

PP

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Synthesis and Their Properties of PP Graft Copolymers by E-beam Radiation and Vapor Phase Reaction

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: benzoyl peroxide
(BPO) glycidyl methacrylate (GMA)
가 가 가
가 70 , GMA 80
GMA

ABSTRACT : Graft copolymerization of styrene and glycidyl methacrylate (GMA) to the peroxidized polypropylene (PP) fabric with E - beam in O₂ atmosphere was carried out in vapor phase with benzoyl peroxide (BPO) as an initiator. The degree of grafting of copolymers was increased with the increase of the reaction temperature and the highest degree of grafting was obtained at 70 °C with styrene, and at 80 °C with GMA. The highest degree of grafting of styrene grafted PP according to reaction time was higher than that of GMA grafted PP. In vapor phase graft polymerization, the degree of grafting of copolymers according to water composition in monomer mixture was effected by the boiling temperature of monomers.

Keywords : synthesis, E-beam, polypropylene, vapor phase reaction.

가
. 1 4

. 5,6

가

. 7

8 10

PP PP

PP 10 g bag
가

(total dose) 20 Mrad PP

11

PP 1 M BPO 1
500 rpm

Figure 1

가

가

1000 ppm hydroquinone 가

50 mg/min

13

가

PP

가

60

(1)

12,13

14

$$\text{Degree of Grafting (\%)} = \frac{W_g - W_o}{W_o} \times 100 \quad (1)$$

W_o W_g

(PP) (trunk polymer)
 () 100 g/m², 20 μm
 gly -
 cidyl methacrylate (GMA) Junsei Chemical
 benzoyl peroxide
 (BPO) Wako Pure Chemical

2

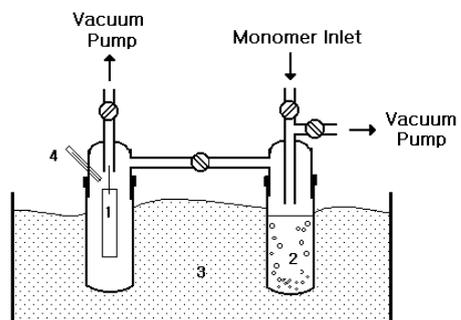


Figure 1. Schematic diagram of vapor phase graft copolymerization apparatus. 1. Trunk polymer, 2. Monomer and water, 3. Oil bath, 4. Thermometer.

PP

Mattson FT - IR spectrometer
 4000 400 cm^{-1}
 32, resolution 4 cm^{-1}
 PP
 ion
 sputter ion current 5 mA gold coating
 JEOL JSM - 840A Model
 (SEM) 150

70 가
 80 가 70%
 가 가
 가 가 Chung 15
 가 PP 가
 가
 70
 가

PP 2 GMA Figure 3
 Figure 3 5
 Figure 3 BPO 50
 vol% 5 가 가
 Figure 3 가 가
 가 70
 가 82%
 GMA

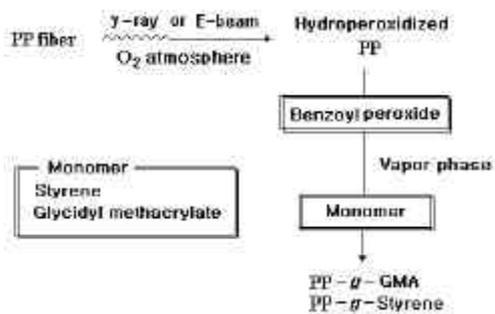


Figure 2. Synthetic diagram of PP copolymers with peroxidation by E - beam.

Figure 4

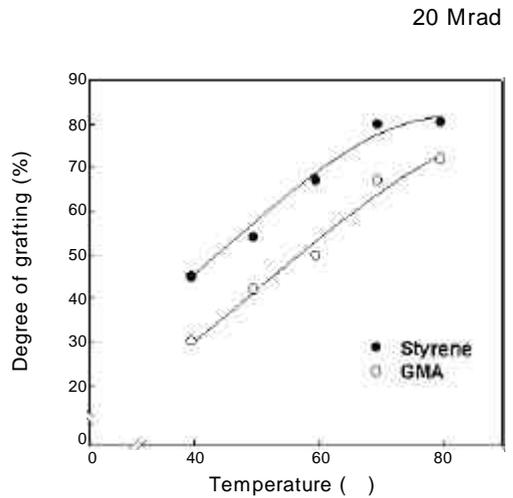


Figure 3. Effect of reaction temperature on the styrene and GMA grafting onto PP fiber.

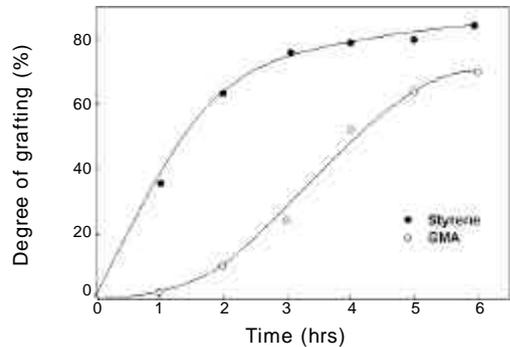


Figure 4. Effect of reaction time on the styrene and GMA grafting onto PP fiber.

