



CHAPTER V

CONCLUSIONS

Preparation of chitosan was achieved by deacetylation of chitin. Chitosan used in this study was obtained from the 3rd alkali treatment because it has high degree of deacetylation (97%) as well as high molecular weight (807 kDa). The plasma treatment time of 10 s was used in further study. The decreasing of water contact angle suggests that the DBD plasma treatment increased the hydrophilicity of the plasma-treated polymeric film surfaces. In the case of plasma-treated PP and PLA films, no statistically significant differences are observed in mechanical properties of all plasma treatment time. On the other hand, a little difference was observed on plasma-treated PVC and PE films either tensile strength or elongation at break before and after plasma treatment for 30s. The increasing number of C–O species and O–C=O species on the PVC and PLA surfaces and number of C–O species on the PE and PP surfaces were attributable to the oxidation in air of active species induced on the all polymeric surfaces by the DBD plasma treatment. Also, the O/C ratio of the plasma-treated films was higher than untreated films. The root mean square roughness (RMS) values of the polymeric film surfaces were confirmed by AFM observation and were found to have the increasing of roughness values of all plasma-treated polymeric films. FTIR results showed that the oxygen functional groups such as the carbonyl group (C=O) and the carboxylate anions (COO⁻) were presented after plasma treatment, this indicated the FTIR spectra are in good agreement with the XPS results. TGA thermogram confirmed that chitosan was incorporated onto surface of all treated films and also thermal stability of all polymeric films did not change after coating with chitosan. However, the appearance of new peak in ATR-FTIR spectra were postulated that the interaction between polymeric and chitosan could be occurred via the oxygen functional groups of the plasma-treated films, this indicating that chitosan successfully coated on the plasma-treated all polymeric film surfaces. In addition, amount of chitosan deposited on the polymeric films increased linearly by the rising of concentration of chitosan from 0.1% to 2%. With the washing of polymeric films for three cycles, the amount of chitosan on the polymeric films was constant. Lastly, the chitosan-coated polymeric

films exhibited excellent antimicrobial activity against both *S. aureus* (gram-positive bacteria) and *E. coli* (gram-negative bacteria). Therefore, the chitosan-coated polymeric films are effective for antimicrobial packaging.