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APPENDIX A

% Crystallinity

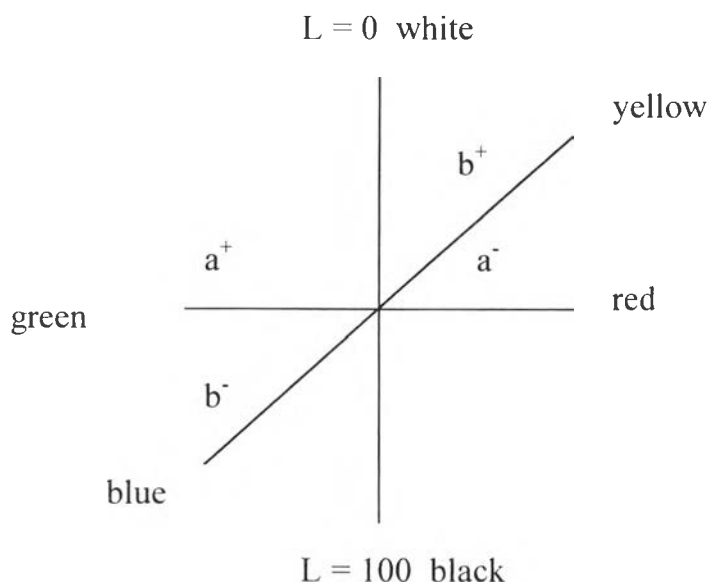
The heat of fusion (H_f) can be converted to the percentage of crystalline by using the following equation ;

$$X \% = 100 \times \Delta H_f / \Delta H_f^{\circ}$$

- $X\%$ = the percentage of crystallinity
- ΔH_f = the heat of fusion from DSC thermogram
- ΔH_f° = the hypothetical heat of fusion of a perfectly crystalline material
= 288 J/g

APPENDIX B

Color Coordinate



$$\Delta E = ((\Delta a^*)^2 + (\Delta b^*)^2 + (\Delta L^*)^2)^{1/2}$$

The color difference characteristics are determined by the spectrophotometer. The same intensity lights are released from the machine and the different of reflecting light from samples are record by the machine. It can be calculated the different of reflection from samples in each axis of the color-coordinate compares to the reference. The color different, ΔE , is obtained by the above equation.

The Optical Scanning Method

The amount of ink presents on each plastic sheet both before and after deinking was determined by using an optical scanning method. The step involved the optical scanning are shown in the Figure B1 to B3.

For optical scanning, each plastic were carefully put on the scanner and scanned at optimum condition (standardize) using a HP Laser 4c scanner. In order to prevent the reflection from the white surface of the scanner cover, a black poster board was placed behind the sample during scanning. After scanning, an image file was imported into an Adobe Photoshop program to qualify the amount of ink (pixels) present on the plastic surface.

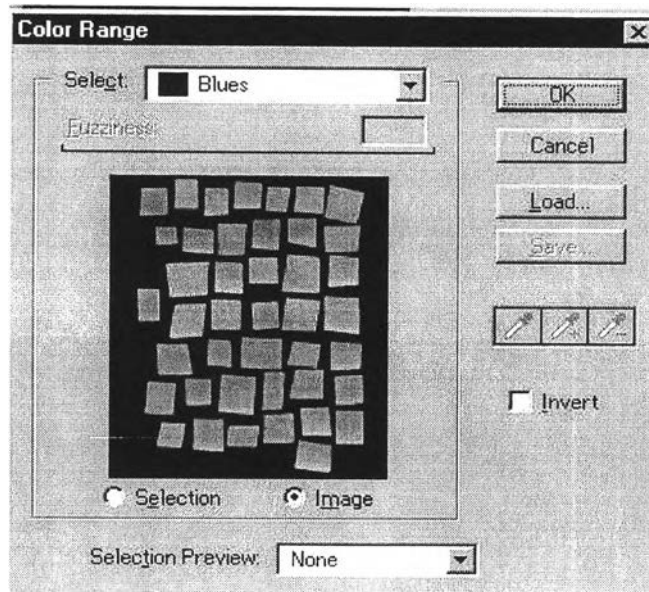


Figure B1 Selection of the specified color (blue).

