

REFERENCES

- Aiba, S. (1994) Preparation of N-acetylchitooligosaccharides from lysozymic hydrolysates of partially N-acetylate chitosans. *Carbohydrate Research*, 261, 297–306.
- Allan, G.G., Peyron, M. (1995a) Molecular weight manipulation of chitosan I: kinetics of depolymerization by nitrous acid. *Carbohydrate Research*, 277, 257–272.
- Allan, G.G., Peyron, M. (1995b) Molecular weight manipulation of chitosan II: kinetics of depolymerization by nitrous acid. *Carbohydrate Research*, 277, 273–282.
- Andrade, A.L., Torikai, A., Kobatake, T. (1996) Spectral sensitivity of chitosan photodegradation. *Journal of Applied Polymer Science*, 62, 1465–1471.
- Aydin, Z., Akbu, J. (1996) Chitosan beads for the delivery of salmon calcitonin: Preparation and release characteristics. *International Journal of Pharmaceutics*, 131, 101–103.
- Berthold, A., Cremer, K., Kreuter, J. (1996) Preparation and characterization of chitosan microspheres as drug carrier for prednisolone sodium phosphate as model for anti-inflammatory drugs. *Journal of Controlled Release*, 39, 17–25.
- Bodnar, M., Hatmann, J.F., Bobely, J. (2005) Preparation and Characterization of Chitosan-Based Nanoparticles. *Biomacromolecules*, 6, 2521–2527.
- Chan, P., Kurisawa, M., Chung, J.E., Yang, Y. (2007) Synthesis and characterization of chitosan-g-poly(ethylene glycol)-folate as a non-viral carrier for tumor-targeted gene delivery. *Biomaterials*, 28, 40–549.
- Chatelet, C., Damour, O., Domard, A. (2001) Influence of the degree of acetylation on some biological properties of chitosan film. *Biomaterials*, 22, 261–268.
- Chawla, J. S., Amiji, M.M. (2002) Biodegradable poly(ϵ -caprolactone) nanoparticles for tumor-targeted delivery of tamoxifen. *International Journal of Pharmaceutics*, 249, 127–138.

- Chen, M., Serizawa, T., Kishida, A., Akashi, M. (1999) Graft Copolymers Having Hydrophobic Backbone and Hydrophilic Branches. XXIII. Particle Size Control of Poly(ethylene glycol)-Coated Polystyrene Nanoparticles Prepared by Macromonomer Method. *Journal of Polymer Science: Part A: Polymer Chemistry*, 37, 2155–2166.
- Chenite, A., Chaput, C., Wang, D., Combes, C., Buschmann, M.D., Hoemann, C.D. (2000) Novel injectable neutral solutions of chitosan form biodegradable gels *in situ*. *Biomaterials*, 21, 2155–2161.
- Csaba, N., Caamaño, P., Saánchez, A., Domínguez, F., Alonso, M. PLGA: poloxamer and PLGA: poloxamine blend nanoparticles: new carriers for gene delivery. *Biomacromolecules*, 6, 271–278.
- Desai, K., Park, H. (2005) Encapsulation of vitamine C in tripolyphosphate cross-linked chitosan microspheres by spray drying. *Journal of Microencapsulation*, 22, 179–192.
- Dumitriu, S., Popa, M.I., Cringu, A., Stratone, A. (1989) Bioactive polymer 61. Synthesis and characterization of some retard antibiotics. *Colloid and Polymer Science*, 267, 595–599.
- Fangkangwanwong, J., Akashi, M., Kida, T., Chirachanchai, S. (2006) Chitosan-hydroxybenzotriazole aqueous solution: A novel water-based system for chitosan functionalization. *Macromolecule Rapid Communication*, 27 1039–1036.
- Gan, Q., Wang, T. (2007) Chitosan nanoparticles as protein delivery carrier- Systematic examination of fabrications for efficient loading and release. *Colloids and surfaces B: Biointerfaces*, 59, 24–34.
- Gu, M., Yuan, X., Kang, C., Zhao, Y., Tian, N., Pu, P., Sheng, J. (2007) Surface biofunctionalization of PLA nanoparticles through amphiphilic polysaccharide coating and ligand coupling: Evaluation of biofunctionalization and drug releasing behavior. *Carbohydrate Polymers*, 67, 417–426.
- Horton, D., Lineback, D.R. (1965) N-Deacetylation (book chapter). *Methods in Carbohydrate Chemistry*, 5, 403–406.
- Hirano, S., Kondo, S., Ohe, Y. (1975) Chitosan gel: a novel polysaccharide gel. *Polymer*, 16, 622.

