

CHAPTER V

CONCLUSION AND SUGGESTION

5.1 Conclusion

In this study, the recycled polyethylene resins: recycled HDPE (film), recycled HDPE (bottle), and recycled LDPE were employed by blending with the virgin HDPE for film application. Based on the statistical using a personal computer program STATGRAPHICS with one-way analysis of variance (ANOVA) at the 95% confidence level for analyses the recycled polyethylene resins, the effect of mechanical properties could be initially found. We found that the recycled LDPE has the higher F-ratio than the other resins in terms of MFI and film properties. Therefore, the recycled LDPE blend was chosen to study the effect of the recycled LDPE resin mixed with other recycled resins on the mechanical properties, the rheological properties, the film properties, thermal behaviors, and morphological characteristics.

The major findings in this study are as follows:

1. The MFI of the blended polyethylene film is increased when blended with recycled polyethylene resins.
2. In film properties, the elongation and stress at break, and stress at yield were the properties affected the film performance.
3. For the viscoelastic properties, Young's storage moduli, loss moduli and $\tan \delta$ of the recycled LDPE are the lowest (4.2×10^3 MPa, 2.2×10^3 MPa, and 0.057, respectively). It can be explained that the recycled LDPE could possibly result from the branch structure of polymer

chains. Since an increased recycled LDPE needs more energy in a cyclic motion, and gives a decreased $\tan \delta$ and Young's loss moduli at -137°C .

4. The flow curve of the recycled LDPE was different from other resins. It was used to blend with other resins for improving flow behavior of the blended polyethylene resins. For other polyethylene resins, the flow curves were not much different.
5. As for thermal behaviors, the melting points of blended polyethylene resins are not significantly different and a single melting peak was observed. The heat of fusion has a better correlation between compositions and the degree of crystallinity. As expected, the recycled LDPE has a lower percent of crystallinity than other polyethylene resins. Therefore, a high proportion of blended recycled LDPE produces a decreased percent crystallinity of the polyethylene blended films.
6. The morphological characteristics of the blended polyethylene films, all blends have crystallinity regions (as the bright fibrils) on the film surface in SEM photographs which were confirmed by X-ray diffraction (XRD). For XRD spectra, percent crystallinity of the polyethylene blended film is in the range of 67-75 percent. It indicates that most of the recycled LDPE affects the morphology and mechanical properties. For an increased recycled LDPE content of the blended film, the morphology of film was not smooth and a decreased mechanical property was found. In this study, the polyethylene blended film having 10-20 percent recycled LDPE gives the good film morphology and mechanical properties.

5.2 Suggestions for Further Work

1. Other recycled resins, such as LLDPE and PP, which are used in film application could be blended with HDPE.
2. Gel permeation chromatography (GPC) should be used to study the effect of average molecular weight average of the virgin and recycled resins.



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