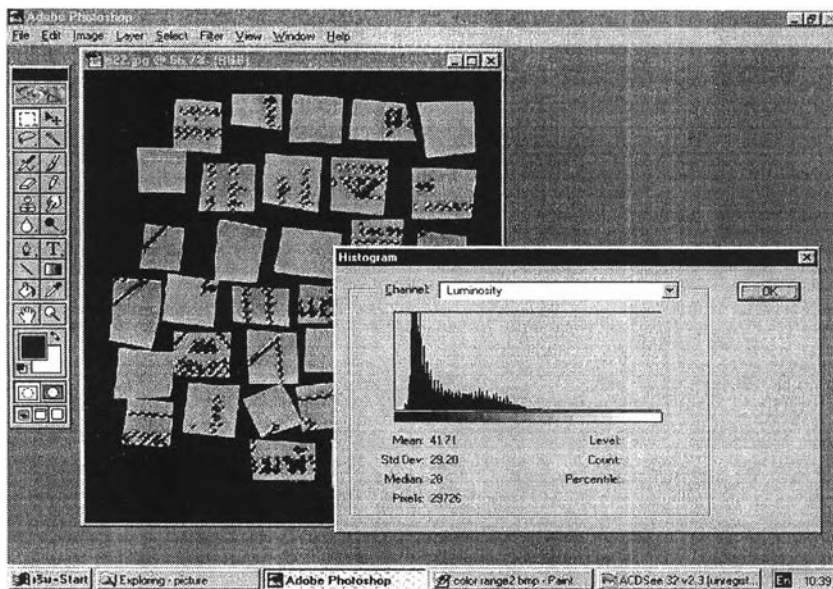


Figure B2 Histogram and data values showing the distribution of blue ink on printed plastic sheet before ink removal process.

