CHAPTER IV
CONCLUSIONS

4.1 Rheological Studies

The viscosity of the starch-based HDPE blends increased with increasing starch content at low shear rates. At high shear rates the viscosity of the blends increased only slightly with increasing starch content. The power law indices of the blends were all less than 1, indicating that the blended melts underwent shear thinning. An increase in temperature led to a decrease in the viscosity of the blends. Tapioca and rice starch blends gave almost the same melt viscosities.

For the elastic behavior, the shear modulus and shear yield stress of the blends increased with increasing starch content because of the high stiffness of the tapioca and rice starch particles. In contrast, the shear yield strain of the blends tended to decrease as the starch content increased. It was found that the shear modulus of rice starch-HDPE blends was higher than that of tapioca starch-HDPE blends at all starch proportions.

In terms of viscoelastic properties, the blends with higher starch content showed higher storage modulus and loss modulus. But the loss tangent decreased with increasing starch content. Both the storage and loss moduli of rice starch-HDPE blends were higher than that of tapioca starch-HDPE blends.

4.2 Microstructure Characterization

From scanning electron micrographs of fractured surfaces of the blends, both types of starch showed poor adhesion between starch particles and the HDPE matrix. In addition, the rice starch particles exhibited agglomeration while tapioca starch particles were discrete and well distributed in the HDPE matrix. Agglomerates of rice starch were larger than the particles of tapioca starch. Furthermore, the agglomerate size of rice starch increased with increasing starch content.