

CHAPTER V

CONCLUSION AND RECOMMENDATIONS

Conclusion

This research covered the preparation of PDMS/PEG-modified chitosan/CMC hydrogels. PDMS was synthesized via an acid-catalyzed ring-opening reaction of D₄, followed by hydrosilylation with allyl alcohol to obtain hydroxyl-terminated PDMS. PEG was commercially available and used as received. Hexamethylene-1,6-di-(aminocarboxysulfonate) (HDA), a water soluble derivative of 1,6-hexamethylene diisocyanate (HDI), was used as a crosslinker in this system. Aminocarboxysulfonate of HDA has been reported as a highly reactive functional group toward amino groups [66, 67]. PDMS or PEG was incorporated in chitosan or CMC along with HDA crosslinker to interlock PDMS and PEG into place, enabling the formation of semi-interpenetrating polymer network (semi-IPN) structure. The effects of PDMS/PEG concentrations (1, 5, 10 and 20 wt%) and their molecular weights (2,000 and 8,000 g/mol) in the hydrogels on the properties, e.g. water swelling behavior, percent of crosslinking, water contact angles, water vapor permeability, surface morphology, and tensile strength, were elucidated.

To form chitosan/CMC hydrogels, 10% HDA in the system was sufficient to obtain chitosan/CMC in the gel form. Further increase its concentration in the solutions did not enhance % crosslinking but rather suppressed its water swelling capability. Addition of PDMS/PEG in the chitosan/CMC hydrogels promoted water swelling properties, significantly in the CMC cases. The improvement in water swellability upon addition of hydrophobic PDMS in the networks was initially surprising. In good agreement with this result, the enhancement of water permeability of the PDMS-containing hydrogels was also observed. In accordance with the SEM results, it was rationalized that PDMS submicron phases might be formed in the chitosan/CMC continuous phases, enabling the materials having more polymer-air interfaces and more contact with water. It should be noted that the previously reported paper has rationalized in the similar explanation when one observed a number of porous structure in PDMS-chitosan blend and high percent of water swelling

capability was observed [36]. The improvement in water swellability in PEG-modified chitosan/CMC was expected due to the partial water solubility of PEG oligomers, which might, to some extent, enhance water swelling properties.

According to DSC experiments, no phase transition was observed in PDMS-modified chitosan/CMC, while T_m of PEG phase in PEG-modified chitosan/CMC was observed with a slight decrease as compared to PEG homopolymer. Unmodified CMC and PDMS/PEG-modified CMC did not show a significant difference in TGA thermograms; they showed similar degradation rate and char yield, regardless of the molecular weights of PDMS and PEG. Only a slight improvement toward thermal degradation was found in the PDMS/PEG-modified chitosan.

From morphological observation, addition of HDA crosslinker obviously enhanced miscibility between PDMS/PEG and chitosan/CMC phases. Unexpectedly, tensile properties of PDMS/PEG-modified chitosan/CMC were considerably deteriorated. Increasing the molecular weight of PDMS and PEG in chitosan/CMC hydrogels seemed to slightly enhance their tensile properties. The modified chitosan/CMC hydrogels possessed PDMS/PEG-enriched surfaces as indicated by their higher water contact angles than the unmodified hydrogels.

Recommendations

Under this study, the modification of chitosan/CMC with PDMS/PEG in the order to use as a wound dressing. It was found that the modified have disadvantage due to its tensile and swelling property are lowed. In the order to improve their properties, flexible and swelling property needs to investigate.

1. For the modification of chitosan/CMC, it may be use polymers that have hight flexibility as a copolymer such as polyurethane etc.
2. For improve the swelling property, it can be increased surface area by make that it have a shape like sponge.