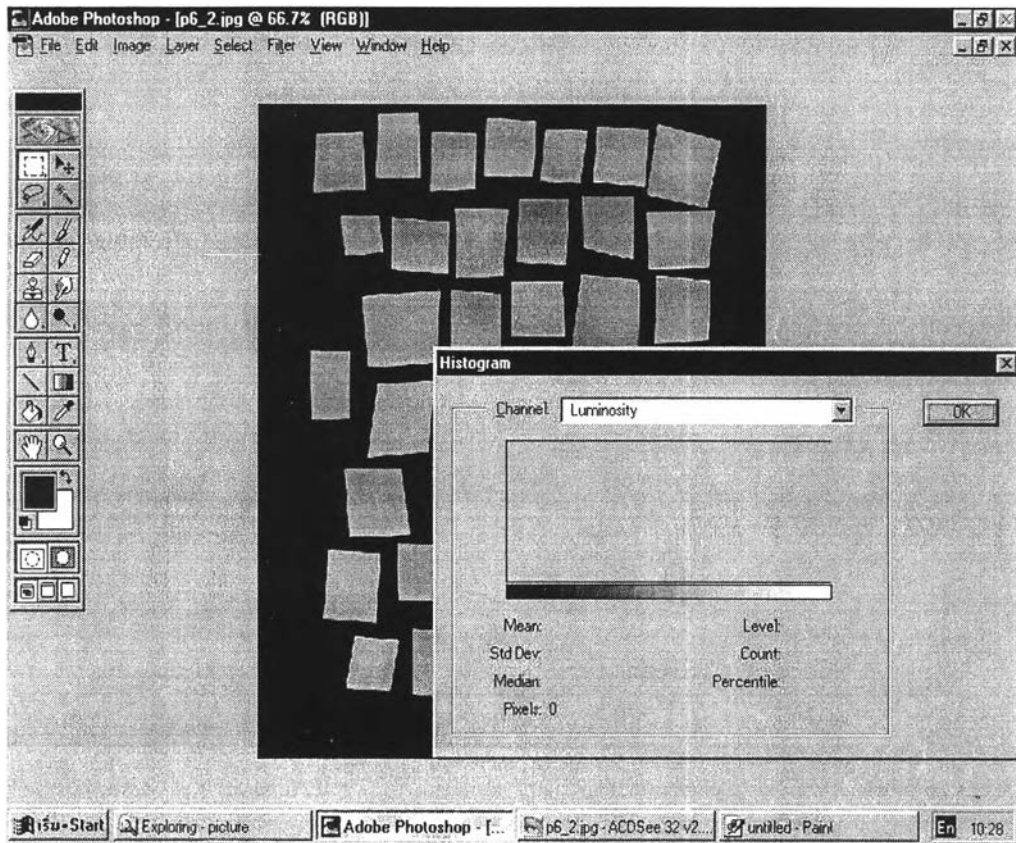


Figure B3 Histogram and data values showing the distribution of blue ink on printed plastic sheet after ink completely removed.

APPENDIX C

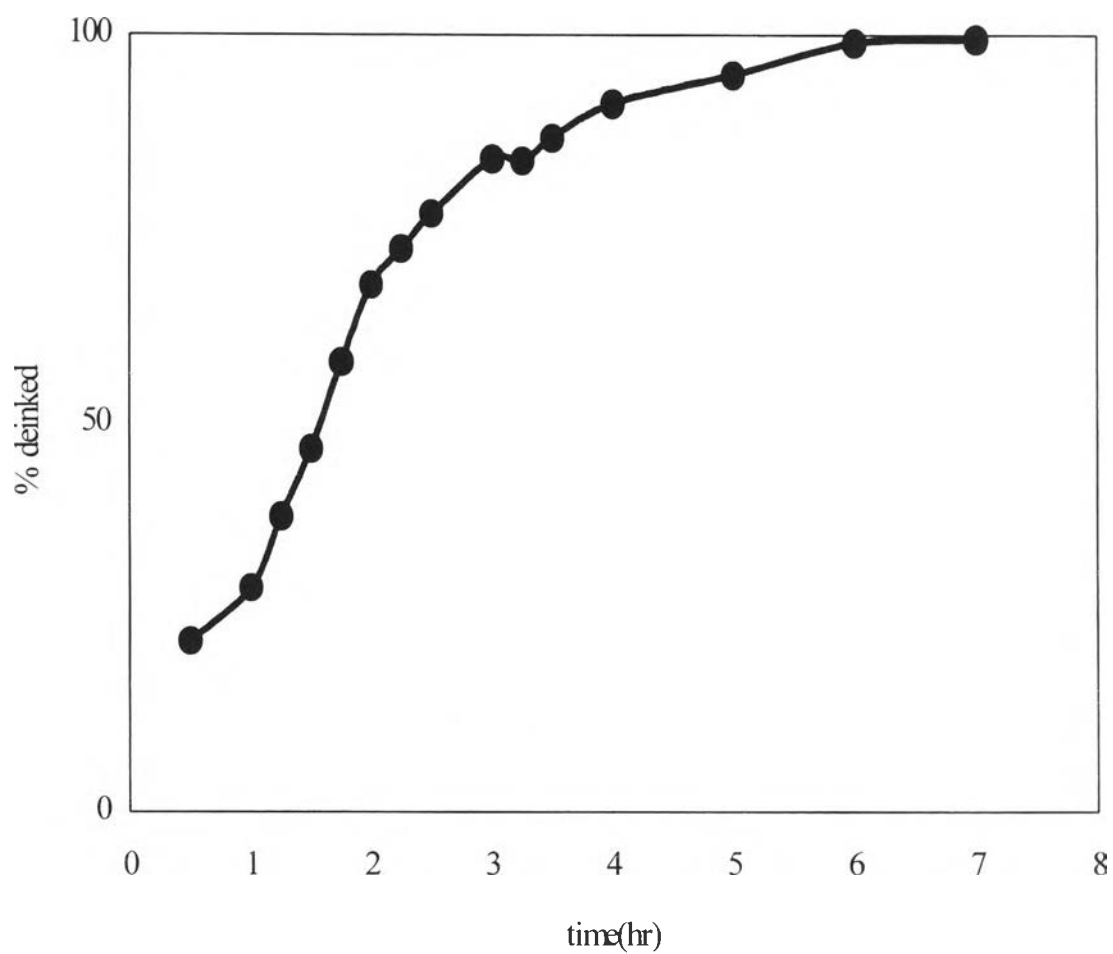


Figure C1 Shaking time for ink removal from surfaces process at 5mM of CTAB pH12 30°C 2hrs of soaking time