PP 50
 vol% 70
 Figure 3

4
 2 가
 가
 GMA 가

Figure 5 20 Mrad
 PP 70 5
 Figure 5

가 50 vol%
 GMA 20
 vol% 가
 가 50 vol% 가

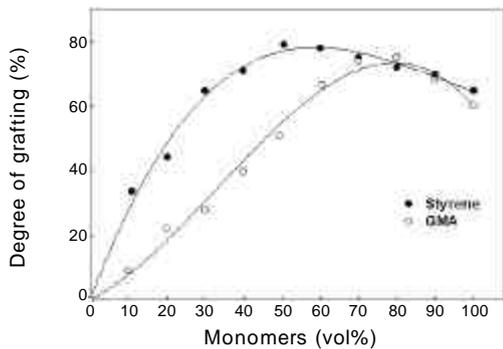


Figure 5. Plot of degree of grafting of PP copoly - mers and monomer contents with water. Grafting conditions : radiation dose, 20 Mrad ; reaction temp., 70 .

, GMA
 가 가
 가 GMA

FT-IR Figure 6
 20 Mrad E - beam PP
 FT - IR Figure 6 (a)
 3100 2872 cm⁻¹ CH₃
 가 , 1435 cm⁻¹ CH₂
 PP
 Figure 6 (b)

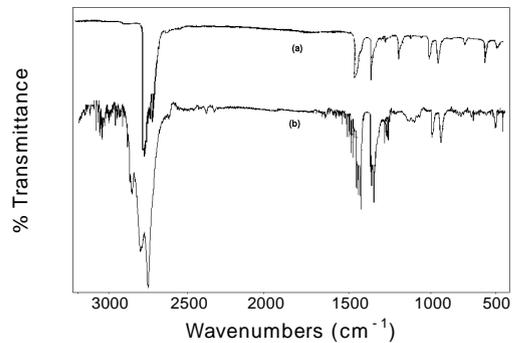


Figure 6. FT - IR spectra of PP trunk polymer and hydroperoxidized PP. (a) PP trunk polymer and (b) hydroperoxidized PP.

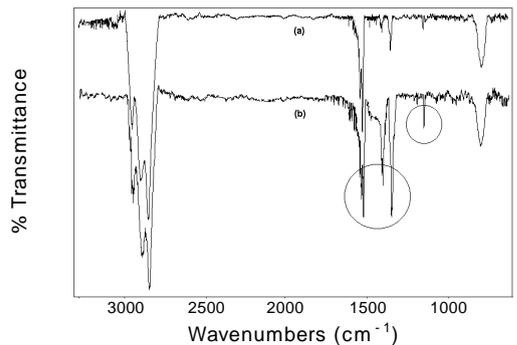


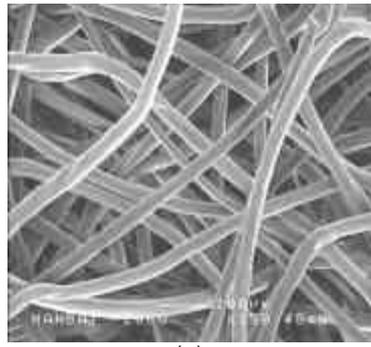
Figure 7. FT - IR spectra of styrene grafted PP copolymers in various water/styrene ratio. (a) Water : Styrene (80 : 20) and (b) Water : Styrene (50 : 50). Grafting conditions : radiation dose, 20 Mrad ; reaction temp., 70 ; reaction time, 5 hrs.

PP

E - beam 3100 2872 cm^{-1}
 1100, 1300 cm^{-1}
 Figure 7 FT - IR 20 Mrad E -
 beam PP

가 1750 cm^{-1}
 C=C 가 1650 1450 cm^{-1}
 가
 가
 GMA 가

70 , 5
 Figure 7 CH
 가 2800 3000 cm^{-1}
 -CH 가 3030 cm^{-1}
 C=C 가 1450 1600 cm^{-1}
 20



(a)

vol% 50 vol%
 가 가 Figure 4 가



(b)

Figure 8 GMA
 70 , 5
 Figure 8 FT - IR
 GMA 가 910 cm^{-1} ,

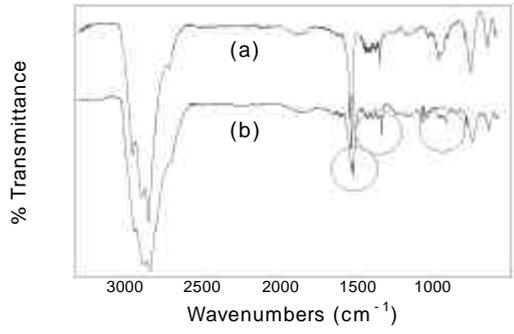


Figure 8. FT - IR spectra of GMA grafted PP copoly -
 mers in various of water/styrene ratio. (a) Water :
 GMA (50:50) and (b) Water : GMA (20 : 80).
 Grafting conditions : radiation dose, 20 Mrad ;
 reaction temp., 80 ; reaction time, 5 hrs.



(c)

Figure 9. SEM photograph of styrene - grafted PP
 fibers synthesized in liquid and vapor phase. (a)
 PP fiber, (b) liquid phase, and (c) vapor phase.

Figure 5

SEM . Figure 9
 80% morphology SEM
 . Figure 9 (b),(c)
 PP 가
 . Figure 9 (b)
 Figure 9 (c)
 Figure 9
 (b) PP 가 Ohguchi
 16
 PP BPO
 GMA PP
 1. 가 가
 70 , GMA
 80 가
 2. 2 , GMA 4
 가
 3. 50 vol% , GMA
 20 vol% 가
 4. morphology 가

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