

# Compatibilization of PE/PS and PE/PP Blends. I. Effect of Processing Conditions and Formulation

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**ABSTRACT:** The objective of this work was to study the effectiveness of low-cost commercial compatibilizers and several processes (internal mixer, single- and twin-screw extruders) for two types of plastic blends: high-density polyethylene/polypropylene and high-density polyethylene/polystyrene blends, to gain insight into the recycling of wastes from those frequently encountered mixed plastics. Blends going from a pure A to a pure B component, with and without a compatibilizer, were prepared using an internal mixer, a corotating twin-screw extruder, as well as a single-screw extruder to follow an industrial-convenient process. In both cases, the analyses of blend morphologies highlighted the poor adherence between the two phases in the uncompatibilized blends. Compatibilized blends display

better adherence between phases and the ability to process blends made from both single- and twin-screw extruders. When adding a compatibilizer, the viscosity of each blend (PE/PP or PE/PS) increased due to a better adhesion of the phases. Charpy impact tests showed that the presence of the compatibilizer in PE/PS blends increased their impact properties. Indeed, the improvement of the adhesion between the two phases enabled stress transfer at the interface. A single-screw extruder seems to be efficient as a processing method on an industrial scale when a compatibilizer is used. © 2003 Wiley Periodicals, Inc. *J Appl Polym Sci* 90: 2475–2484, 2003

**Key words:** polyolefins; blends; processing; mechanical properties; recycling

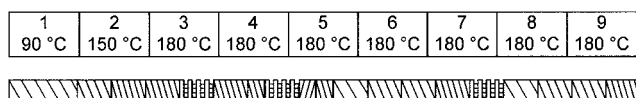
## INTRODUCTION

The recycling of mixed plastic wastes has attracted much interest because of the economical and ecological advantages over separately compounding each component.<sup>1–7</sup> It is of no doubt that the amount of mixed plastic wastes increases with an increasing use of polymer blends in the plastics industry and the recycling of mixed plastic wastes will be a great task of future technology in the plastic industry for environmental protection.

In general, deterioration of the properties caused by the incompatibility of the components is, however, one of the major problems in processing mixed plastic wastes. In this vein, the role of compatibilizers has been considered as one of the main subjects in industrial production as well as of academic interest. A considerable amount of work has been reported on the properties of polymer blends, based on thermoplastic resins, such as polyethylene (PE), polypropylene (PP),

poly(vinyl chloride) (PVC), poly(ethylene terephthalate) (PET), and polystyrene (PS), and on the role of compatibilizers in incompatible polymer blends with the objective of improving their recycling.<sup>2,5–16</sup> Thus, the objective of this work was to investigate systematically the effect of the formulation and processing conditions on the properties of several plastic blends. The systems investigated include high-density PE/PP and PE/PS blends. The compatibilizer used for the PE/PP blends was a random maleic anhydride-grafted ethylene-propylene copolymer (EP-g-MAH). This elastomer has the advantage of being reactive for possible subsequent blending with the corresponding functionalized polyolefins. For the PE/PS blends, a PS/poly(ethylene/butylene)/PS block copolymer (SEBS) was used as a compatibilizer. The effect of the compatibilizing polymer on the rheology and thermal behavior in both the PE/PP and PE/PS blends was studied. In addition, PE/PS blends were evaluated in terms of the diameter of the dispersed phase, which is an indicator of the effectiveness of the compatibilizers.<sup>17–21</sup> The impact strength is also a good indicator of the effectiveness of the compatibilizers<sup>20–24</sup> as well as of the processing conditions,<sup>25–27</sup> and this was also examined for each blend.

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**Figure 1** Twin-screw extruder. Screw and temperature profile.

## EXPERIMENTAL

### Materials

The materials used in this work, PP, PE, PS, SEBS, and EP-g-MAH, are all commercially available grades. High-density PE was supplied by Dow Plastics (Roissy, France) (PE 10262A; specific gravity, 0.962 g/cm<sup>3</sup>; melt flow index (MFI), 10 g/10 min under 2.16 kg at 190°C). Isotactic PP was supplied by Atofina (La Défense, France) (PP 3030 BN1; specific gravity, 0.905 g/cm<sup>3</sup>; MFI, 3 g/10 min under 2.16 kg at 230°C). PS was supplied by Atofina (LACQRENE PS 1540/1541; specific gravity, 1.05 g/cm<sup>3</sup>; MFI, 12 g/10 min under 5 kg at 200°C). SEBS was supplied by SHELL (Lavera, France) (Kraton G 1650; specific gravity, 0.91 g/cm<sup>3</sup>;  $M_w = 9.5 \times 10^4$  g mol<sup>-1</sup>; styrene content, 30%). EP-g-MAH was supplied by Exxon Mobil (Notre Dame de Gravenchon, France) (Exxelor VA 1801;  $M_n = 80,000$  g/mol; ethylene content, 69.6 % wt; propylene content, 29.8 % wt; and MAH content, 0.6 % wt). Although not necessary for the compatibilization of PE and PP, the presence of MAH functions could be interesting for adhesion with polymers such as polyamides that could be mixed with PE/PP blends during a future recycling.