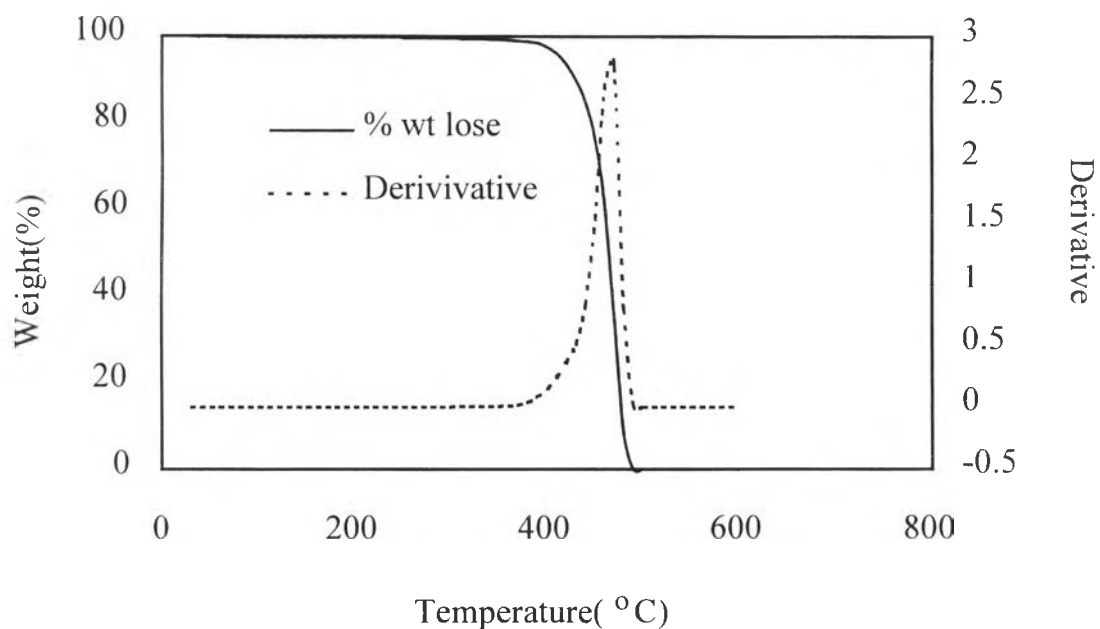


Figure C2 TGA data of the virgin HDPE without deinking from surfaces

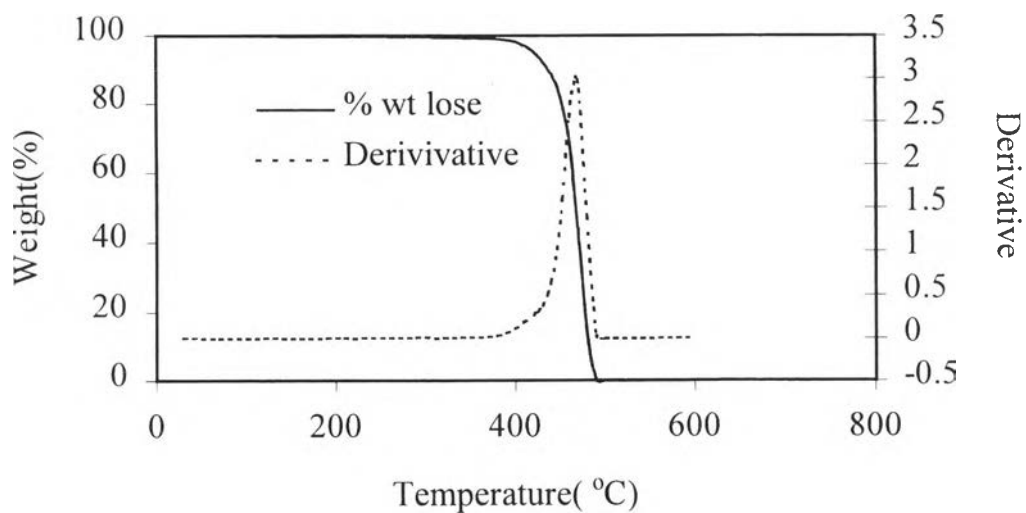


Figure C3 TGA data of the printed HDPE without deinking from surfaces

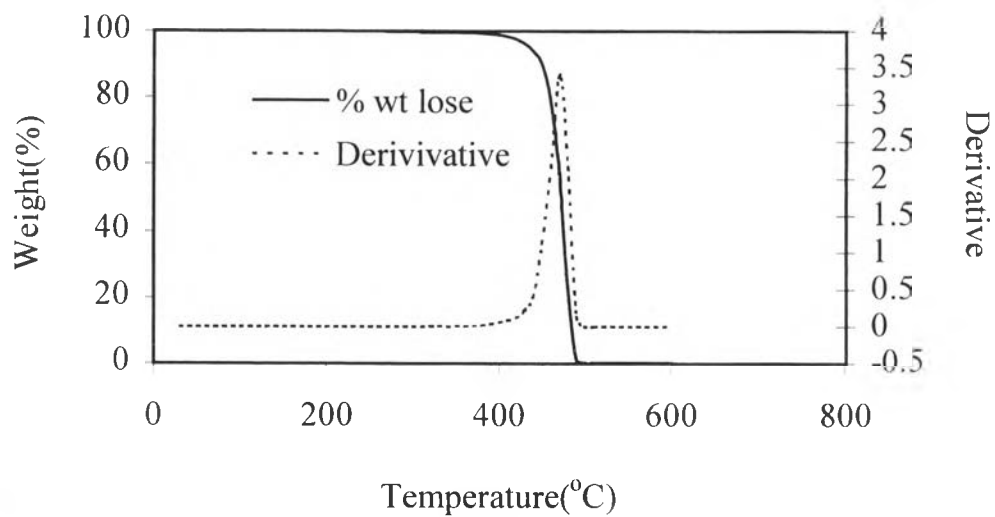


Figure C4 TGA data of the virgin HDPE at 50% deinking from surfaces

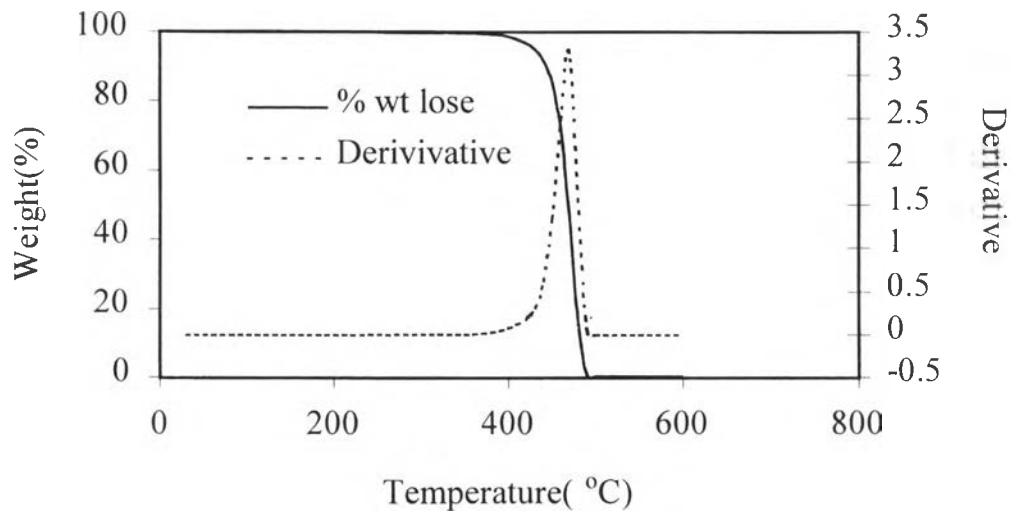


