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Compatibilization of poly(ether imide)/Rodrun blends by means of a polyarylate

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Abstract

A compatibilization method for improving the mechanical properties of thermoplastic/liquid-crystalline polymer (LCP) blends has been tested in blends of poly(ether imide), PEI, with a thermotropic copolyester (Rodrun). It is based on the addition to the blend of a third component, both miscible with the matrix and also able to interact with the LCP. Given the miscibility of a polyarylate (PAr) with PEI up to 20% PAr content, and its probable interactions with Rodrun, a constant 20% PAr was added to the PEI matrix to test its possible compatibilizer activity in PEI/Rodrun blends. The observed decrease in the interfacial tension between the matrix and the dispersed phase induced by the PAr gave rise to a smaller size and to fibrillation of the dispersed phase. Fibrillation also gave rise to improved modulus of elasticity and tensile strength, thus proving the compatibilization activity of PAr. © 2000 Elsevier Science Ltd. All rights reserved.

Keywords: Poly(ether imide); Rodrun; Polyarylate

1. Introduction

Blends composed of thermoplastics and small amounts of liquid-crystal polymers (LCPs) have been the subject of a number of studies [1–3]. Among the reasons for this research activity, the possibility of obtaining reinforced materials based on these blends is probably the most important. The possibility of reinforcing arises from the fact that, during processing, the LCPs may be strongly oriented in the blends. The possibility of orientation is due to their special chemical structure, and gives rise in the solid state to fibrillar structures with high stiffness and strength which are the so-called “in-situ composites”. These composites show a level of properties comparable to those of conventional glass fibre-reinforced thermoplastics [4]. An additional advantage of these blends is the low melt viscosity of LCPs, compared to the high friction and wear of conventional mineral reinforcements on the metallic components of the processing machinery.

Among thermoplastic/LCP blends, those containing engineering thermoplastics as the matrix are probably the most studied. This is with the main exception of polypropylene (PP), whose blends with different LCPs have also been studied extensively [5,6].

Poly(ether imide) (PEI) is an amorphous high performance thermoplastic, which has been commercialized in glass and carbon fibre-reinforced grades. For this reason, reinforcement by means of LCPs is an obvious potential extension to the development of PEI-based materials. Thus, different PEI/LCP blends, such as those with Vectra A [7–12], Vectra B [13,14], HX1000 [8,9,15–17], HX4000 [15–17], K161 and KU-9221 [12] have been studied. Ternary blends containing PEI, poly(ether ether ketone) (PEEK) and LCPs have also been studied [18–22].

Recently, blends of PEI with an ethylene terephthalate/*p*-hydroxy benzoate (20:80) thermotropic copolyester (Rodrun 5000) have been studied [23–27]. The aspects studied included the acid–base interactions between the blend components [23], the interfacial adhesion strength [24], the calorimetric and dynamic-mechanical behaviour and the determination of the interaction parameter [25], and the influence of the composition [26] and of the processing method [27] on the morphology and mechanical properties of the blends. As usual in thermoplastic/LCP blends, PEI and Rodrun appeared as immiscible [23,25–27]. Moreover, they showed a poor dispersion of LCP in the thermoplastic matrix, either after direct mixing by injection moulding [26] or after mixing by extrusion and subsequent

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injection moulding [27]. No significant fibrillation of Rodrun was attained, and the interfacial adhesion was low, giving rise to mechanical properties lower than those might be expected on the basis of those of the pure components.

The fibrillar morphology that leads to good mechanical properties does not often appear in thermoplastic/LCP blends. This is because, for instance, a high interfacial tension may lead to the existence of sphere-like structures far from the desired elongated fibres. However, the morphology may be improved by means of compatibilizers that decrease the interfacial tension between the components, thus facilitating fibrillation. Moreover, they increase the interfacial adhesion between the matrix and the dispersed phase in the solid state. The most used compatibilization method is the addition of some chemically modified polymer matrix that may interact with the LCP, such as maleic anhidride-grafted polypropylene [5,28], but copolymers [29,30], sulfonate ionomers [31], and epoxy couplers [32,33] for example have also been used. Some of them have been used in PEI/LCP blends [29,30].