### Blends preparation, morphologies, and mechanical properties

Homopolymers with and without a compatibilizer were premixed as pellets to the required proportions prior to processing in

- A Haake roller mixer (RHEOMIX 600), in which molten polymers were mixed for 12 min at 200 and 210°C for the PE/PP and PE/PS blends, respectively. The rotation speed of the mixer was 60 rpm. According to the geometry of the mixing chamber, the level of shearing is low.
- A corotating twin-screw extruder (Cletral BC 21:  $D = 25$  mm,  $L/D = 36$ ). The screw and temperature profiles used in this study are given in Figure 1.
- A laboratory single-screw extruder (YVROUD HE 25/28:  $D = 25$  mm,  $L/D = 28$ ). Screw speeds of 100 and 60 rpm were selected for the PE/PP and PE/PS blends, respectively. This choice was based mainly on a compromise between homogenization related to the shear level, which improves with the screw speed, and degradation,

which is enhanced by the severity of the thermo-mechanical treatment in the case of high values of viscosity. Four zones of temperature from the feeding to the end of the path were controlled. The temperatures in the exit of the path were 210 and 220°C for the PE/PP blends and the PE/PS blends, respectively. The extruded material was cooled in a water bath, granulated, and extruded again to give good homogenization. As already shown in previous works,<sup>4,6,28</sup> this procedure gave a finer morphology (average particle size and distribution of particle sizes) and mechanical behavior of the blends. The A/B blends' composition was varied from the pure polymer A, that is, 100/0 to pure B, that is, 0/100 for both PE/PP and PE/PS blends (wt %).

- Five and seven percent of EP-g-MAH were added into the PE/PP blends, whereas the same amount of SEBS was used for the PE/PS blends. For example, for a blend containing 80 g of PE, 20 g of PS, and 5 g of SEBS, the notation is PE/PS/SEBS 80/20/5.

Pure PS and PP were processed with a single- or twin-screw extruder in the same way as were their corresponding blends.

The morphologies and the mechanical properties were analyzed on 4-mm-thick specimens prepared by injection molding with an ERINCA 21 press. The barrel temperature ranged from 210 to 235°C and from 190 to 210°C for the PE/PS and PE/PP blends, respectively. The mold temperature was 30°C.

The morphology of the blends was observed with a scanning electron microscope (SEM Philips XL 30). Samples were fractured in liquid nitrogen. The fractured surface of the specimens was observed after gold coating under an accelerating voltage of 30 kV.

Charpy impact tests were carried out at  $21 \pm 1^\circ\text{C}$  using a falling-weight impact tester (type Otto Wolpert-Werke Ludwigshafen a. Rh.) according to the French standard NF T 51-035. The results supplied correspond to an average of 20 measurements for each blend.

DSC analyses and dynamic rheological properties were analyzed on 1-mm-thick films prepared by compression molding. Blends were placed in a preheated table press and pressed into the shape of plates under 30 bars at 200 and 210°C for the PE/PP and PE/PS blends, respectively. After 10 min, the plates were transferred into a second press cooled with water to control the cooling ramp, 36 K min<sup>-1</sup>.

The thermal analyses were performed under argon using a Mettler TA 3000 differential scanning calorimeter (DSC). Standard aluminum pans were used. Samples (10–20 mg) were weighted directly in the pan and an empty pan was used as a reference. Temperature calibration was performed using indium. Experiments

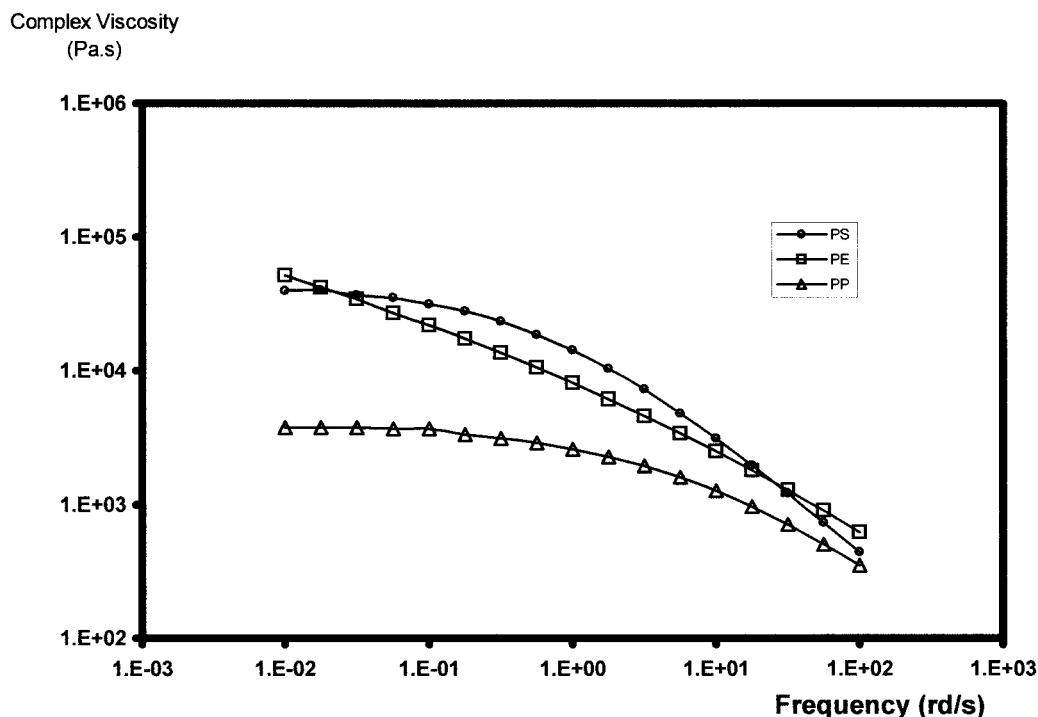


Figure 2 Variations of melt viscosity with frequency of PS, PE, and PP at 180°C.

were carried out between 25 and 220°C; cooling and heating rates were both set to 10 K/min.

Rheological properties were measured with a Rheometrics dynamic analyzer (RDA 700) at 180°C using parallel plates, with 25-mm disk samples. Shear strain was maintained at 10% throughout the experiments.

