

CHAPTER V

CONCLUSION AND SUGGESTION

Poly(*tert*-butyl acrylate) (*Pt*-BA) brushes can be prepared from the surfaces bearing α -bromoester groups by surface-initiated atom transfer radical polymerization (ATRP) of *tert*-butyl acrylate (*t*-BA) and thickness of the *Pt*-BA brushes can be controlled by reaction time and monomer to initiator ratio in the solution (targeted degree of polymerization). The graft density *Pt*-BA brushes were approximately 0.37 and 0.34 chains/nm² for the targeted DP = 100 and 200, respectively. Poly(acrylic acid) (PAA) brushes were subsequently obtained after *tert*-butyl groups of *Pt*-BA brushes were removed by acid hydrolysis.

As determined by toluidine blue O assay, the carboxyl group density of the PAA brushes was varied as a function of the chain length (MW). It has been demonstrated that the carboxyl groups of PAA brushes are readily available as negatively charged moieties for layer-by-layer assembly of selected polyelectrolytes, chitosan (CHI), poly(acrylic acid) (PAA) and PPCDA vesicles, all of which are weak polyelectrolytes. The formation of CHI/PPCDA multilayer system was monitored by UV-VIS spectroscopy whereas the CHI/PAA multilayer system was characterized by ellipsometry, water contact angle measurements, FT-IR, and AFM. In the case of CHI/PPCDA multilayer system, it was found that the quantity of PPCDA deposited not only depended upon the number of deposition step but also varied as a function of the molecular weight of the surface-tethered PAA brushes and deposition time. It is also clear that the thickness of each layer in the CHI/PAA multilayer assembly depends heavily on the thickness of the initial PAA brush layer. As high as 5-10 nm thick film can be deposited by one deposition step. The results in this section implied that the graft density of PAA brushes was high enough to induce chain stretching and thereby allowed a thicker individual layer to be formed. According to the contact angle and AFM analyses, the alternate surface properties were observed indicating that the multilayer formed was stratified. The presence of the multilayer film was also confirmed by FT-IR analysis.

In addition, the bioactivity of the CHI/PAA multilayer film can be tailored by changing the last polyelectrolyte deposited. This was realized from the studies of albumin adsorption. Although the attempt to investigate the change of bioactivity through the test of antibacterial activity was failed, other results have demonstrated the potential of using the surface-tethered PAA brushes as a substrate for multilayer assembly.

The stability of the multilayer film assembled on the surface-tethered PAA brushes is a subject of our future investigation. We aim to use more sensitive techniques such as SPR or QCM to monitor the stability of the multilayer film under different environment. The CHI/PPCDA system is of particular interest because its potential as a chromogenic sensing applications. The behavior of the CHI/PPCDA multilayer deposited on the surface-tethered PAA brushes will be compared with that deposited on the conventional substrate.