The double role of interaction with both the matrix and the LCP may be accomplished by the above-stated techniques, but it may also be accomplished by a single polymer without the chemical modification of the matrix or production of any copolymer. Hence, in this work, a different compatibilization method is explored. It consists of the addition of a second thermoplastic, miscible with the matrix, which additionally may interact with the LCP. This method was tested in PEI/Rodrun blends by means of the addition of small amounts of a polyarylate (PAr). It is known [34,35] that the addition of PAr to PEI gives miscible blends at low PAr contents. Moreover, the interactions between PAr and Rodrun are likely, given the polyester nature of both polymers. So, compatibilization of the PEI/Rodrun blends by PAr seems reasonable. In this work, ternary PEI/PAr–Rodrun blends were obtained by a two stage melt mixing process in an extruder, and subsequent injection moulding. The structures of the blends were studied by DSC and SEM. The mechanical properties were measured by means of tensile testing and were compared with those of the corresponding binary PEI/Rodrun blends.

2. Experimental

The polymers used were commercial PEI (Ultem 1000, General Electric), Rodrun LC-5000 (Unitika Ltd.) and polyarylate (PAr) (U-Polymer, Unitika Ltd.). The molecular weights of PEI are $M_w = 30,000$ and $M_n = 12,000$. Rodrun is a 20:80 ethylene terephthalate/*p*-hydroxy benzoate copolyester, with an intrinsic viscosity of 0.552 dl/g, as determined at 30°C in a phenol/tetrachloroethane (50:50) mixture. The PAr was a copolyester of bisphenol-A and a 50:50 mixture of isophthalic and terephthalic acids with average molecular weights of $M_w = 51,500$ and $M_n = 21,500$, determined by GPC in THF at 30°C. All polymers were dried before processing in order to avoid possible degradation reactions caused by moisture. PEI and Rodrun were dried for 8 h at 135°C and PAr for 24 h at 80°C.

The PEI/Rodrun blends were prepared at 330°C using a single-screw extruder (Brabender) attached to a Brabender PLE-650 plasticorder, and equipped with a six-element Kenics static mixer. The screw had a diameter of 19 mm, *L*/*D* of 25 and compression ratio 2:1. A rod extrudate was obtained and pelletized at the exit of the die. To prepare the ternary blends, first, PEI and PAr were mixed in a 80:20 composition under the same conditions as those used to prepare the PEI/Rodrun blends. Then, dry mixtures of the PEI/PAr (80:20) pellets and different Rodrun contents were fed into the extruder to obtain the ternary blends which were also pelletized. The ternary compositions will be named as PEI/PAr–Rodrun (80:20-XX), XX being the Rodrun content with respect to the whole blend. The Rodrun content ranged from 5 to 40%. The extruder was operated under the same conditions as those used to prepare the binary blends. The additional extrusion suffered by the PEI/PAr blends should not influence the mechanical behaviour, given the high thermal stability of both polymers [36,37].

Both the PEI/Rodrun and PEI/PAr–Rodrun blends were injection moulded using a Battenfeld BA230E reciprocating screw injection moulding machine. The screw had a diameter of 18 mm and *L*/*D* ratio of 17.8. The melt and mould temperatures were 330 and 85°C, respectively. The mould provided 2-mm thick tensile specimens according to ASTM D-638, type IV. The injection speed was 23 cm^3/s, and the injection pressure 2850 bar. Neat PEI and Rodrun were injection moulded under the same conditions in order to use them as a reference.

The phase behaviour of the blends was analysed by differential scanning calorimetry (DSC). A Perkin Elmer DSC-7 calorimeter was used. A first scan was carried out from 30 to 330°C at 20°C/min in order to remove the previous thermal history. After cooling at the maximum speed provided by the calorimeter (approximately 100°C/min), a second scan was carried out under the same conditions as the first. The glass transition temperatures (T_g) and the melting temperature (T_m) of Rodrun were determined in the usual way. The calorimeter was calibrated with respect to an indium standard and a nitrogen flow was maintained through the sample and reference chambers.

Tensile tests were carried out in an Instron 4301 tensile tester at room temperature. The mechanical properties (Young's modulus, tensile strength, and ductility, measured as the break strain) were determined from the load–elongation curves. At least eight specimens were tested for each reported value.

The morphology of the tensile-broken specimens was studied by scanning electron microscopy (SEM), after gold coating. A Hitachi S-2700 microscope was used at an accelerating voltage of 15 kV.