## RESULTS AND DISCUSSION

### Melt rheology

Morphology of blends depends on the ratio of the viscosity of both phases. Figure 2 shows plots of the melt viscosity versus frequency for homopolymers. It shows that the viscosity of PE, PS, and PP decreases with an increasing frequency, showing a typical property of pseudoplastic non-Newtonian fluids.<sup>28,29</sup> However, the dependence of the melt viscosity on the frequency varies with the homopolymers. The viscosity of PE and PS are rather close at 180°C, whereas the one of PP is lower. The melt rheological properties of the blends constitutes a sensitive method for the characterization of the interfacial tension in the blend compositions as well as the compatibilizer's effect. Indeed, the rheological behavior of these blends depends not only on the characteristics of the components, but also on the particle size and interactions between phases.<sup>7,30</sup> Figures 3 and 4 show the melt viscosity versus the frequency, respectively, of PE/PS 20/80 and PE/PP 40/60. When adding a compatibilizer, the viscosity of each blend (PE/PP or PE/PS) is increased.

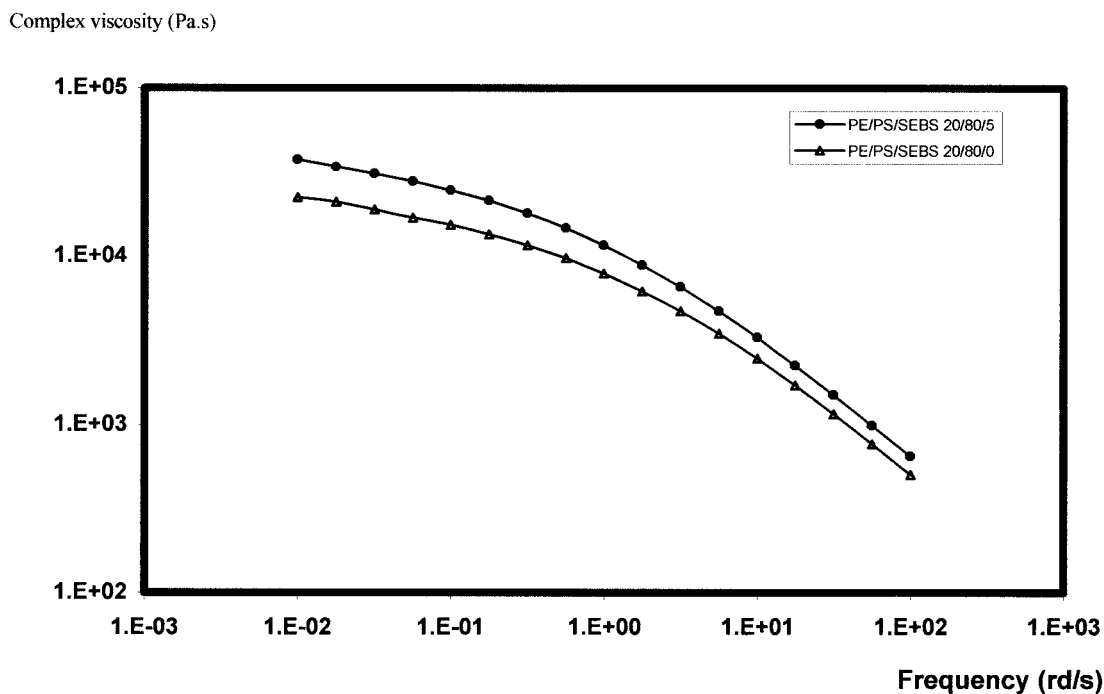
Indeed, the compatibilizer will increase the interactions between the components. Thus, at low frequencies (from 0.01 to 10 s<sup>-1</sup>), the movements of the chains are interdependent due to a lower interfacial tension.<sup>1,6,7</sup> In the same way, in the molten state, blends can be considered as heterogeneous solutions, in which compatibilizers act as emulsifiers, which prevent agglomeration of the dispersed phase.

On the other hand, the curves tend to converge toward higher frequencies; therefore, a compatibilizer's effect on the viscosity of these blends strongly decreases as the shear rate is increased. Indeed, as previously discussed, at high frequencies, the interfacial tension has no effect on the dynamic viscosity of immiscible polymer blends.<sup>31,32</sup>

