CHAPTER 5
CONCLUSION

5.1 Solution Blending

For solution blending, blend of various PBS/CAB films (40-60 μm) were prepared by solution-casting technique using chloroform as solvent and a petri dish as a casting surface. Polymer blend ratios were calculated to give blend compositions with varying PBS/CAB weight ratio of 100/0, 70/30, 50/50, 30/70, 60/40, 50/50, 40/60, 30/70, 20/80, 10/90 and 0/100. Moreover, the various amount of Paraplex G40 plasticizers (10, 20, 30 % by weight) were added. In Chapter 3, the blend compatibility of PBS and CAB was considered from a theoretical viewpoint based on some change the mechanical properties, thermal transitions and morphology. From the result obtained, the tensile strength and elongation at break was not tested at composition of PBS $\geq$ 70 because the films were stick in petri dish. The SEM images at composition of PBS $\geq$ 70, it is observe to appear that PBS is not dissolved complete in chloroform that influence the mechanical properties of polymer blends. The blend films are compatible when the weight% of PBS $\leq$ 50 influence increased mechanical properties of polymer blends.

Effect to addition of plasticizers (Paraplex G40 or polyester adipate) were studied. Addition of Paraplex with PBS/CAB blends effect the mechanical properties. Using 10 wt% of Paraplex G40 to cause increased the EB all of blend compositions. When add 20, 30 wt% of Paraplex G40 to cause decreased the EB all of blend compositions. This result is correspond to SEM images which the increase plasticizer content (20% Paraplex G40), the particle size increased and separated phase in PBS/CAB matrix.

While the addition 10% Paraplex G40 in PBS/CAB system, it can see that the SEM images show small uniform particle of PBS/CAB blends. Paraplex G40 dispersed in PBS/CAB matrix. This morphology is typical of partial compatible blends resulting in good mechanical properties.

5.2 Melt Blending

For melt blending, blend of various PBS/CAB were prepared by melt-mixing technique from internal batch mixer. The compound was composed into flat sheet about 0.5-1.0 mm thickness by a compression-molding machine. Polymer blend ratios were calculated to give blend compositions to obtain blend solutions with varying PBS/CAB mass ratio of 100/0, 70/30, 50/50, 30/70, 60/40, 50/50, 40/60, 30/70, 20/80, 10/90, and 0/100. Moreover, the addition of plasticizers (Paraplex G40) 10% by weight based on some change the mechanical properties, thermal transitions, morphology and the biodegradability test for the ultimate aerobic biodegradation under control composting conditions (ISO 14855-1).

From the result thermal transitions and morphology, a direct proof of polymer compatibility can be obtained by observing the change in T_g and T_m of both the polymers in the blend. A single T_g is observed for all blend compositions, which indicates that the polymer compounds is compatible. The percentage elongation at break (%EB) of the blends increased when increased weight % of PBS until the composition PBS/CAB = 70/30, the %EB drastically increased by more than 230%. It was found that the addition of small amount of CAB was effective for plasticizing of PBS. It was postulated that this plasticizing effect of CAB on PBS was derived from the change in the crystalline state of PBS as mentioned above. The different crystalline state formed by a small amount of CAB could disturb the original crystalline state by an intermolecular interaction. The drastic change in the mechanical properties addition of a small amount of CAB coincided with the thermal properties.

The % EB of ternary blends was increase gradually with increasing PBS content. However, the high content of CAB, it was found that CAB was as an

inhibitor for the biodegradation of polymer blends as mentions Therefore, ternary blends at 70/30/10 interested to development and improve for packaging application.

The resulting %biodegradation of Cellulose, PBS and CAB were 91%, 80% and 3%, respectively on the 90 days. For PBS/CAB/Paraplex G40 (70/30/10) blend, the biodegradation value of 16% was obtained on the 90 days. When compare this with the PBS sample tested under same conditions, it can observe a lower percentage biodegradation more than PBS when adding CAB. Because of CAB were butyryl content 51%, acetyl content 4%, and hydroxyl content 1%, but CA is made from natural resources; some of the three hydroxyl groups in glucose unit of cellulose are substituted for acetyl groups. It is known that the biodegradability of CA depends on the degree of substitution (DS). Biodegradation can be observed in a sample with a DS of less than 2.5 [Sawada, & Fujimaki, 1994]. Since the hydroxyl groups in cellulose acetate are blocked and substituted by acetyl groups in various degrees, the biodegradability of cellulose acetate is less certain. The effects of the degree of substitution in each anhydroglucose unit on microbial attack have been intensively studied. These studies have shown that at least one substituent on every anhydroglucose unit resulted in complete resistance to microbial attack on cellulose due to the chemical blocking of one or more of the hydroxyl groups. It was found that CAB additive was an inhibition for the biodegradation of polymer blends.