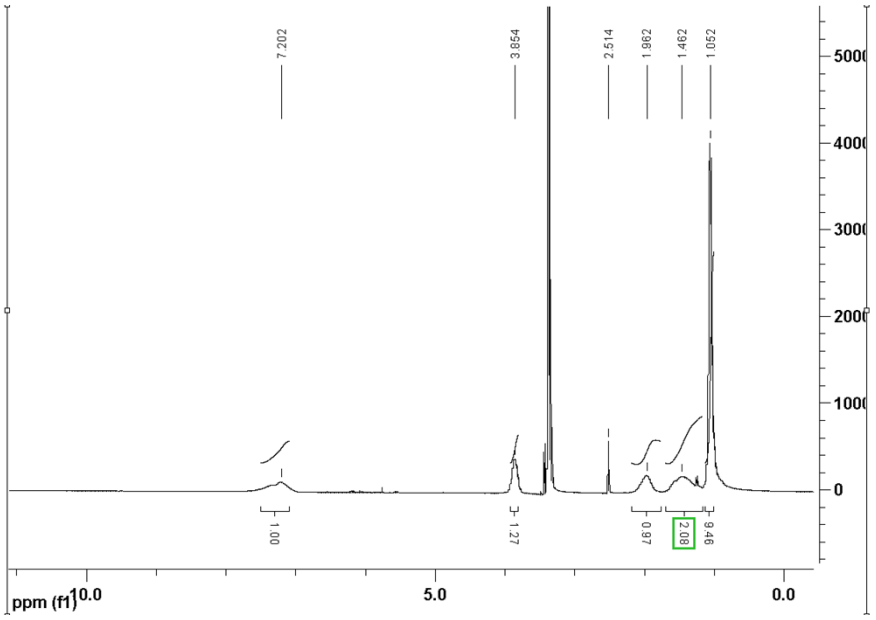
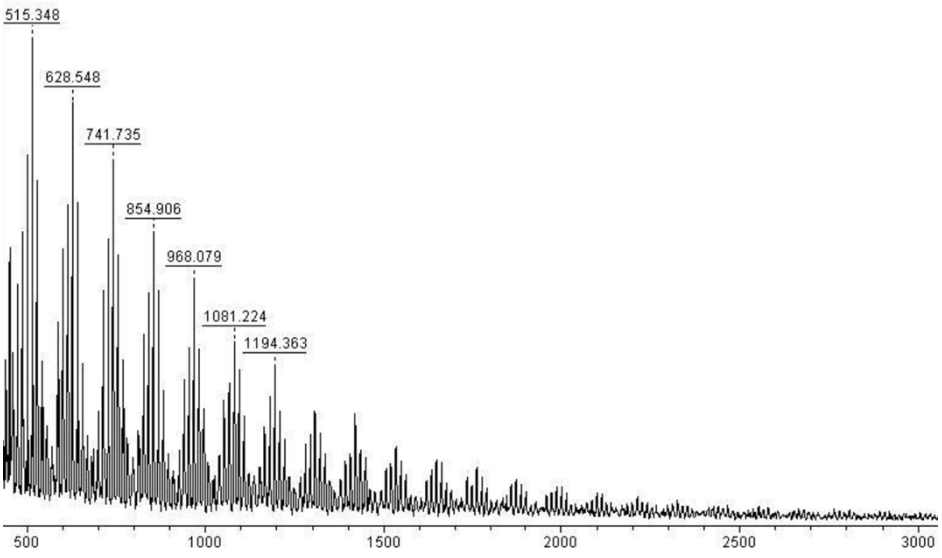


Fig. S2 MALDI-TOF spectra of *p*-NIBIm, *p*-BVIm, and *p*-NIPAAm.