### Morphologies of binary and compatibilized blends

#### PE/PS blends

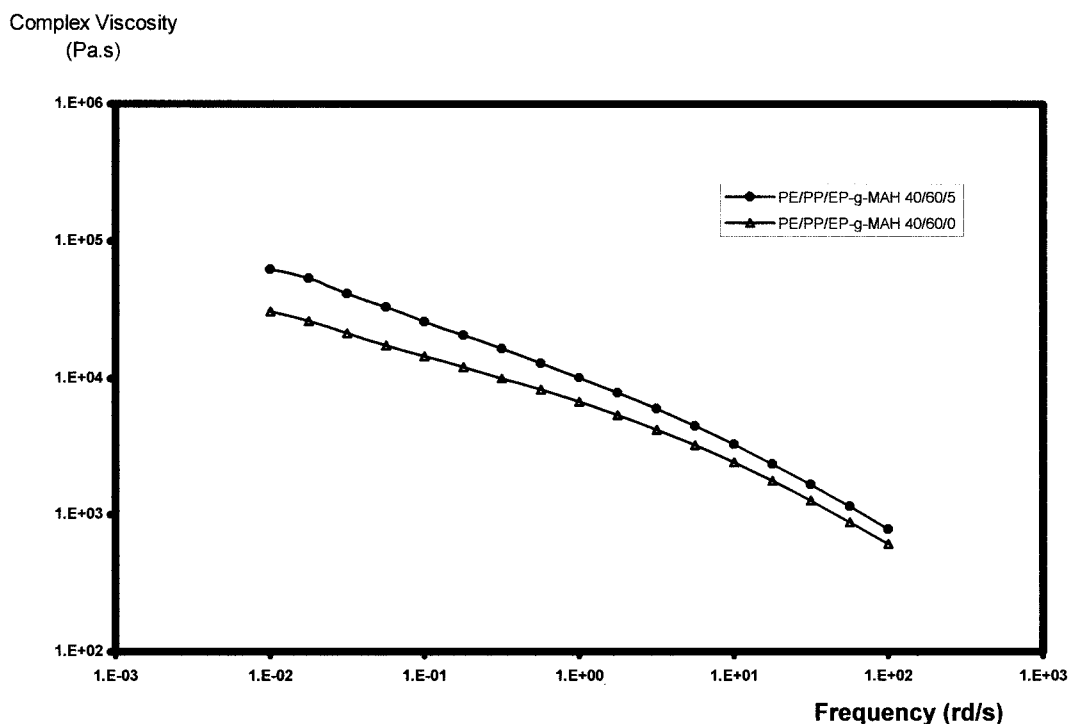
The SEM micrographs of the fracture surfaces of materials prepared using the internal mixer and covering a broad composition range for the PE/PS blends without or with the addition of 5 wt % of SEBS are shown in Figure 5(a–h). Figure 5(a) shows the morphology of the fractured surface of the binary (noncompatibilized) PE/PS 80/20 blend. The SEM analyses revealed two-phase morphology with a rather large polydispersity of ellipsoidal PS particles in the PE matrix as well as the presence of cavities due to the extortion of nodules, that is, the result of high interfacial tension



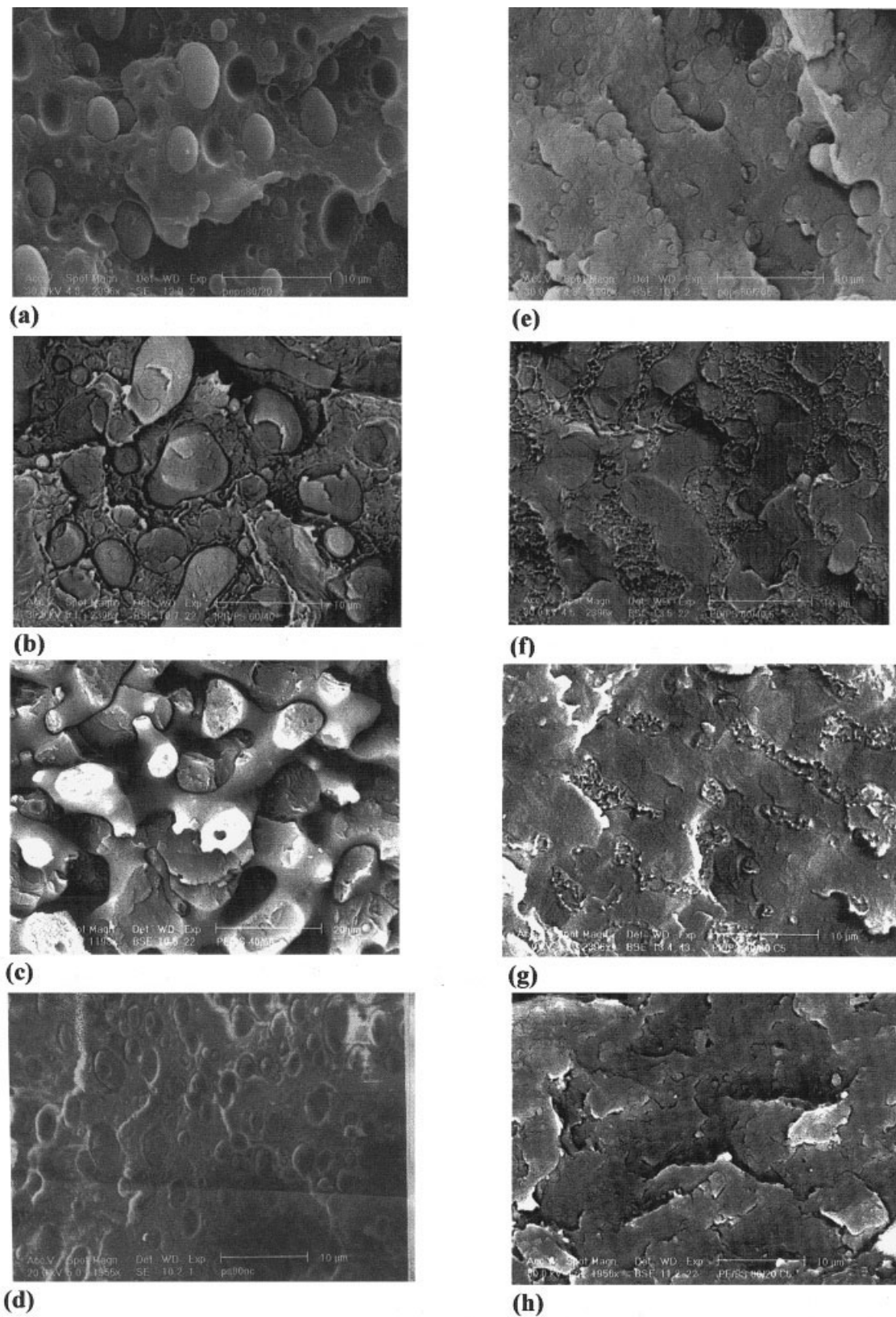
**Figure 3** Variation of melt viscosity with frequency of PE/PS 20/80 without and with addition of 5% SEBS ( $T = 180^{\circ}\text{C}$ ).

