CHAPTER V

CONCLUSION AND FUTURE DIRECTION

5.1 Conclusion

A combined method of freeze-drying and UV-crosslinking was employed for the preparation of three-dimensional porous scaffold from chitosan. In the first part, parameters including type of chitosan, concentration of chitosan solution in acetic acid, and freezing temperature, were studied for their effects on pore formation of non-crosslinked scaffold. Freezing temperature was proved to strongly affect the pore morphology. At the temperature of $-10^{\circ}C$ and slower cooling rate, interconnecting round pore with 30-50 μm in diameter was observed in the scaffold. The concentration and type of chitosan showed non-significant influence on the pore morphology and size. In the sense of mechanical properties, the compressive modulus of the scaffold increased when the concentration of chitosan solution used to prepare the scaffold was increased.

For the second part, 1,3-diazido-2-propanol (DAZ) was added to the chitosan acidic solution. The mixture was then exposed to UV lamp to obtain a crosslinked matrix, which was then freeze-dried to obtain the scaffold. The crosslinking reaction was monitored by FT-IR, from the reduction of azide signal at ~2100 cm^{-1}. The degree of crosslinking increased with the amount of DAZ and irradiation time. The photo-crosslinked scaffold that was hydrated in acidic medium was able to retain its shape more effectively than the non-crosslinked one. Despite the evidence of crosslinking in the chitosan matrix, the compressive modulus of photo-crosslinked chitosan was inferior to that of pure chitosan. This might be a result of photo-degradation of chitosan and/or the DAZ acting like a plasticizer. For biological aspect, the photo-crosslinked scaffold was proved to be non-toxic against L929 cells, fibroblast-like mouse connective tissue.

5.2 Future Direction

Apart from the microstructure and stability of the scaffold, one crucial factor in tissue engineering is cell biocompatibility. A good scaffold should sufficiently support and accelerate cell infiltration and proliferation. Meanwhile, its biodegradability can be controlled. Therefore, *in vitro* and *in vivo* biocompatibility and biodegradation of the photo-crosslinked chitosan are recommended to study in the future.