Figure C5 TGA data of the printed HDPE at 50% deinking from surfaces

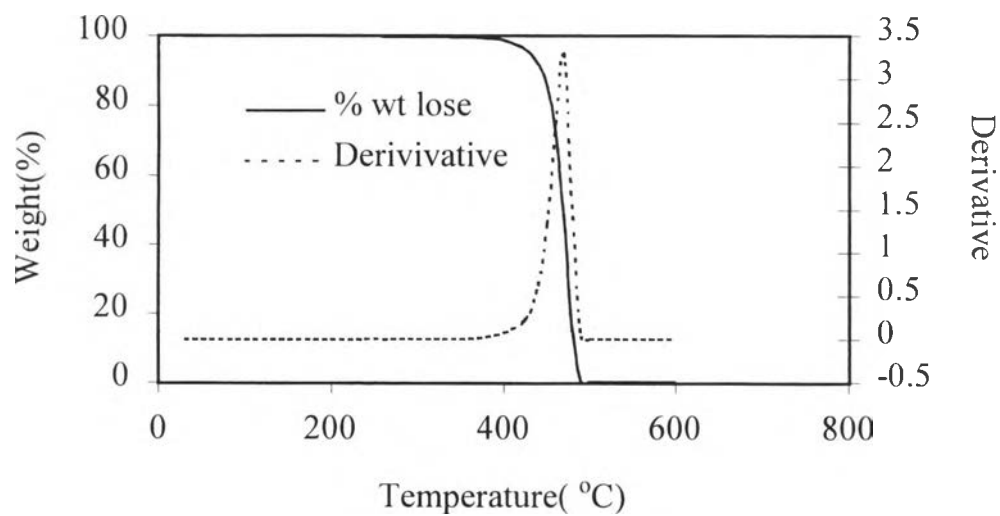


Figure C6 TGA data the virgin HDPE at 100% deinking from surfaces

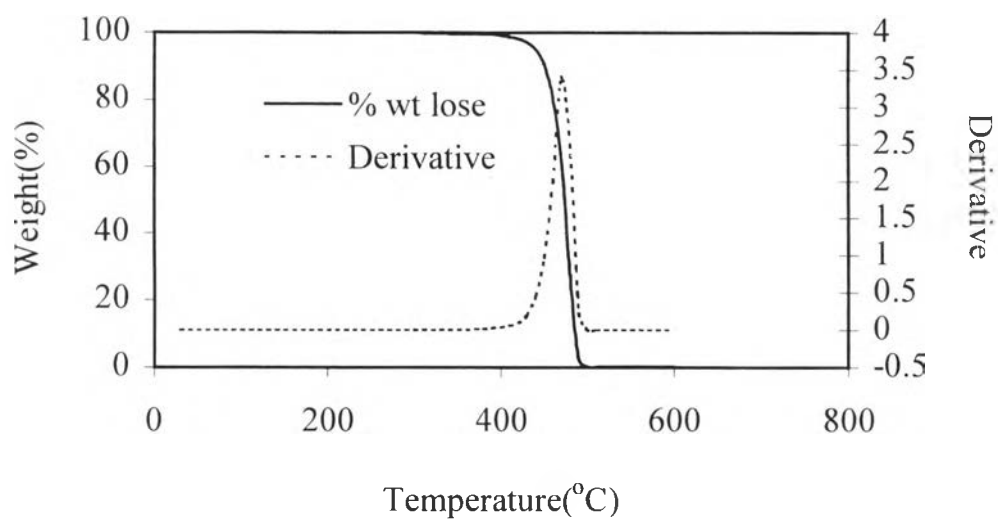


Figure C7 TGA data of the printed HDPE at 100% deinking from surfaces

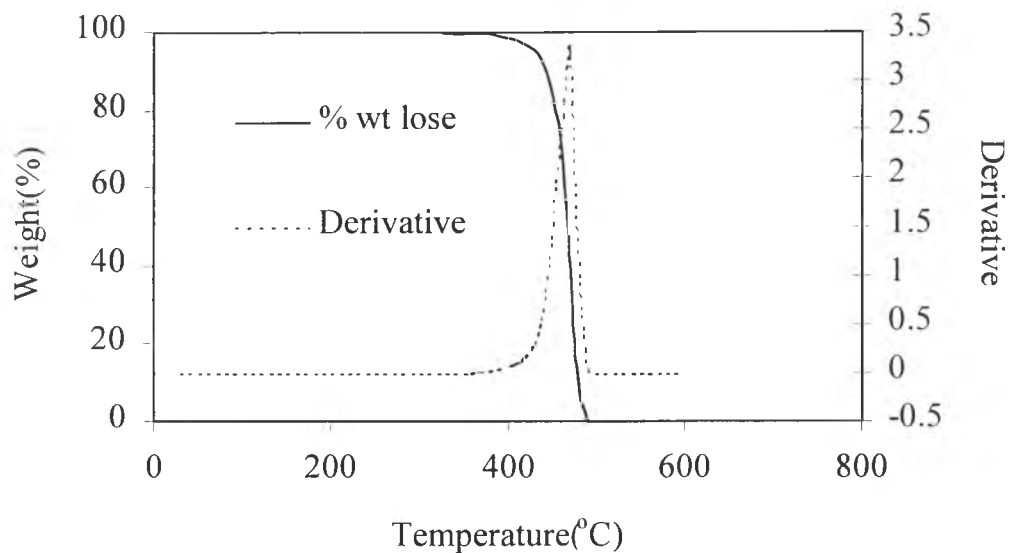


Figure C8 TGA data the virgin HDPE after 5 passes of re-extrusion

