CHAPTER II

EXPERIMENTAL PART

2.1 Materials

The two commodity thermoplastics, High Density Polyethylene (HDPE) and Polyethylene Teraphthalate (PET) were used for studying the crack morphology compared with engineering thermoplastics, Polyamide (PA) and Polyetherimide (PEI).

- High Density Polyethylene (Polene G 2855) in pellet form was supplied by Thai Petrochemical Industry.
- The post consumer HDPE and PET bottles were recovered and then ground to be small chips to represent as recycled materials.
- Polyamide (Nylon 6,6 ; Zytel 101) was supplied from Dupont.
- Polyetherimide (Ultem 1000) was supplied from General Electric.
- Maleic anhydride modified polyolefin, Mitsui Admer AT 4696 were used as a compatibilizing agent for the ternary blends of HDPE and PET.

2.2 Processing

HDPE, HDPE/PET, and Nylon 6,6 were compounded in a Collin ZK-25, co-rotating laboratory twin screw extruder, 25 mm x 30D equipped with rod die diameter 4 mm, while the PEI were processed in a single screw, Brabender Plasticorder, PL2000 with 19 mm x 25D screw. Table 2.1 shows the extrusion parameters, including barrel temperature profile, general guide for drying, operating speed and actual pressure. The PET scraps were predried

for 4 hours at 90 °C before compounding. The blends were dried for 2 hours prior to reprocessing in each pass.

Table 2.1 Typical extrusion parameters for HDPE, HDPE/PET, Nylon, and PEI

Extrusion parameter	HDPE	HDPE/ PET	Nylon	PEI
Drying time, hr.	-	2	30	4
Drying temperature, °C	-	90	80	150
Extruder heat profile, °C				
• Zone 1	195	200	220	380
• Zone 2	235	240	260	385
• Zone 3	235	255	265	375
• Zone 4	235	255	270	
• Zone 5	235	255	275	
Die temperature, °C	235	255	255	365
Speed, rpm	60	30	20	15
Pressure, bar	30-40	20	~2	2-6

2.3 Specimen Preparation

Test specimens were prepared by compression molding. All materials were dried before molding. Table 2.2 showed the typical molding condition for each HDPE, HDPE/PET and the engineering plastics.

Table 2.2 Compression molding conditions for HDPE and HDPE/PET, Nylon and PEI

Compression molding parameter	HDPE	HDPE/ PET	Nylon	PEI
Mold preheat temperature °C	-	-	80	150
Melting temperature, °C	230	230	285	385
Chill temperature, °C	23	23	30	30
Pressure, psi	140	140	80	70
Melting time, min.	5	5	7.5	7
Cooling time, min.	5	5	5	5

2.4 Mechanical Test

Specimens were tested by following the ASTM D256(A), Izod type by pendulum impact tester, Swick 5113. Tensile strength was measured at a crosshead speed of 50.8 mm/min by Instron 4206 universal testing machine with load cell 5 kN at temperature of 25 °C following ASTM D638-91.

2.5 Scanning Electron Microscope

The fracture surfaces were examined by secondary electron image, using JEOL JSM 5200 scanning electron microscope, SEM. The operating voltages were in the range of 10-25 kV. Prior to examination, the fracture surface was coated with a thin evaporated layer of gold in order to improve conductivity and prevent electron charging on the fracture surfaces.