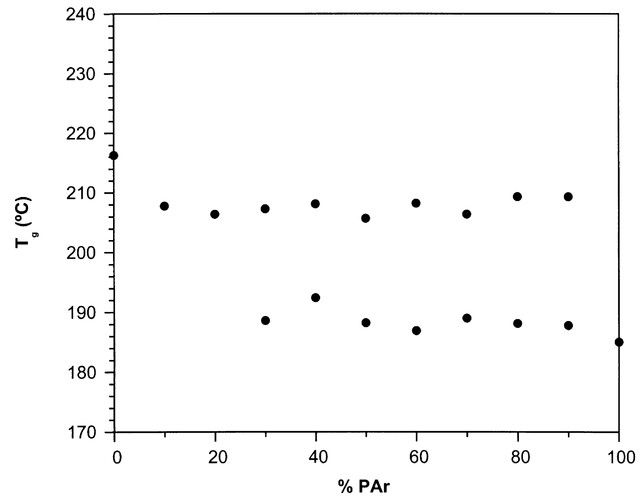

Fig. 1. Glass transition temperatures of PEI/PAr blends, determined by DSC. (Reproduced from Ref. [34]. Copyright (1996) with kind permission from Elsevier Science, Ltd.)

Interfacial tension measurements were carried out by means of the two-liquid Harmonic Method [38–40]. The contact angle measurements of the two liquids on the surface of each polymer were carried out in a CAM 100 Goniometer (KSV), using water and ethylene glycol. The mean standard deviation of the measurements was 2–3°, which gave rise to an error of approximately 20% in the interfacial tension values.

3. Results and discussion

3.1. Possibility of interactions between the components of the blends

Two conditions related with the level of interaction must be fulfilled by a compatibilizer of thermoplastic/LCP blends: (i) it has to interact with both the matrix and the dispersed LCP phase, but (ii) the interactions should not lead to partial miscibility with the LCP because the amount of reinforcing fibres decreases. As stated above, PAr is partially miscible or fully miscible with PEI depending on the composition, so interactions with PEI are inevitable. With respect to the possibility of interactions between PAr and Rodrun, both are polyesters, so, according to the results obtained by different authors [41], interactions between the functional groups of both polyesters should exist. They would favour miscibility or, at least, interfacial adhesion. For example, blends of PAr and an ethylene terephthalate/*p*-hydroxy benzoate (40:60) copolymer, which has the same components as Rodrun but in a different proportion, are partially miscible [42,43]. So, some interaction between PAr and Rodrun ought to exist.

Transesterification reactions have been demonstrated to take place [42] after annealing at high temperature in the blends of PAr with the LCP mentioned above, which comprises the same components as those of Rodrun. The processing temperature of this work (330°C) is high enough for transesterification to take place. It was selected taking into account the favourable effect of high processing temperatures on the morphology of the PEI/Rodrun blends [27], and the fact that previous studies [27] showed that a higher processing temperature (350°C) gave rise to degradation and deteriorated the mechanical properties of Rodrun. However, in this work, the dwell time between consecutive injection moulding cycles of the blends was short (2 s) in order to minimize possible chemical reactions between PAr and Rodrun and thus to investigate only the physical effects of the interactions between PAr and Rodrun. So, in this work, transesterification reactions [41,44] will be minimized. The effects of chemical reactions will be the subject of another work, but if they took place, they would enhance possible interactions and the interphase conditions.

The possibility of interchange reactions and that of partial miscibilization was checked by preparing a PAr/Rodrun (50:50) blend in a Brabender mixing head, that provides intensive mixing, at 330°C, until the torque became constant. This blend showed two glass transitions at 185 and 63°C by DSC, which correspond to the practically pure PAr and Rodrun phases. This showed the lack of significant reactions at short blending times and the almost complete immiscibility of the blend. Almost total immiscibility was also suggested by the melting temperature of Rodrun in the blend (279°C), which was almost identical to that of pure Rodrun. Thus, the level of interactions with PEI and Rodrun that PAr gives rise to, fulfils the two conditions initially stated for a compatibilizer of PEI/Rodrun blends; the interactions of PAr with both components probably exist, but they are not strong enough to produce a significant miscibilization with the Rodrun.