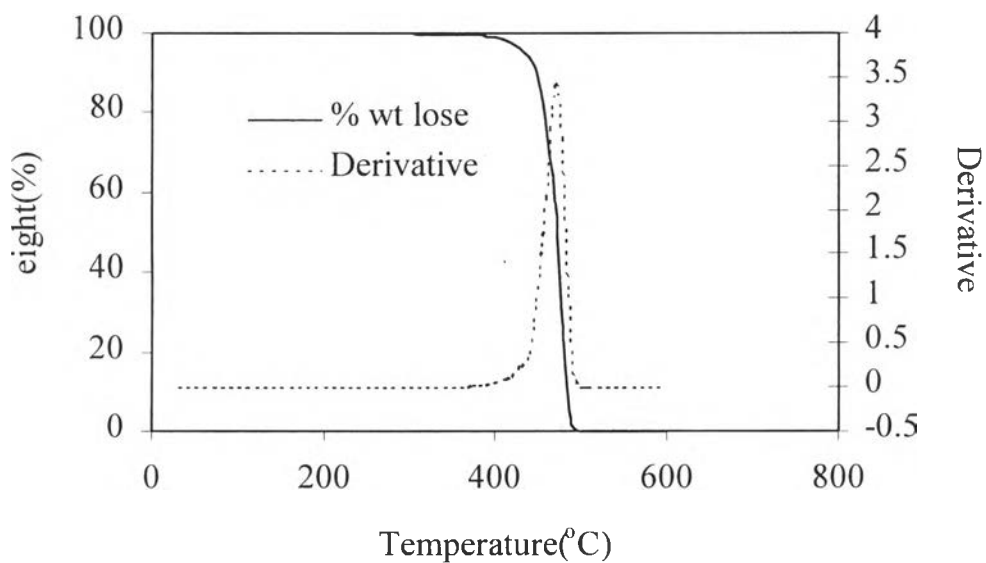


Figure C9 TGA data the printed HDPE after 5 passes of re-extrusion

APPENDIX D

This part contains raw data of materials which are

- the melting temperature
- the % crystallinity
- the tensile strength
- the impact resistance
- the hardness

Table D1 Melting temperature data of re-extruded HDPE at 0, 50 and 100% ink removal from surfaces.

sample		number of cycle					STDV
		1	2	3	4	5	
0% deinked	virgin (°C)	131.66	132.70	132.70	132.67	132.7	0.46
	printed (°C)	131.83	132.67	132.60	132.00	132.57	0.39
50% deinked	virgin (°C)	132.16	132.87	132.83	132.87	132.87	0.31
	printed (°C)	131.50	132.70	132.67	132.53	132.53	0.50
100% deinked	virgin (°C)	131.67	132.37	132.50	132.33	132.37	0.33
	printed (°C)	131.66	132.53	132.47	132.43	132.40	0.36