and coalescence.<sup>33</sup> The PS domain size ranges from 1 to 5  $\mu\text{m}$  in diameter. When the PS content in the blend is increased to 40 wt % [Fig. 5(b)], the micrograph reveals a change in the shape and in the distribution of the dispersed PS particles. They are rarely spherical

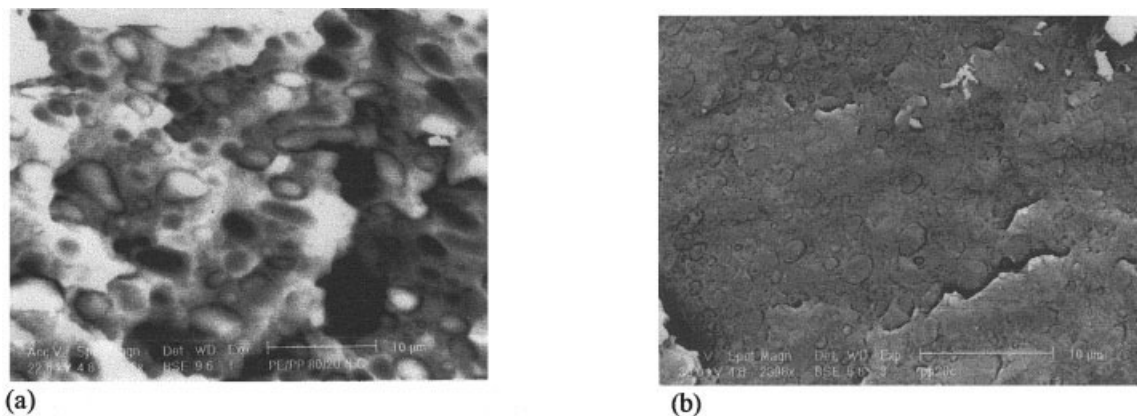
and many of them start to form aggregates; poor interfacial adhesion between the phases can be observed. The PS domain size ranges from 3 to 15  $\mu\text{m}$  in diameter. With an increase of the PS content of the blend to 60 wt %, phase inversion appears [Fig. 5(c)];



**Figure 4** Variation of melt viscosity with frequency of PE/PP 40/60 8 without and with addition of 5% EP-g-MAH ( $T = 180^{\circ}\text{C}$ ).



**Figure 5** Morphologies of PE/PS blends prepared with the internal mixer. Effect of the formulation: (a) PE/PS/SEBS 80/20/0; (b) PE/PS/SEBS 60/40/0; (c) PE/PS/SEBS 40/60/0; (d) PE/PS/SEBS 20/80/0; (e) PE/PS/SEBS 80/20/5; (f) PE/PS/SEBS 60/40/5; (g) PE/PS/SEBS 40/60/5; (h) PE/PS/SEBS 20/80/5.



**Figure 6** Morphologies of PE/PP blends prepared with the internal mixer. Effect of the compatibilizer: (a) PE/PP/EP-g-MAH 80/20/0; (b) PE/PP/EP-g-MAH 80/20/5.

it can be seen that the structure and shape of the dispersed particles are very complex and PS becomes the continuous matrix, whereas PE disperses in the matrix. The morphology observed in the PE/PS 20/80 blends [Fig. 5(d)] is similar to the one of PE/PS 80/20 [Fig. 5(a)] and PE particles are ellipsoidal. The PE domain size ranges from 1 to 5  $\mu\text{m}$  in diameter. From Figure 5(a–h), one can observe, independently of the composition of the noncompatibilized PE/PS blends, poor interfacial adhesion between the phases.