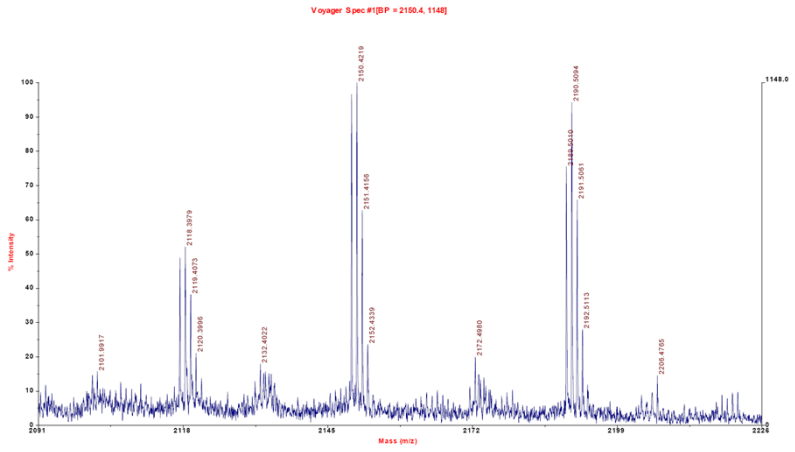
a) *p*-NIBIm

Mn = 1353; Mw = 2001; Mw/Mn = 1.47



b) *p*-BVIm

Mn = 2102; Mw = 2114; Mw/Mn = 1.0



c) *p*-NIPAAm

Mn = 1998; Mw = 2521; Mw/Mn = 1.26

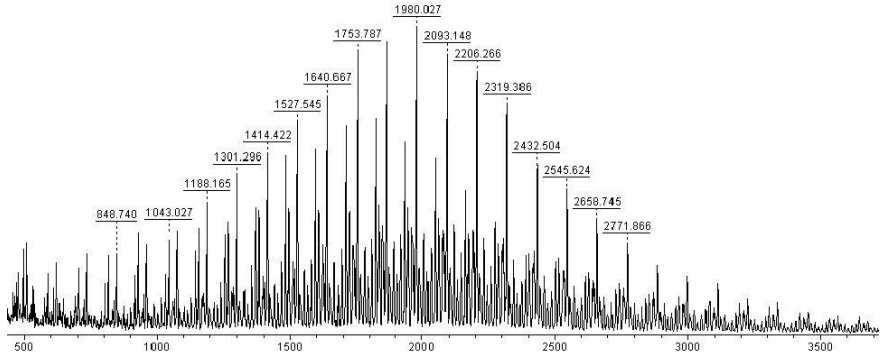


Fig. S3 FT-IR spectra of *p*-NIBIm, *p*-BVIm, and *p*-NIPAAm.

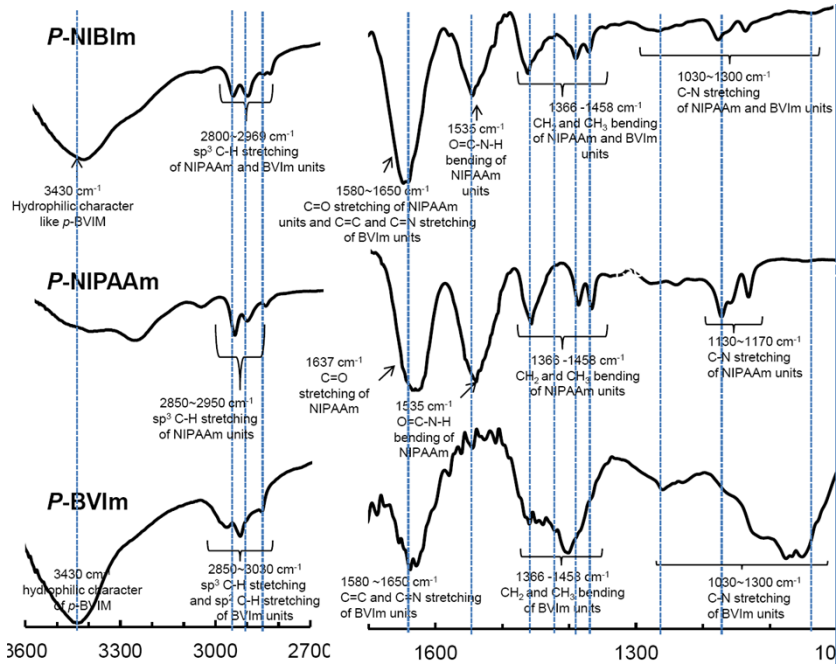


Fig. S4 LCST determination of IL-doped *p*-NIBIm using DSC scan; a) via several continuous heating and cooling cycles at pH=7 and b) in the acidic pH environments (pH=4-5).