Table D2 Melting temperature data of the virgin and the printed samples after 5 times of re-extrusion.

sample		number of cycle					STDV
		1	2	3	4	5	
virgin plastic	1 pass (°C)	131.66	132.70	132.70	132.67	132.7	0.46
	5 pass (°C)	132.83	133.50	133.2	133.20	133.17	0.16
printed plastic	1 pass (°C)	131.83	132.67	132.60	132.00	132.57	0.39
	5 pass (°C)	132.83	133.50	133.37	133.30	133.37	0.07

Table D3 Percent of crystallinity data of re-extruded HDPE at 0. 50 and 100% ink removal from surfaces.

sample		number of cycle					STDV
		1	2	3	4	5	
0% deinked	virgin (%)	67.27	69.20	69.00	67.89	67.89	0.82
	printed (%)	63.81	66.37	66.31	67.03	66.50	1.26
50% deinked	virgin (%)	67.74	69.51	69.44	69.60	69.60	0.81
	printed (%)	65.26	67.77	67.59	67.27	67.44	1.03
100% deinked	virgin (%)	68.27	70.37	70.42	70.42	69.91	0.93
	printed (%)	66.79	69.02	69.04	67.84	68.10	0.94

Table D4 Percent of crystallinity data the virgin and the printed samples after 5 times of re-extrusion.

sample		number of cycle					STDV
		1	2	3	4	5	
virgin plastic	1 pass (%)	67.27	69.20	69.00	67.89	67.89	0.82
	5 pass (%)	68.92	71.29	71.37	71.28	71.16	1.05
printed plastic	1 pass (%)	67.74	69.51	69.44	69.60	69.60	0.81
	5 pass (%)	69.51	71.57	71.73	71.94	68.19	1.66

Table D5 The tensile strength data of re-extruded HDPE at 0, 50 and 100% ink removed from surfaces.

sample		tensile strength (MPa)
0% deinked	virgin	30.31±1.19
	printed	30.94±0.35
50% deinked	virgin	28.32±0.25
	printed	29.95±1.03
100% deinked	virgin	28.54±1.05
	printed	27.47±0.82

Table D6 The tensile strength data of the virgin and printed HDPE after 5 times of re-extrusion

sample		tensile strength (MPa)
virgin plastic	1 pass	30.31±1.19
	5 pass	30.27±1.10
printed plastic	1 pass	30.94±0.35
	5 pass	31.21±1.24

Table D7 The impact resistance data of re-extruded HDPE at 0, 50 and 100% ink removed from surfaces.

sample		impact resistance (MPa)
0% deinked	virgin	12.06±0.59
	printed	11.78±0.84
50% deinked	virgin	14.01±1.06
	printed	13.70±0.68
100% deinked	virgin	14.76±0.59
	printed	14.82±1.97

Table D8 The impact resistance data of the virgin and printed HDPE after 5 times of re-extrusion

sample		impact resistance (MPa)
virgin plastic	1 pass	12.06±0.59
	5 pass	16.30±0.99
printed plastic	1 pass	11.78±0.84
	5 pass	14.01±1.12

Table D9 The hardness data of re-extruded HDPE at 0, 50 and 100% ink removed from surfaces.

sample		Shore D
0% deinked	virgin	69.80±0.42
	printed	70.80±0.42
50% deinked	virgin	68.80±0.70
	printed	71.90±0.88
100% deinked	virgin	70.20±0.79
	printed	71.75±0.46

Table D10 The hardness data of the virgin and printed HDPE after 5 times of re-extrusion

sample		Shore D
virgin plastic	1 pass	69.80±0.42
	5 pass	70.60±0.52
printed plastic	1 pass	70.80±0.42
	5 pass	66.40±2.01

CURRICULUM VITAE

Name: Ms. Chuthamas Nandidarbha

Date of Birth: June 3, 1977

Nationality: Thai

University Education:

1995-1998 Bachelor Degree of Science in Chemical Engineering,
Faculty of Science, Chulalongkorn University, Bangkok,
Thailand