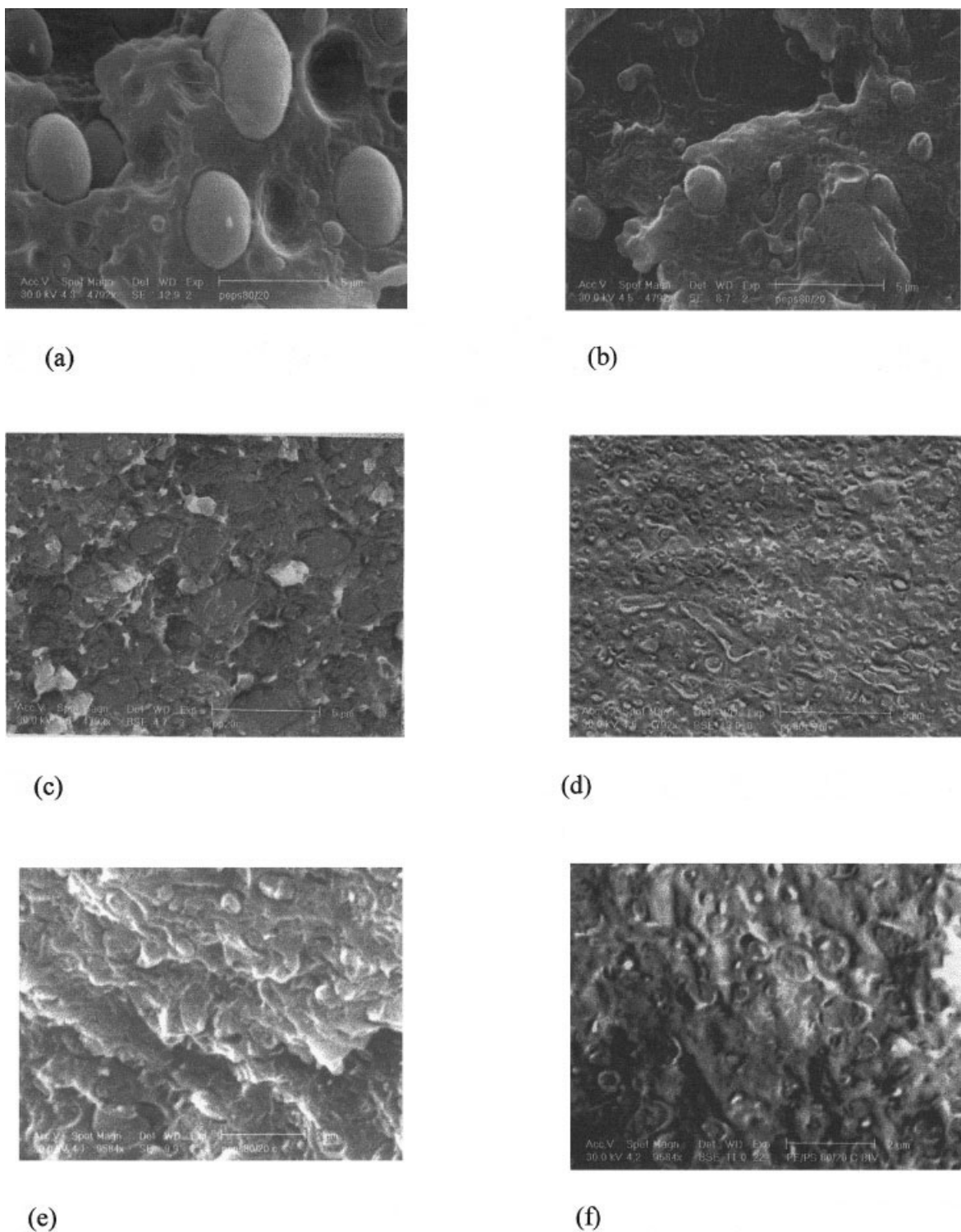
The SEM analyses also provide an insight into the interfacial activity of compatibilizers in polymer blends. Figure 5(e) shows SEM micrographs of the fractured surfaces of the compatibilized PE/PS/SEBS (80/20/5). The SEM micrographs of the fractured surfaces of the compatibilized blends show that the domain size of PS is slightly reduced by adding the compatibilizer (the PS domain size ranges from 0.5 to 3.5  $\mu\text{m}$  in diameter) but one can see that the fracture crack passes through the PS particles without decohesion, meaning that compatibilization was achieved for the PE/PS blends in the presence of the copolymeric compatibilizer, SEBS.<sup>8</sup> The effect of compatibilization is less pronounced for PE/PS/SEBS (60/40/5) [Fig. 5(f)]. For this composition, the PS domain size is not reduced and the PS domain can be easily insulated from its PE matrix but there is a reduction of emptiness to the interfacing. From Figure 5(g,h), we can see that the PE domain size is very reduced, mainly for compatibilized PE/PS/SEBS 80/20/5 [Fig. 5(h)] and the PE particles are dispersed in the PS matrix with good interfacial adhesion. It can be seen that the structure and shape of the dispersed particles is very complex. This improvement of the interfacial adhesion in the compatibilized PE/PS/SEBS blends could be the result of localization of the SEBS block copolymer at the interface.

#### PE/PP blends

The effectiveness of EP-g-MAH to PE/PP blends is displayed in Figure 6. Several authors used the EP copolymer with PE and PP blends to improve their poor compatibility.<sup>34,35</sup> It was reported that the addition of EP to PE/PP blends improved the impact strength of the binary blend as well as their compatibility. It was expected that EP-g-MAH was not so active as a compatibilizer for the PE/PP blends, since those polyolefins do not possess any polar group able to react with the MAH group (without addition of corresponding grafted polyolefins). However, the morphology of the PE/PP/EP-g-MAH 80/20/5 blend, as shown in Figure 6(b), as compared with the binary PE/PP 80/20 blend, shown in Figure 6(a), was much finer and a crack propagates through the particles, so one can expect that compatibilization was achieved for the PE/PP blend in the presence of the compatibilizer, EP-g-MAH. As previously said, the presence of MAH functions might be interesting for adhesion with polyamides that could be mixed with PE/PP blends. But a partial deterioration of polyolefins ( $\beta$  scission of the chains of PP in particular) in the presence of the MAH group in the molten state may occur.<sup>36</sup>

#### Effect of processing

Figure 7(a) shows that, for the noncompatibilized PE/PS 80/20 blend prepared with the internal mixer, the SEM analyses revealed two-phase morphology with a rather large polydispersity of ellipsoidal particles in the PE matrix, which is probably the result of coalescence. Figure 7(b) shows that there is a narrower dispersion with spherical particles when corresponding blends are extruded with the single-screw extruder. In the same way, for the PE/PP/EP-g-MAH 80/20/7 blend prepared with the twin-screw ex-



**Figure 7** Morphologies of binary and ternary blends. Effect of processing conditions: (a) PE/PS/SEBS 80/20/0 prepared with the internal mixer; (b) PE/PS/SEBS 80/20/0 extruded with the single-screw extruder; (c) PE/PP/EP-g-MAH 20/80/7 prepared with the internal mixer; (d) PE/PP/EP-g-MAH 20/80/7 extruded with the twin-screw extruder; (e) PE/PS/SEBS 80/20/7 extruded with the single-screw extruder; (f) PE/PS/SEBS 80/20/7 extruded with the twin-screw extruder.

truder, the dispersion is narrower and the PP-dispersed particles are more spherical than are those of the corresponding blend prepared with the internal mixer [Fig. 7(c,d)].