3.2. Determination of the amount of compatibilizer

Before the ternary compatibilized blends were studied, the amount of the PAr to be added to compatibilize the blends had to be decided. According to previous results obtained in our laboratories [34,35], as indicated in Fig. 1, where the T_g results of the PEI/PAr blends taken from Ref. [34] are shown, PAr is partially miscible with PEI for compositions with PAr contents higher than 20 wt%. However, the PEI/PAr 90:10 and 80:20 blends showed a single glass transition intermediate between those of the pure components, which indicates full miscibility. The presence of miscibilized PAr in the matrix will assure its contact with Rodrun, and the control of the morphology of Rodrun will also be easier in the case of a monophasic matrix. Moreover, the properties of the PEI/PAr blends in the miscible region of low PAr content showed only a very slight decrease with respect to those of neat PEI. Thus, a

Table 1
Glass transition temperatures of the PEI/Rodrun and PEI/PAr–Rodrun blends

% Rodrun	$T_{g,PEI/Rodrun}$ (°C)	$T_{g,PEI/PAr-Rodrun}$ (°C)
0	217	205
5	209	201
10	212	201
20	206	196
30	212	195
40	212	195

composition within the miscible range should be chosen. Of the possible PAr contents, taking into account that 20% PAr is not high for Rodrun contents up to 40%, and that the maximum miscible amount (20%) has to assure a maximum interaction level, a constant PEI/PAr (80:20) composition was selected as the matrix of the compatibilized blends.

3.3. Phase behaviour of the uncompatibilized and compatibilized blends

According to our previous results [26], PEI and Rodrun form immiscible blends. Taking into account that the processing conditions of this work are in part different and that the mixing procedure might have an effect on the phase structure, the full immiscibility of the binary PEI/Rodrun blends was confirmed by DSC. The obtained T_g values are summarized in Table 1. As can be seen, only one T_g was observed. A transition would be expected near 60°C, corresponding to the Rodrun phase [45]. It is not reported in Table 1 because it was not clearly observed due to the small specific heat increase of Rodrun at the glass transition and to its low content in the blends. The observed T_gs correspond to an almost pure PEI phase. The slight decrease in the T_g of the blends with respect to that of neat PEI is similar to that found previously [26], and also to that seen in the PEI/Vectra B950 blends [13]. It was not attributed to a slight LCP presence in the PEI phase, but to a more active movement of the LCP chains in the blends.

Table 1 also summarizes the T_gs determined for compatibilized blends. As in the case of the PEI/Rodrun blends, neither the glass transition nor the melting endotherm of Rodrun were clearly observed. The T_g of the neat PEI/PAr (80:20) blend was below that of pure PEI, as expected from the miscibility of the blend at this composition [34,35]. The slight decrease observed for blends containing increasing Rodrun contents could be due to a slight level of transesterification reactions between PAr and Rodrun. However, the decrease is similar to that seen on the left-hand side of Table 1 for blends without PAr, so it is probably due to the same reasons. These results indicate a practically full immiscibility, and the presence in the compatibilized blends of two practically pure phases composed of Rodrun and a miscible 80:20 PEI/PAr blend.