- Hirano, S., Nagamura, K., Zhang, M., Kim, S.K., Chung, B.G., Yoshikawa, M., Midorikawa, T. (1999) Chitosan staple fibers and their chemical modification with some aldehydes. *Carbohydrate Polymers*, 38, 293–298.
- Huang, M., Fang, Y. (2006) Facile preparation of biodegradable chitosan derivative having poly(butylene glycol adipate) side chains. *Biopolymers*, 82, 597–602.
- Kendra, D.F., Hadwiger, L.A. (1984) Charaterization of the smallest chitosan oligomer that is maximally antifungal to Fusarium soloni and elicit pisatin formation in Pisum sativum. *Experimental Mycology*, 8, 276–281.
- Kulkarni, A.R., Lin, Y., Liang, H., Chang, W., Hsiao, W.W., Sung, H. (2006) A novel method for the preparation of nanoaggregates of methoxy polyethyleneglycol linked chitosan. *Journal of Nanoscience and Nanotechnology*, 6, 2867–2873.
- Kurita, K., Kayama, Y., Chikaoka, S. (1988b) Studies on chitin X VI. Influence of controlled side chain introduction to chitosan on the adsorption of copper (II) iron. *Polymer Journal*, 20(12), 1083–1089.
- Lin, C., Chiu, W., Lee, C. (2005) Thermal/pH-sensitive core-shell copolymer latex and its potential for targeting drug carrier application. *Polymer*, 46, 10092–10101.
- Matsusaki, M., Himatari, K., Higashi, M., Kaneko, T., Akashi, M. (2004) Stably-dispersed and surface-functional bionanoparticles prepared by self-assembling amphipathic polymers of hydrophilic poly(γ -glutamic acid) bearing hydrophobic amino acid. *Chemical Letters*, 33, 398–399.
- Mitra, S., Gaur, U., Ghosh, P.C., Maitra, A.N. (2001) Tumour targeted delivery of encapsulated dextran-doxorubicin conjugate using chitosan nanoparticles as carrier. *Journal of Controlled Release*, 74, 317–323.
- Na, K., Lee, T.B., Park, K., Shin, E., Lee, Y., Choi, H. (2003) Self-assembled nanoparticles of hydrophobically-modified polysaccharide bearing vitamin H as a targeted anti-cancer drug delivery system. *European Journal of Pharmaceutical Sciences*, 18, 165–173.
- Nishi, N., Maekita, Y., Nishimura, S.I., Hasegawa, O., Tokura, S. (1987) Highly phosphorylated derivatives of chitin, partially dacetylated chitin and

