

**FROM CHITOSAN FLAKES TO CHITOSAN NANOSPHERES:
INVESTIGATION OF NANOSPHERE STRUCTURE AND FACTOR
RELATED TO NANOSPHERE FORMATION AND MODEL DRUG
INCORPORATION**



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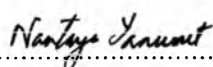
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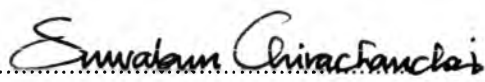
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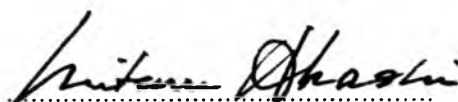
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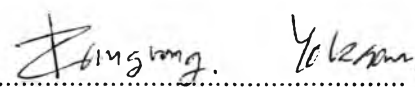

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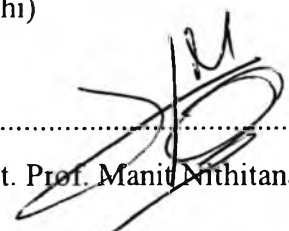
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ABSTRACT

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Chantiga Choochottiros: From Chitosan Flakes to Chitosan Nanospheres: Investigation of Nanosphere Structure and Factor Related to Nanosphere Formation and Model Drug Incorporation

Thesis Advisors: Assoc. Prof. Suwabun Chirachanchai, and Dr. Rangrong Yoksan, 86 pp

Keywords: Chitosan/ Nanospheres/ Drug delivery/ pH-responsive/ Surface charge/ Proteins

Development of chitosan as nanomaterial is proposed by modification of functional group on chitosan chain. Grafting phthalic anhydride and α -carboxylpropyl- ω -methoxy polyethylene glycol (mPEG-COOH) on chitosan exhibits spherical form via self-assembly process in aqueous system. The molecular weight of mPEG plays an important role to control the particle size. As compared to mPEG 2000, which gives a bimodal nanosphere (~200, and ~300 nm), mPEG 5000 initiates a monodispersed nanosphere with the smaller size (150 nm). In aqueous solution, the nanosphere surface is negatively charged resulting in a well dispersion in neutral to high pH but a significant precipitation in low pH. The studies on model drug (lidocaine, camptothecin, and proteins) incorporation with chitosan nanospheres exhibit efficiency of nanosphere as drug and/or vaccine carrier.

บทคัดย่อ

จันทิกา ชูโชติรส : จากแผ่นไคโตซาน เป็นไคโตซานนาโนสเฟียร์: การตรวจสอบโครงสร้างของไคโตซานนาโนสเฟียร์และปัจจัยที่เกี่ยวข้องกับการก่อรูปเป็นนาโนสเฟียร์ และการอยู่ร่วมกันกับโมเลกุลยาต้นแบบ (From Chitosan Flakes to Chitosan Nanospheres: Investigation of Nanosphere Structure and Factor Related to Nanosphere Formation and Model Drug Incorporation) อ. ที่ปรึกษา : รองศาสตราจารย์ ดร. สุวบุญ จิระชาญชัย และ ดร. รังรอง ยกसान, 86 หน้า

การพัฒนาไคโตซานเพื่อเป็นวัสดุที่มีขนาดระดับนาโนเมตรถูกเสนอโดยการปรับหมู่ฟังก์ชันบนสายโซ่ไคโตซาน การติดหมู่พทาสิกแอนไฮไดด์ และ α -คาร์บอกซิลโพรพิล- ω -เมทอกซี พอลิเอทิลีน ไกลคอล (mPEG-COOH) บนไคโตซาน จะก่อรูปเป็นสเฟียร์โดยผ่านกระบวนการรวมตัวกันเองในระบบที่มีน้ำเป็นองค์ประกอบ น้ำหนักโมเลกุลของ mPEG เป็นปัจจัยสำคัญที่มีผลต่อการควบคุมขนาดของอนุภาคนาโนสเฟียร์ เมื่อเปรียบเทียบอนุภาคที่ได้จากการติดหมู่ mPEG 2000 อนุภาคนาโนสเฟียร์ที่ได้จะมีลักษณะการกระจายตัวของขนาดอนุภาคแบบคู่ (~200 และ ~300 นาโนเมตร) กรณี mPEG 5000 จะได้อนุภาคนาโนสเฟียร์ที่มีการกระจายอนุภาคแบบเดี่ยว และมีขนาดอนุภาคที่เล็กกว่า (150 นาโนเมตร) เมื่อไคโตซานนาโนสเฟียร์กระจายตัวในน้ำ ค่าประจุที่ผิวของอนุภาคจะแสดงค่าเป็นลบ ซึ่งส่งผลต่อการกระจายตัวในอนุภาคที่สภาวะพีเอชต่างๆ ได้แก่ การเกิดการกระจายตัวในสภาวะที่เป็นกลางถึงเบส แต่จะเกิดการตกตะกอนในสภาวะที่เป็นกรด การศึกษาการเก็บกักหรือการตรึงโมเลกุลยาต้นแบบ (ลิโดเคน แคมโทเทซิน และ โพรตีน) แสดงถึงประสิทธิภาพในการนำไคโตซานนาโนสเฟียร์ไปใช้เป็นตัวนำส่งยาหรือโปรตีน

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