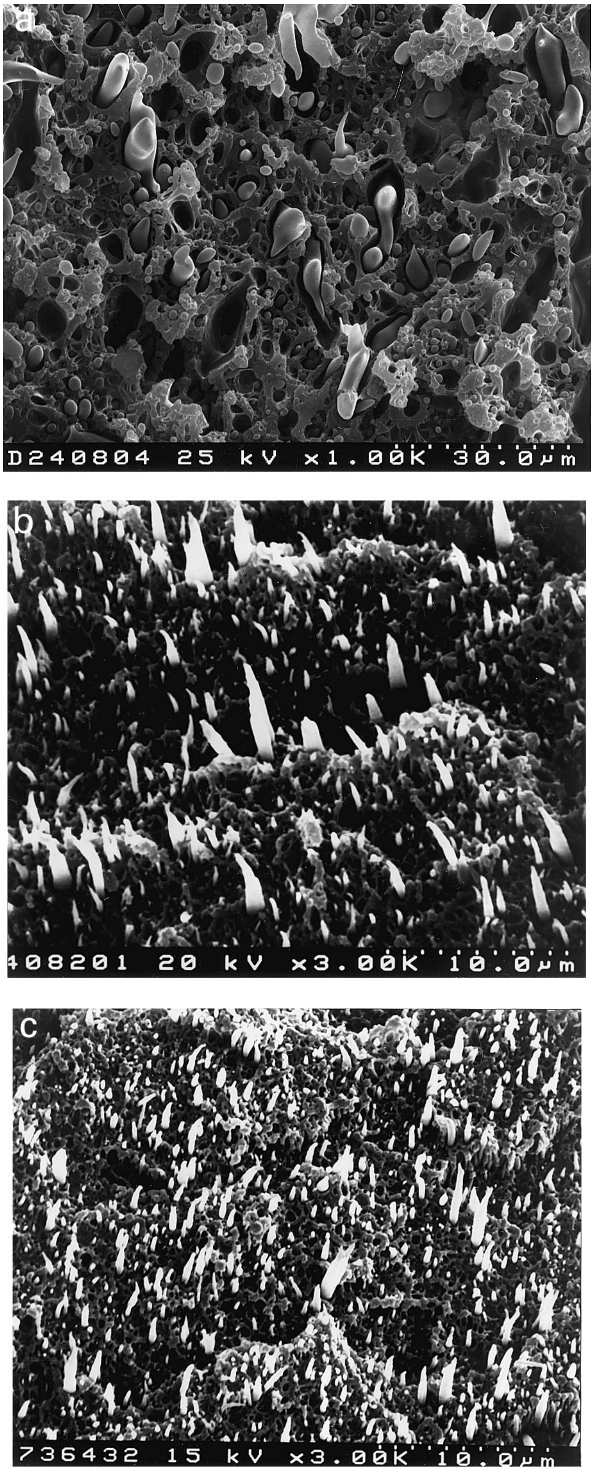

Fig. 2. Tensile fracture surfaces of the core of the PEI/Rodrun (80:20) blend (a), and of the skin (b), and the core (c) of the PEI/PAr–Rodrun (80:20–20) blend.

3.4. Morphology

The morphology of the compatibilized PEI/PAr–Rodrun blends is shown in Figs. 2 and 3, compared with that of the PEI/Rodrun blends as a reference. Fig. 2a shows the core of

