

CHAPTER FIVE

CONCLUSIONS AND

RECOMMENDATION

FOR

FUTURE WORK

5.1 Conclusions

Inherent brittleness, thermal properties and high melting point of PHB have been problematic in terms of processing and have limited PHB's use to certain industries. The main objective of the thesis was studied the improvements in properties of PHB, when blended with a bio-based polymer such as PVAc copolymer. The addition of PVAc to the blends of PHB/PVAc (95/5 to 65/35 (v:v)) showed remarkable improvements in PHB's brittleness and thermal properties.

The FTIR properties showed a decrease in CO wavenumber with increase the PVAc from 5 to 35% ratio in the blend.

The FESEM showed the micrographs of PHB/PVAc, which indicate that the PHB/PVAc blends were immiscible in all the compositions studied here. All samples showed smooth and homogeneous surface.

The thermal stability results showed that the PHB/PVAc blends are thermally more stable than pure polymers.

The DSC thermograms results showed the blends with two separate melting temperatures, indicating that the PHB/PVAc blends were immiscible over the entire composition range.

Degradation test showed improvement in the properties of the PHB/PVAc blend. The results indicated that blending of PHB with PVAc could be advantageous with improved properties when compared to native PHB.

5 . 2 Recommendation for future work

1 . Since these blend films have shown a high degradation temperature and known to be biodegradable and non-toxic material, this could be used for biomedical application.

2 . Since the blend films obtained in this work showed some improvements in their physical properties, this could promote their use in various applications. It is recommended to test the oxygen and water vapor permeability to explore their suitability for packaging medical supplies and food packaging application.

3 . Cross-linking of these blend films is highly recommended to further improve, for example the mechanical properties of the blended films, which are an important criteria to be matched to requirement for specific applications.

4 . A study on the optimum composition of PHB and PVAc is suggested with PHB/PVAc blends between the compositions of 90/10 to 50/50 with 10%. This further study can be used to investigate whether there is a reaction between PHB and PVAc.

APPENDICES

Appendix.1. LIST OF PUBLICATIONS

1 . Conferences from this work

Some results of this research project were presented as poster at three national and international conferences, These are listed below.

1. Olla Sharhan, Abdul Hamid Yahaya, Mohamed Mahmoud Nasef, *Preparation and characterization of poly(3-hydroxybutyric acid)/poly(vinyl acetate) blend films*, Malaysia polymer international conference (MPIC), 25-26 September 2013.

2. Olla Sharhan, Abdul Hamid Yahaya, Mohamed Mahmoud Nasef, *Joint Malaysia-UK Symposium on Inorganic Chemistry*, Organized by Centre for Natural Products and Drug Research (CENAR) and Royal Society of Chemistry (RSC), 5th December 2013.

3. Olla Sharhan, Abdul Hamid Yahaya, Mohamed Mahmoud Nasef, 5TH *Um-Nus. Cu Trilitteral Mini SympOsiumand Scientific Meeting 2014*, Organized by Department of Chemistry, Faculty of Science, University of Malaya on 11th - 12th February 2014.

2. Publications:

1. Olla Sharhan, Abdul Hamid Yahaya, Mohamed Mahmoud Nasef, (2015). Preparation and characterization of poly(3-hydroxybutyric acid)/poly(vinyl acetate) blend films, *Asian. Journal of Chemistry*, **27**(3), 979-983.