CHAPTER V
CONCLUSIONS

The ultimate goal of this research to improve cell-adhesion of nanofibrous scaffolds by coating with polyelectrolyte multilayer thin films (PEMs) has been fulfilled. According to the experimental results, the following conclusions were drawn.

1. Three PEMs, that are PDADMAC/PSS, PDADMAC/gelatin and chitosan/gelatin, were successfully coated on glass slides, silicon wafers and PCL films, by the layer-by-layer technique. PEM formation and their properties were studied. It was found that, at the same number of layers, PDADMAC/PSS possessed the highest thickness as revealed by AFM analysis. The AFM analysis also suggested that the thickness increased as the number of layers increased. The water contact angle of PEMs on glass slides pointed out the hydrophobic characteristic of PDADMAC/gelatin and chitosan/gelatin. Similarly, the water contact angle of PEMs on PCL films implied that PDADMAC/gelatin and chitosan/gelatin was hydrophobic, whereas PDADMAC/PSS was hydrophilic. When immersed PEMs film in culture medium solution for 4, 8, 24, 48 hr, chitosan/gelatin showed a significant change in its hydrophobic as well as a substantial loss of surface thickness while PDADMAC/gelatin was almost unaffected. It was then able to indicate that the use of chitosan/gelatin was limited by its unstable characteristic in culture medium solution comparing with PDADMAC/gelatin.

2. To study cell behavior on PEMs, PEMs coated glass cover slips were used as substrates to evaluate the viability, proliferation and spreading of mouse fibroblasts (L929 cells). All prepared PEMs were non-toxic and were capable of promoting viability and proliferation of cells. The pictures obtained from the light microscope indicated that cells completely spread on negatively charged gelatin. PEMs coated with PDADMAC/gelatin was selected for subsequent experiment since they supported viability of cells. In contrast, cells did not stick on PEMs coated with chitosan/gelatin at the first 24 hr, however, they proliferated after 24 hr, an indication of non-toxicity of chitosan/gelatin. It was also found that the number of layers did not

affect cell proliferation and displayed no significant differences between each substrate.

3. In order to improve cell adhesion, PEMs were coated, with $(PDADMAC/PSS)_4$ as the primer, on nanofibrous scaffolds made from electrospun PCL fiber. The effects of PDADMAC/gelatin top coat on cell behavior were investigated. The obtained results showed that PDADMAC/gelatin top coat promoted viability of cell and enhanced proliferation. SEM micrographs revealed that the cells expanded more effectively on $(PDADMAC/PSS)_4$+$(PDADMAC/gelatin)_4$ coated scaffolds than on the uncoated scaffold and $(PDADMAC/PSS)_4$ coated scaffolds. This indicated the preferable, strong interaction between cells and PEMs.

In summary, among the PEM systems studied in this work, it was suggested that coating PCL scaffolds with PDADMAC/PSS as the primer following by PDADMAC/gelatin as the top coat is the most effective system to improve cell-scaffold adhesion. It can be finally concluded that cell adhesion can be improved by coating scaffolds with suitable PEM structures.