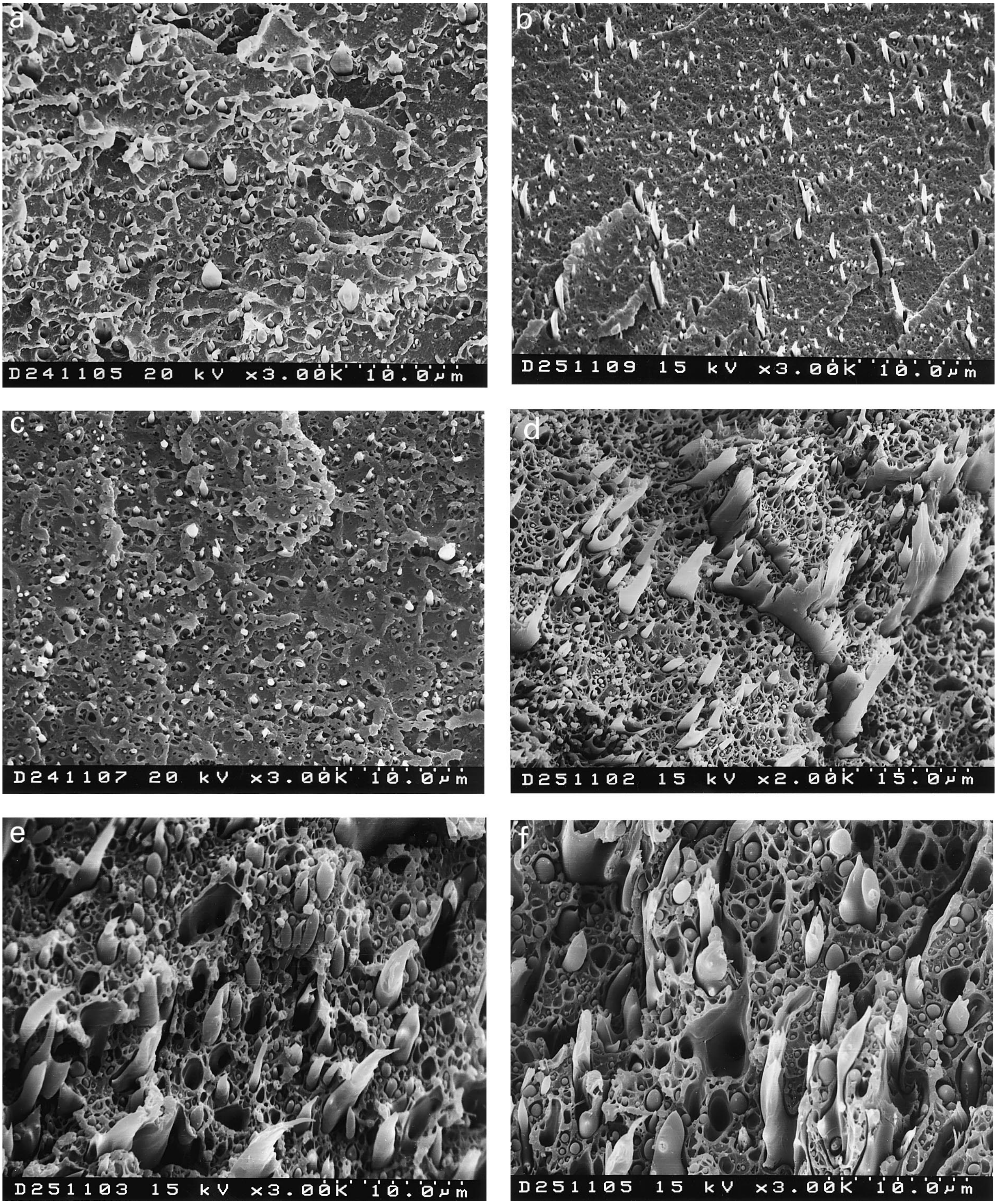

Fig. 3. Tensile fracture surfaces of the core of the 80:20–5 blend (a), the skin (b) and the core (c) of the 80:20–10 blend, the skin (d) and the core (e) of the 80:20–30 blend, and the core of the 80:20–40 blend (f).

an uncompatibilized PEI/Rodrun (80:20) specimen. It is representative of the whole morphology, because it was practically constant across the thickness of the specimens. As can be seen, despite the premixing (screw extrusion and static mixer), the dispersion is poor. A mixture of large (10 μm) apparently coarsened particles and smaller dispersed particles with a very wide range of sizes appeared. When the morphology of the binary blend of Fig. 2a is compared with that of the 80:20–20 compatibilized blend (Fig. 2b and c), it is clear that the dispersion is much better and that slightly oriented structures are found both in the skin (Fig. 2b) and also with a similar shape in the core

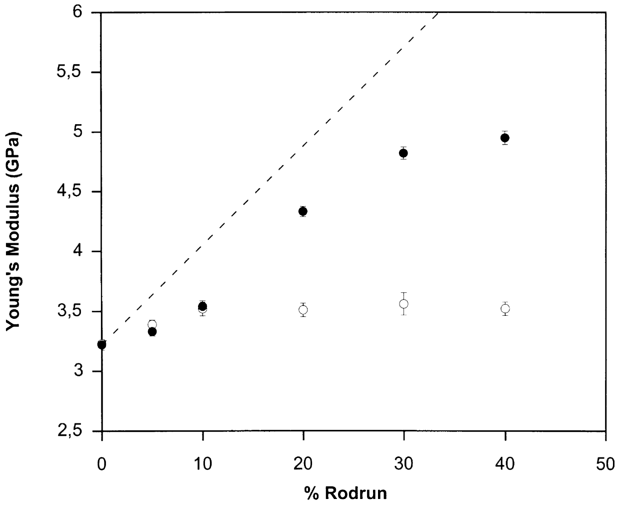

Fig. 4. Young's modulus of the uncompatibilized PEI/Rodrun (○) and compatibilized PEI/PAr–Rodrun (●) blends.

(Fig. 2c). The aspect ratio of the particles (l/*d* from 5 to 10) is not big, but the presence of oriented structures, which were absent in the uncompatibilized PEI/Rodrun blends, supposes an important morphological improvement. This elongated blend morphology leads to a clear increase in the contact surface in the solid state and, consequently, in the amount of stress which can be transmitted from the thermoplastic matrix to the LCP reinforcement of the blends. This should influence the mechanical properties, as we shall see below.

The morphology of the rest of the blends at an angle of 30° is shown in Fig. 3a–f, where the morphology of the core (similar to the skin) of the 5% Rodrun (Fig. 3a), the skin and the core of the 10% Rodrun (Fig. 3b and c) and 30% Rodrun (Fig. 3d and e) blends, as well as that of the core of the 40% Rodrun (Fig. 3f) blends are shown.

As can be seen in Fig. 3a of the 80:20–5 blend, very slightly deformed and very short particles were present both in the skin and in the core. The same was seen in the case of the 80:20–10 blend; although in this case the fibrillation of the skin was more important in some of the fibres which showed aspect ratios between 5 and 10. This morphology contrasts with the well developed and general fibrillation of the 80:20–20 blends of Fig. 2b and c that, additionally, was also present in the core.

In the case of the 80:20–30 blend of Fig. 3d and e, fibrillation also took place but the fibres were thicker and even some platelets were seen in the skin. The 80:20–40 blend showed the same morphological features. The presence of platelets was probably due to the coalescence of the Rodrun phase that is favoured at increasing contents of this component in the blends [46,47]. However, these morphologies are also clearly more favourable than the slightly oriented thick particles among a majority of unoriented and very large clusters of the binary PEI/Rodrun (60:40) blends which, in some cases, were even directly observable.

