



CHAPTER V

CONCLUSIONS AND SUGGESTION FOR FURTHER WORK

5.1 Conclusions

5.1.1 The EVA/modified starch blends for hot melt adhesives

The physical properties of EVA/starch blends-based hot melt adhesives could be correlated to the compatibility of each composition. These blends comprised of melt polymer, melt starch and unmelted starch granules. The addition of starch in the hot melt adhesive compositions with the aim for biodegradable hot melt adhesive was led to the increase in torque, melt temperature, tensile modulus and melt viscosity but decrease in T-peel strength, compatibility of each composition of hot melt adhesives. The hot melt adhesives containing starch should be controlled by careful process under heating and shearing due to starch is thermal sensitive substrate. The high heat will make starch decompose. The modified starch with acetyl functional group will made the product of blends has higher compatibility than the corresponding blend with native starch. Thus, better in product properties will be produced. However, it might be increased in cost of manufacturing due to starch functional group modification process.

5.1.2 The formulation of EVA/modified starch blends for hot melt adhesives

The optimum formulation of ethylene vinyl acetate copolymer and starch blends as base of biodegradable hot melt adhesives for packaging application was HMA20/3. The compositions were consisted of 30% of ethylene vinyl acetate copolymer (MV1055), 20% of acetyl modified starch, 10% of polyethylene wax (PE300), 40% of rosin ester and 0.25 phr of antioxidant. The physical properties of HMA20/3 were shown in Table 5.1

Table 5.1 The physical properties of EVA/modified starch blends-based biodegradable hot melt adhesives (HMA20/3).

Specification value	Value	Unit	Method
T-peel strength	5-6	N/mm	ASTM D-1876
Softening point	180-190	°C	ASTM D-3954
Viscosity	46,870	Cps @150°C	ASTM D-3236

The manufacturing cost estimation of EVA/modified starch blends-based hot melt adhesive (HMA20/3) was shown in Table D1 (see appendix D). The result of calculations showed that EVA/modified starch blends-based hot melt adhesives could be produced with 15% lower in cost (30 Baht/kg) than that of the EVA-based hot melt adhesives without any starch in composition (36 Baht/kg). The market price for commercial EVA-based hot melt adhesive without any starch was 50-60 Baht/kg.

5.2 Suggestion for further work

The base resin should be changed to others such as ethylene ethyl acrylate (EEA), polyvinyl butyral (PVB), polyvinyl ethers, styrene copolymers such as styrene-butadiene-styrene (SBS), and styrene-isoprene-styrene (SIS) for other applications.