

Thesis Title	Development of Silver Nanoparticles-Loaded Alginate Beads Embedded in Gelatin Scaffolds for Wound Dressing Applications
Author	Porntipa Pankongadisak
Degree	Master of Science (Materials Science)
Advisor	Dr. Orawan Suwantong
Co-Advisor	Dr. Uracha Rungsardthong Ruktanonchai

ABSTRACT

Wound infection is a main problem for wound healing process that caused from bacterial infection. From this problem, wound dressing is developed by incorporating an antibacterial agent which has an activity to kill bacteria. Silver nanoparticles (AgNPs) are mostly used as antibacterial agents that have strong antibacterial activity for using in small amount. In this research, the AgNPs-loaded alginate beads embedded in gelatin scaffolds were fabricated for use as wound dressings. The AgNPs-loaded calcium alginate beads were obtained by either electrospraying or emulsification/external gelation method. The silver (Ag^+) ions in alginate solution reduced to AgNPs were prepared by UV irradiation technique. The size and shape of beads were observed using optical microscope (OM) and scanning electron microscope (SEM). Gelatin scaffolds were fabricated from 5% w/v of gelatin solution and crosslinked with genipin. The AgNPs-loaded calcium alginate beads embedded in gelatin scaffolds were fabricated by freeze-drying method. The morphology, mechanical properties and thermal properties of these scaffolds were characterized by SEM, universal testing machine (UTM) and thermogravimetric

analysis (TGA), respectively. Moreover, these scaffolds were investigated for their water swelling and weight loss behaviors in the phosphate buffer solution (PBS) at 37 °C for 1, 3, 5 and 7 days. The release characteristics of Ag⁺ ions from both the AgNPs-loaded calcium alginate beads and the AgNPs-loaded calcium alginate beads embedded in gelatin scaffolds were carried out in either deionized water (DI) or PBS at 37 °C for 7 days. Lastly, the AgNPs-loaded calcium alginate beads embedded in gelatin scaffolds were tested for their cytotoxicity and antibacterial activity.

Keywords: Silver nanoparticles/Calcium alginate beads/Electrospraying/Gelatin scaffolds/Emulsification method/Internal gelation method