Considering the reasons for the presence of oriented particles, it is known [48–54] that one of the main factors that affect the deformation of dispersed particles is the viscosity ratio ($\lambda = \eta_d/\eta_m$) between the dispersed phase and the matrix of the blend. The ratio between the melt viscosities of Rodrun and PEI at 330°C and at a shear rate of $10^3\ s^{-1}$ (of the order of the usual range in injection moulding) is very small (2.5×10^{-3}). Although the optimum viscosity ratio range for fibrillation is a matter of discussion [48,52,54–57], a $\lambda = 2.5 \times 10^{-3}$ appears to be very low compared to those which have been found previously to produce fibrillation in most thermoplastic/LCP blends. The incorporation of PAr to PEI in compatibilized blends reduces the viscosity of the thermoplastic matrix, so that the viscosity ratio increases to 7×10^{-3}. However, this increase is too small to even partially favour the orientation of Rodrun particles. Therefore, the appearance of elongated structures and small Rodrun particles in compatibilized blends seems to be due to another parameter such as a decrease in the interfacial tension between the matrix and the Rodrun phase. To confirm the decrease in interfacial tension between Rodrun and PEI/PAr (80:20) with respect to that between Rodrun and PEI, it was measured by the contact angle. The clearly different values of 0.92 and 0.35 mN/m, respectively, for the uncompatibilized and compatibilized blends, proved the decrease in interfacial tension induced by the PAr presence and as a consequence its compatibilizer activity.

3.5. Mechanical properties

The effects of compatibilization on the mechanical properties of the blends were analysed by means of tensile tests. In Fig. 4, Young's moduli of the PEI/Rodrun and PEI/PAr–Rodrun blends are compared with those of the additivity tie line between the values of neat PEI and Rodrun (3.3 and 11.2 GPa, respectively), which are used as a reference.

As observed, the uncompatibilized blends showed modulus values only slightly higher than that of PEI and the PEI/PAr 80:20 blend [35], which have the same value and are plotted on the vertical axis. The modulus–composition relationship is less than linear for all the blends. In the case of uncompatibilized blends, this is due to the poor dispersion and the lack of orientation of the LCP that, consequently, did not reinforce the thermoplastic. In the case of compatibilized blends, the modulus–composition relationship below linearity indicates that the Rodrun orientation is lower in the blends than in the neat thermotropic copolyester. As can be seen, the addition of PAr, which is less stiff (modulus of elasticity 2 GPa) and cheaper than PEI, did not change the moduli of the blends for Rodrun contents equal to or below 10%. This was probably due to the lack of significant orientation of the Rodrun dispersed phase that was seen in Fig. 3a–c. However, the incorporation of PAr in the PEI/Rodrun blends with Rodrun contents equal to or higher than 20%, gave rise to increases in Young's modulus of roughly 30% with respect to the modulus of pure PEI.

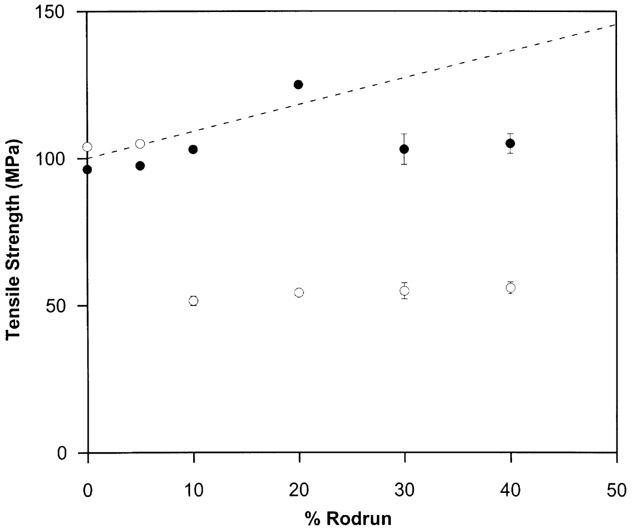

Fig. 5. Tensile strength of the uncompatibilized and compatibilized blends (symbols as in Fig. 4).