Figure 7(e,f) shows that, for the compatibilized PE/PS/SEBS 80/20/7, the morphology of the blends prepared with the single-screw extruder is finer than that of the blends prepared with a twin-screw extruder.

**TABLE I**  
**Enthalpy of Fusion, Temperature of Fusion, and Crystallization for PE/PS Blends**

PS/PE + PS blends	$\Delta H_{\text{fusion}}$ (J/g of PE)		Melting temperature (°C)		Crystallization temperature (°C)	
	Without SEBS	With addition of 5% SEBS	Without SEBS	With addition of 5% SEBS	Without SEBS	With addition of 5% SEBS
0	-196	-189	136	134	109	111
0.2	-190	-177	133	133	110	111
0.4	-194	-163	134	134	112	111
0.6	-179	-172	131	132	113	112
0.8	-168	-163	131	129	113	113
1	—	—	—	—	—	—

This may be because, with the single-screw extruder, blends are extruded twice.<sup>4,6</sup> Indeed, the morphology of blends not only depends on the viscosity ratio but also depends mainly on the shearing level and the living time, which influence the domain size of the dispersed phase and the interface.

When blends are prepared with a single- or twin-screw extruder, they undergo a high shearing level but a short living time. These conditions are opposite to those of the internal mixer: The shearing level is less intense but the living time is more important.

### Thermal properties

Tables I and II illustrate the thermal behavior (nonisothermal crystallization and subsequent melting, as probed by DSC) of the neat PE and PP and of the various PE/PS and PE/PP blends. Crystallinity was calculated with respect to the PE and PP fractions in the blends.

For any blend sample, the temperature of the crystallization peak increases in the blends when compared with the one of neat PE in PE/PP and PE/PS blends and neat PP in PE/PP blends. This result suggests a strong influence of the other components on the crystallization of PE and PP in blends, most probably on the primary nucleation of spherulites. According to Bartczak et al.,<sup>37</sup> who studied PE/PS and PP/PS blends, such behavior is a result of the migration of

heterogeneities (catalysts, additives, impurities, etc.), constituting potential nucleation sites and that the driving force for that migration is the difference of the interfacial free energy of those heterogeneities and the blend components. Similar migration phenomena are probably responsible for the increase of the crystallization temperature of the PE and PP components in blends reported in this study.

Upon heating, the melting temperature of PE in PE/PS and PE/PP noncompatibilized blends, just as that of PP in PE/PP noncompatibilized blends, is decreased in comparison with the neat PE or PP. This decrease of the melting peak temperature in the blends compared to the neat PE or PP suggests that the crystals grown in the blend samples are less perfect than those formed in the neat PE and PP,<sup>37,38</sup> with the formation of smaller crystals. Furthermore, there is no sensitive effect of the compatibilizers on the crystallinity of PE and PP in the PE/PS and PE/PP blends.

### Charpy impact

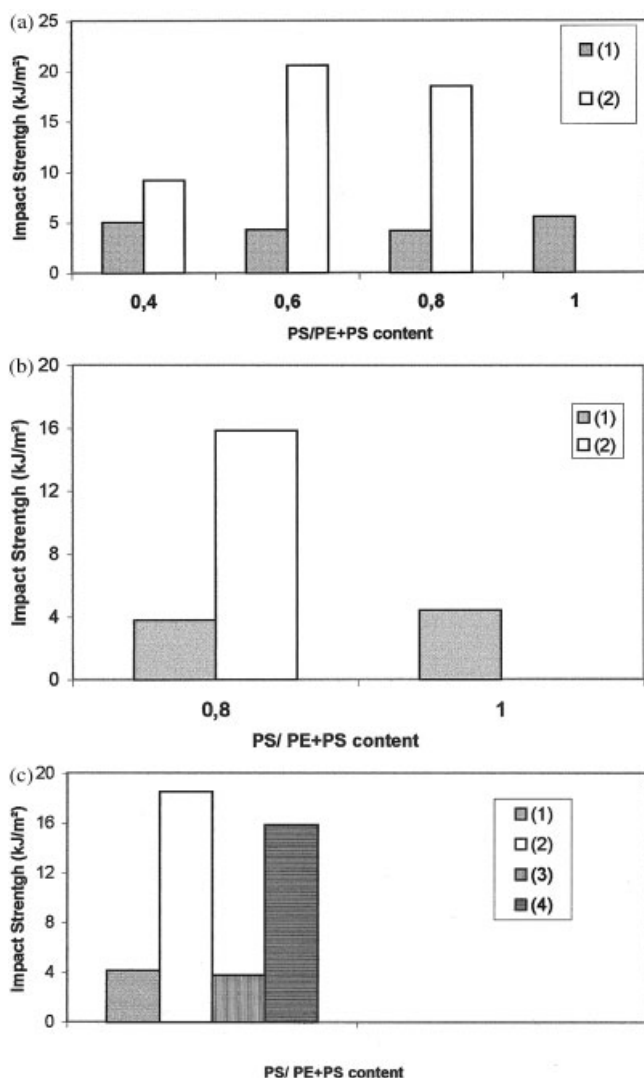
Figures 8(a–c) show the impact strength of various PE/PS blends as a function of the PS content. For PE, PE/PS 80/20, and PE/PS/SEBS 80/20/7 blends, the specimens are too ductile to be broken, whether they are made with a single- or twin-screw extruder.