- chitosan as new functional polymers: metal biding property of the insolubilized materials. *International Journal of Biological Macromolecules*, 9, 109–114.
- Nishimura, S.I., Kongo, O., Kurita, K., Kuzuhara, H. (1991) Chemospecific Manipulation of a rigid polysaccharide: Synthesis of novel chitosan derivatives with excellent solubility in common organic solvents by regioselective chemical modifications. *Macromolecules*, 24, 4745–4748.
- Ohya, Y., Shiratani, M., Kobayashi, H., Ouchi, T. (1994) Release behavior of 5-fluorouracil from chitosan-gel nanospheres immobilizing 5-fluorouracil coated with polysaccharides and their cell specific cytotoxicity. *Pure and Applied Chemistry*, A31, 629–642.
- Pellegrino, J.J., Geer, S., Maegley, K., Rivera, R., Steward, D., Ko, M. (1990) Chitin-chitosan membranes: Separation of amino acids and polypeptides. *Annals of the New York Academy of Sciences*, 589(1), 229–244.
- Riley, T., Heald, C.R., Stolnik, S., Garnett, M.C., Illum, L., Davis, S.S., King, S.M., Heenan, R.K., Purkiss, S.C., Barlow, R.J., Gellert, P.R., Washington, C. (2003) Core-shell structure of PLA-PEG nanoparticles used for drug delivery. *Langmuir*, 2003, 8428–8435.
- Rodrigues, J., Santo-Magalhaes, N.S., Coehlo, L.C.B.B., Couvreur, P., Ponchel, G., Gref, R. (2003) Novel core (polyester)-shell (polysaccharide) nanoparticles: protein loading and surface modification with lectins. *Journal of Controlled Release*, 92, 103–112.
- Roy, S.K., Todd, J.G., Glasser, W.G. (1998) US Patent 5,770,712.
- Sakaguchi, T., Horikoshi, T., Nakajima, A. (1981) Adsorption of uranium by chitin phosphate and chitosan phosphate. *Agricultural and biological chemistry*, 45, 2191–2195.
- Sannan, T., Kurita, K., Iwakura, Y. (1976) Studies on chitin, 2. Effect of deacetylation on solubility. *Die Makromolekulare Chemie*, 177, 403–406.
- Shimizu, Y., Kono, K., Kim, I.S., Takagishi, T. (1995) Effects of added metal ions on the interaction of chitin and partially deacetylated chitin with an azo dye carrying hydroxyl groups. *Journal of Applied Polymer Science*, 55, 255–261.

- Suzuki, S., Watanabe, T., Mikami, T., Suzuki, M. (1986) Chitin in Nature and Technology. Plenum Press, New York and London.
- Vårum, K., Myhr, M., Hjerde, R., Smidsød, O. (1997) In vitro degradation rates of partially N-acetylated chitosans in human serum. Carbohydrate Research, 299, 99–101.
- Wei, Y.C., Hudson, S.M., Mayer, J.M., Kaplan, D.L. (1992) The crosslinking of chitosan fibers. Journal of Polymer Science Part A: Polymer Chemistry, 30, 2187–2193.
- Welsh, E.R., Price, R.R. (2003) Chitosan cross-linking with a water soluble blocked diisocyanate 2. solvates and hydrogels. Biomacromolecules, 4, 1357–1361.
- Wu, Y., Zheng, Y., Yand, W., Wang, C., Hu, J., Fu, S. (2005) Synthesis and characterization of a novel amphiphilic chitosan-polylactide graft copolymer. Carbohydrate Polymer, 59, 165–171.
- Yokoyama, M., Satoh, A., Sakurai, Y., Okano, T., Matsumura, Y., Kakizoe, T., Kataoka, K. (1998) Incorporation of water-insoluble anticancer drug into polymeric micelles and control of their particle size. Journal of controlled release, 55, 219–229.
- Yuan, X., Li, H., Yuan, Y. (2006) Preparation of cholesterol-modified chitosan self-aggregated nanoparticles for delivery of drugs to ocular surface. Carbohydrate Polymers, 65, 337–345.

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Publications:

1. Opanasopit, P., Ngawhirunpat, T., Chaidedgumjorn, A., Rojanarata, T., Apirakaramwong, A., Phongying, S., Choochottiros, C., Chirachanchai, S. (2006) Incorporation of camptothecin into N-phthaloyl chitosan-g-mPEG self-assembly micellar system. European Journal of Pharmaceutics and Biopharmaceutics, 64, 269–276.
2. Opanasopit, P., Ngawhirunpat, T., Rojanarata, T., Choochottiros, C., Chirachanchai, S. (2006) N-phthaloyl Chitosan-g-mPEG Design for all-trans Retinoic Acid-loaded Polymeric Micelles. European Journal of Pharmaceutical Sciences, 64, 269–276.