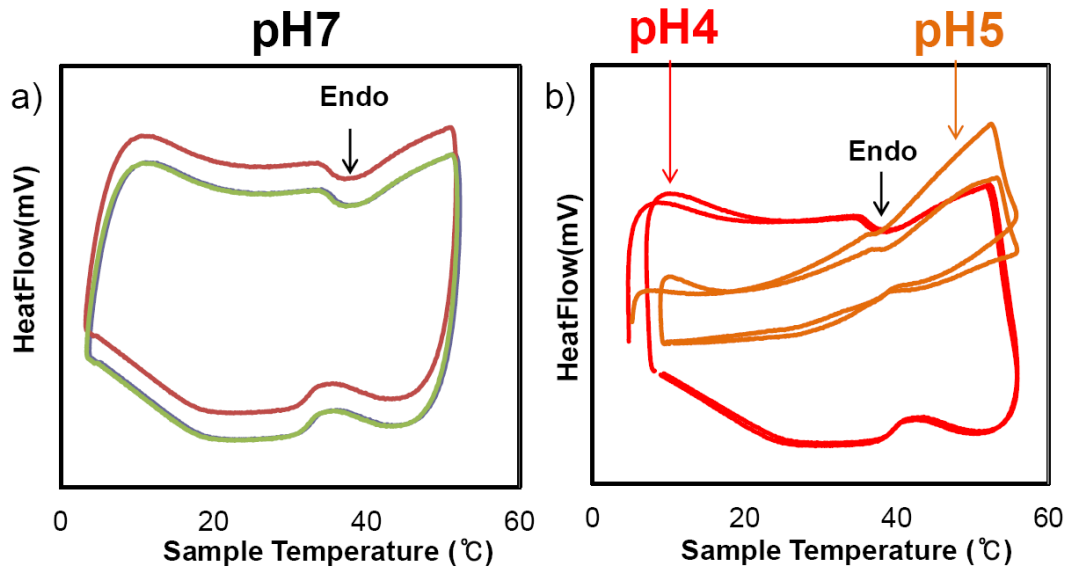
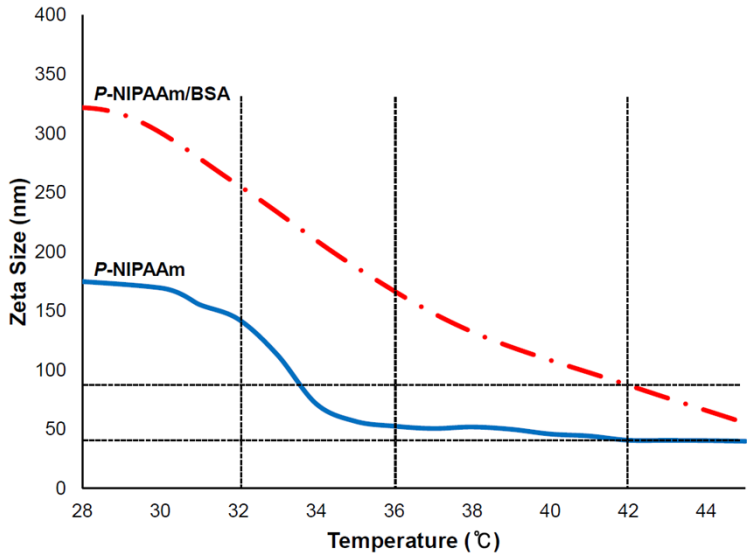


Fig. S5 Colloidal stability of the aqueous *p*-NIBIm solution (0.5 mg/mL) at 37 °C.

Fig. S6 Temperature-dependant size change of the *p*-NIPAAm polymer and the complex with BSA, *p*-NIPAAm/BSA.



Polymer	Micelle size in diameter (nm)				
	25 °C	30 °C	35 °C	40 °C	45 °C
p-NIPAAm	180.6±5.1	169.2±6.2	56.4± 12.7	45.7±4.7	40.8±7.1
p-NIPAAm/BSA	332.0± 9.8	299.8±6.4	187.3±12.3	91.0±13.2	87± 11.2

Fig. S7 The calibration curve, which is created by plotting the known BSA concentration on x axis and the absorbance of BSA/DC complexes at λ_{max}=750 nm on y axis.