For all other noncompatibilized PE/PS blends, the Charpy impact strength is slightly inferior to that of

**TABLE II**  
**Enthalpy of Fusion, Temperature of Fusion, and Crystallization for PE/PP Blends**

PP/PE + PP blends	Melting $\Delta H$				Melting temperature (°C)				Crystallization temperature (°C)	
	Without EP-g-MAH		With addition of 5% EP-g-MAH		Without EP-g-MAH		With addition of 5% EP-g-MAH		Without EP-g-MAH	With addition of 5% EP-g-MAH
	PE peak (J/g of PE)	PP peak (J/g of PP)	PE peak (J/g of PE)	PP peak (J/g of PP)	PE peak	PP peak	PE peak	PP peak		
0	-196	—	-193	—	136	—	134	—	109	110
0.2	-162	-40	-167	-33	136	166	132	167	110	111
0.4	-133	-50	-162	-43	134	168	132	167	111	111
0.6	-128	-60	-146	-53	132	168	132	167	114	112
0.8	-114	-60	-129	-65	132	169	130	167	113	113
1	—	-81	—	-83	—	170	—	170	110	112





**Figure 8** (a) Charpy impact strength of PE/PS injected specimens: (1) noncompatibilized PE/PS blends made with the single-screw extruder; (2) PE/PS with addition of 7% of SEBS made with the single-screw extruder. (b) Charpy impact strength of PE/PS-injected specimens: (1) noncompatibilized PE/PS blends made with the twin-screw extruder; (2) PE/PS with addition of 7% of SEBS made with the twin-screw extruder. (c) Charpy impact strength of PE/PS 80/20 injected specimens: (1) noncompatibilized PE/PS blends made with the single-screw extruder; (2) PE/PS with addition of 7% of SEBS made with the single-screw extruder; (3) noncompatibilized PE/PS blends made with the twin-screw extruder; (4) PE/PS with addition of 7% of SEBS made with the twin-screw extruder.

pure PS whether they are made with a single- or twin-screw extruder [Fig. 8(a,b)]. Figure 8(a,1) also shows that for these noncompatibilized PE/PS blends, the impact strength decreases slightly when the percentage of PS increases. Decreases of the impact strength for uncompatibilized PE/PS blends made with the single- or twin-screw extruder are due to the weak adhesion between the two phases. The dispersed phase participates little in the absorption of energy.

For the PE/PS blends made with the single-screw and twin-screw extruders, an increase of the impact strength of compatibilized blends in relation to their noncompatibilized counterparts [Fig. 8(a,1,2),(b,1,2)] is observed. The contribution of a coupling agent in the two kinds of blends increases their mechanical properties. Indeed, the improvement of the adhesion between both phases enables load transfer at the interface. Therefore, for compatibilized blends, the load becomes partially supported by the two phases.

Figure 8(a,2) shows that, when 7% of SEBS is added to PE/PS blends, the highest impact strength is obtained for the blend PE/PS/SEBS 40/60/7. It is little higher than for the PE/PS/SEBS 20/80/7 blend but twice higher than for the PE/PS/SEBS 60/40/7 blend. These results confirm the conclusions made from the analyses on the morphology of these blends (Fig. 5). Indeed, when comparing the PE/PS/SEBS 60/40/7 and 40/60/7 blends, it can be concluded that, for the PE/PS/SEBS 40/60/7 blend, the compatibilizer acts much better for the reduction of the size of the dispersed phase and the improvement of adhesion between the two phases. For the PE/PS/SEBS 20/80/7 blend, the effect of SEBS is about identical to that of the PE/PS/SEBS 40/60/7 blend, but as the percentage of PS is more important, the material becomes more brittle.

Figure 7(e,f) shows that, for PE/PS/SEBS 80/20/7, the morphology of the blends prepared with the single-screw extruder is finer than that of the blends prepared with the twin-screw extruder. A reduction in the impact properties of twice-extruded blends made with the single-screw extruder in comparison to the corresponding blends made with the twin-screw extruder might be expected. Indeed, potential chain scissions due to longer residence times at elevated temperatures could occur. However, impact results show this possible degradation does not much affect the Charpy impact results. Blends of PE/PS 20/80, with or without a compatibilizer, made with a single-screw extruder even have a higher impact strength than that of those made with a twin-screw extruder [Fig. 8(c)]. This proves that a single-screw extruder, if long enough, is as efficient as a processing method, which is very interesting on an industrial scale.

## CONCLUSIONS

In this work, the study focused on the efficiency of several formulations and processing methods for the elaboration of PE/PP and PE/PS blends with the aim of opening new prospects for the recycling of these materials. The morphology of several blends (compatibilized and not compatibilized) was studied. When compatibilized, blends present better dispersions: The size of the dispersed particles decreases, the shape of these particles is generally spherical, and

there is a better interfacial adhesion between both phases. Blends made with a single- or twin-screw extruder show better dispersion than that of those made with an internal mixer. Study of the melt-rheological properties enabled the enhancement of the compatibilizer's effect. In addition, the presence of the compatibilizing polymers in both PE/PP and PE/PS blends does not modify the crystallinity of the PE/PP and PE/PS blends. From all these analyses, the compatibilizer is located at the interface as the characteristics of the two polymers are the same in the compatibilized and uncompatibilized blends. Charpy impact tests confirmed these results and proved that the single-screw extruder can be considered as an efficient processing method to make polymer blends, which is an interesting feature for the industrial scale. In addition, whereas one generally tends to recycle blends of compositions 80/20 and 20/80, this work shows that, thanks to the selected compatibilizer, blends of type 60/40 or 40/60 can have properties even higher than those of blends of 80/20 or 20/80. This conclusion is also interesting on an industrial scale. Additional work is under investigation to correlate the morphology and mechanical properties to viscoelastic properties of PE/PP and PE/PS blends and to study the effect of model pollutants (ethylene glycol and oil for engines) on the properties of these blends.

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