3. Opanasopit, P., Ngawhirunpat, T., Rojanarata, T., Choochottiros, C., Chirachanchai, S. (2007) Camptothecin-incorporating *N*-phthaloylchitosan-g-mPEG self-assembly micellar system: Effect of degree of deacetylation. *Colloids and Surfaces B*, 60, 117–124.
4. Choochottiros, C., Yoksan, R., Chirachanchai, S. Amphiphilic Chitosan Nanospheres: Factors to Control Nanosphere Formation and Its Consequent pH Responsive Performance. *Polymer accepted*.
5. Choochottiros, C., Yoksan, R., Matsusaki, M., Akashi, M., Chirachanchai, S., Amphiphilic pH Responsive Chitosan Nanospheres. *Submitted to Bioorganic & Medical Chemistry letters*.
6. Choochottiros, C., Yoksan, R., Matsusaki, M., Akashi, M., Chirachanchai, S. An Approach of Chitosan Nanospheres to Protein Carrier *to be submitted in Journal of Biomedical and Biotechnology*.

Proceedings:

1. Choochottiros, C., Yoksan, R., and Chirachanchai, S. (2006, October 5–6) Development of Nanosphere Chitosan for Lidocaine Model Drug Incorporation. Proceeding of the 4th National Chitin-Chitosan Conference, Bangkok, Thailand.
2. Choochottiros, C., Yoksan, R., Matsusaki M., Akashi, M., and Chirachanchai, S. (2008, July 24–25) Sizes and Charges of Controllable Chitosan Nanospheres via Double Layer Structure. Proceeding of the 5th National Chitin-Chitosan Conference, Bangkok, Thailand.

Presentations:

1. Choochottiros, C., Yoksan, R., and Chirachanchai, S., (2004, October 19–21) Chitin Whiskers-Chitosan Nanocomposite Fiber. Oral presented at the 30th Congress on Science and Technology of Thailand, Bangkok, Thailand.
2. Choochottiros, C., Yoksan, R., and Chirachanchai, S., (2005, February 2–4) Development of Nanochitin-chitosan for Drug Delivery System. Poster presented at NRCT: Innovation Day, Bangkok, Thailand.

3. Choochottiros, C., Yoksan, R., and Chirachanchai, S. (2005, April 20–21) Development of Nanochitin-chitosan for Drug Delivery System. Poster presented at NRCT: the 2nd From Shelf to Market, Bangkok, Thailand.
4. Choochottiros, C., Yoksan, R., and Chirachanchai, S. (2005, September 11–15) Chitosan and Chitin Whiskers Nanocomposite Fiber. Oral presented at the 19th European Conference on Biomaterials, Sorrento, Italy.
5. Choochottiros, C., Pongying, S., Fangkangwanwon, J., and Chirachanchai, S. (2006, September 9–13) Chitosan Nanosphere, Cotton-like Chitosan, and Superabsorbent chitosan gel. Poster presented at Thailand Research Expo 2006, Bangkok, Thailand.
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7. Choochottiros, C., Yoksan, R., and Chirachanchai, S. (2006, October 5–6) Development of Nanosphere Chitosan for Lidocaine Model Drug Incorporation. Oral presentation at the 4th National Chitin-Chitosan Conference, Bangkok, Thailand.
8. Chirachanchai, S., Choochottiros, C., Fungkangwanwong J., Phongying S., Ponyomma, T. (2007, March 25–26) Development of Nanostructured Chitosan. Oral presentation at the 1st PKU-CU NanoBilateral Seminar.
9. Chirachanchai, S., Choochottiros, C., Fungkangwanwong J., Phongying S., Yoksan R., Aiba S., Akashi M. (2007 ,May 28–31) Materialization of Chitosan at Nano Level: Another Approach to Develop Novel Functional Chitosans. Oral presentation at the 56th SPSJ Annual Meeting, Kyoto, Japan.
10. Choochottiros, C., Yoksan, R., Matsusaki M., Akashi, M., and Chirachanchai, S. (2008, July 24–25) Sizes and Charges of Controllable Chitosan Nanospheres via Double Layer Structure. Oral presentation at the 5th National Chitin-Chitosan Conference, Bangkok, Thailand.