# Chitosan-based interpolymeric pH-responsive hydrogels for in vitro drug release

Abdelaal, MY (Abdelaal, M. Y.);
Abdel-Razik, EA (Abdel-Razik, E. A.);
Abdel-Bary, EM (Abdel-Bary, E. M.);
El-Sherbiny, IM (El-Sherbiny, I. M.)

## Abstract

Two series of pH-responsive biodegradable interpolymeric (IPN) hydrogels based on chitosan (Ch) and poly(vinyl alcohol) (PVA) were prepared for controlled drug release investigations. The first series was chemically crosslinked with different concentrations of glutaraldehyde and the second was crosslinked upon gamma-irradiation by different doses. The equilibrium swelling characteristics were investigated for the gels at 37 degrees C in buffer solutions of pH 2.1 and 7.4 as simulated gastric and intestinal fluids, respectively. 5-Fluorouracil (FU) was entrapped in the hydrogels, as a model therapeutic agent, and the in vitro release profiles of the drug were established at 37 degrees C in pH 2.1 and 7.4. FTIR, SEM, and X-ray diffraction analyses were used to characterize and investigate the structural changes of the gels with the variation of the blend composition and crosslinker content before and after the drug loading. (c) 2006 Wiley Periodicals, Inc.

Source: JOURNAL OF APPLIED POLYMER SCIENCE Volume: 103 Issue: 5 Pages: 2864-2874 DOI: 10.1002/app.25154 Published: MAR 5 2007
Author Keywords: hydrogel; drug delivery systems; gelation; interpenetrating network; irradiation
KeyWords Plus: GAMMA-RAY IRRADIATION; AQUEOUS-SOLUTION; CROSS-LINKING; SWELLING BEHAVIOR; POLYMERS; ALCOHOL); RADIATION
Reprint Address: Abdelaal, MY (reprint author), Mansoura Univ, Fac Sci, Dept Chem, Mansoura 35516, Egypt.
Addresses:
[ 1 ] Mansoura Univ, Fac Sci, Dept Chem, Mansoura 35516, Egypt
E-mail Address: magdyabdelaal@yahoo.com

| | |
|---|---|
| Abdelaal, Magdy | H-6032-2012 [ View profile at ResearcherID.com ] |

Publisher: JOHN WILEY & SONS INC, 111 RIVER ST, HOBOKEN, NJ 07030 USA
Web of Science Categories: Polymer Science
Research Areas: Polymer Science

## *References:*

*1-Kossmehl, G. A.; Abdel-Bary, E. M.; Sarhan, A. A.; Abdelaa1, M. Y. Angew Makromol Chem 215, 1994, 59–77.*

Direct Link:

2-*Abdelaal, M. Y. J Polym Sci Pt A: Polym Chem 40, 2002, 3909–3915.*

*3- Abdelaal, M. Y.; Abbas, Y. A. Monatsh Chem 127, 1996, 1131–1136.*

4 -*Abbas, Y. A.; Abdelaal, M. Y. Polymer Bull 36, 1996, 273–278.*

5 -*Kurita, K.In Chitin in Nature and Technology; Muzzarelli, R.A.A.; Jeuniaux, C.; Gooday, G.W., Eds.; Plenum Press: New York, 1986, p 287–293.*

6 -*Hirano, S.; Seino, H; Akiyama, Y.; Nonaka, I.In Progress in Biomedical Polymers; Gebelin, C. G.& Dunn, R. L., Eds.; Plenum Press: New York, 1990; p 283–290.*

*7-Muzzarelli, R.; Baldassarre, V.; Conti, F.; Ferrara, P.; Biagini, G.; Gazzanelli, G.; Vasi, V. Biomaterials 9, 1988, 247–252.*

*8-Wang, P. F.; Wu, S. H. K.; Shi, X. Y.; Deng, B. M.; Sun, C. J Mater Sci 33, 1998, 1753–1757.*

*9-Xie, W. M.; Xu, P. X.; Wang, W.; Liu, Q. Carbohyd Polym 50, 2002, 35–40.*

*10-Sannan, T.; Kurita, K.; Iwakura, Y. Macromol Chem 177, 1976, 3589–3600.*

*11-Martien, F. L.In Encyclopedia of Polymer Science and Engineering, Vol. 17, Wiley: New York, 1986; p 167.*

12-*Roberts, G. A. F.; Taylor, K. E. Makromol Chem 1905, 1989, 951–960.*

*13-Wang, Q.; Du, Y.; Fan, L. J Appl Polym Sci 96, 2005, 808–813.*

*14-Bhattacharya, A. Prog Polym Sci, 25, 2000, 371–401.*

*15-Jabbari, E.; Nozari, S. Eur Polym J 36, 2000, 2685–2692.*

*16- Rosiak, J. M.; Ulanski, P. Radiat Phys Chem 55, 1999, 139–151.*

17-*Park, S. E.; Nho, Y. C.; Lim, Y. M.; Kim, H. I. J Appl Polym Sci 91, 2004, 636–643.*

18-*Zainuddin, Z.; Hill, D. J. T.; Le, T. T. Radiat Phys Chem 62, 2001, 283–29*

19-*Roberts, G. A. F. Solubility and solution behaviour of chitin and chitosan, In: Roberts, G.A.F. (Ed.), Chitin Chemistry, MacMillan, Houndmills, 1992, pp. 274–329.*

20 -*Abdelaal, M. Y.; Elmorsy, S. S. Angew Makromolek Chemie 233, 15–21. 1995,*

*21-Roberts, G. A. F.; Domszy, J. G. Int J Biol Macromol 4, 1982, 374–377.*

22-*El-Sherbiny, I. M.; Lins, R. J.; Abdel-Bary, E. M.; Harding, D. R. K. Eur*

*Polym J 41, 2005, 2584–2591.*

*23-Kasaai, M. R.; Arul, J.; Charlet, G. J Polym Sci, B: Polym Phys 38, 2000,591–2598.*

24-*Lapasin, R.; Princl, S.In: Rheology of industrial polysacharides: Theory and application, Blackie Academic & Professional: New York, 1995.*

*25-Wang, T.; Turhan, M.; Gunasekaran, S. Polym Int 53, 2004, 911–918.*

26-*Abd-Alla, S. G.; Said, H. M.; El-Naggar, A. M. J Appl Polym Sci 94, 2004, 167–176.*

27-*Huglin, M. B.; Zakaria, M. B. J Appl Polym Sci 31, 1986, 457–475.*

28-*Wang, B.; Kodama, M.; Mukataka, S.; Kokufuta, E. Polym Gels and Networks 6, 1998, 71–81.*

29 -*Kim, S. J.; Park, S. J.; Kim, S. I. React Funct Polym 55, 2003, 53–59.*

30-*Gupta, K. C.; Kumar, M. N. V. R. J Appl Polym Sci 76, 2000, 672–683.*