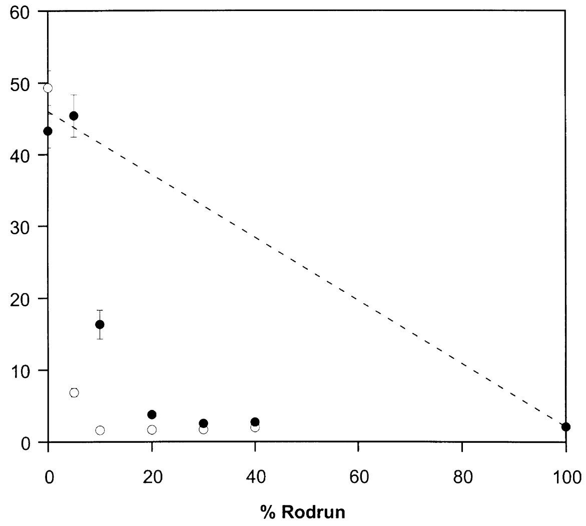

Fig. 6. Ductility of the uncompatibilized and compatibilized blends (symbols as in Fig. 4).

The maximum modulus increase was approximately 50% in the blends with 40% Rodrun. The modulus increase showed a tendency to stabilize at Rodrun contents higher than 30%. This was probably due to the bidimensional structures obtained for the 80:20–40 blend, which reinforce the matrix to a smaller extent than the unidirectionally oriented particles due to their smaller surface/volume ratio. The modulus increases observed in blends with at least 20% Rodrun are due to the orientation of the Rodrun dispersed phase that, after compatibilization, took place not only at the skin, but also in the core of the blends.

The effect of this compatibilization gives rise to a mean modulus increment of 33% in the PEI/PAr–Rodrun blends with respect to the PEI/Rodrun ones for Rodrun contents between 20 and 40%. It is comparable to that found, for example, in the PP/Vectra B950 blends compatibilized with maleic anhydride-grafted PP, which showed a mean increment of 25% for Vectra B950 contents from 20 to 50% [28]. PP/Vectra A900 and PP/Rodrun 3000 [5] displayed increases of 20 and 40%, respectively, in the same composition region. The PP/Vectra B950 blends compatibilized with an ethylene/methacrylic acid copolymer partially neutralized with Zn [55], showed a 20% mean modulus increase with respect to the uncompatibilized blends. The addition of a variable amount of a poly(ester imide) to strands obtained from the PEI/Vectra B950 (75:25) blend [30] gave rise to a maximum modulus increment of 20%. This proves the validity of the compatibilization method used in the present work.

The effect of compatibilization is also clearly displayed by comparing the tensile strengths of uncompatibilized and compatibilized blends that are shown in Fig. 5 against the Rodrun content of the blends. The PEI/Rodrun blends showed a clear tensile strength decrease for Rodrun contents between 5 and 10%, which was probably due to the dispersed particle size increase. However, the tensile strength of the PEI/PAr–Rodrun blends did not show any decrease at increasing Rodrun contents, but it increased and followed approximately the linear interpolation between the values of the neat components. Despite the fact that the tensile strength of PEI is 60% above that of the PAr (66 MPa), the tensile strength of the blends was higher than that of PEI, and reached its maximum value (20% above that of pure PEI) at a Rodrun content of 20%. This was in agreement with the best morphology, with fibres even in the core, observed at this composition in Fig. 2b and c. The lack of additional reinforcement at Rodrun contents higher than 20% is attributed to the presence of the bidimensional structures observed in Fig. 3d. The negative effect on the mechanical properties of thermoplastic/LCP blends of the presence of bidimensional structures has been observed before [14] and is due, as in the case of the modulus of elasticity, to the smaller surface/volume ratio of these structures compared with that of fibres. A larger surface even at the same LCP content allows a more efficient fibre contribution at the same adhesion level.

Finally, the ductility of the PEI/Rodrun and PEI/PAr–Rodrun blends also showed the positive effect of compatibilization. As seen in Fig. 6, where the ductility of both the uncompatibilized (empty circles) and compatibilized (filled circles) blends is shown against the Rodrun content, both PEI and the 80:20 PEI/PAr blend are ductile materials with a break strain of approximately 45%, while that of Rodrun is slightly higher than 2%. The PEI/Rodrun blends, with the exception of the 95:5 composition, which broke immediately after yielding, broke in the linear elastic region of the tensile curves, at a strain close to 2%. This behaviour is usual in blends of thermoplastics with LCPs [14,16,50,58–61], and is due to the intrinsic brittleness of the LCP and the usually low interfacial adhesion between the phases of the blends. However, the ternary blends with 5 and 10% Rodrun content gave rise to a remarkable ductility increase, that made the compatibilized 10% Rodrun blend to appear to be ductile, in clear contrast with the brittle behaviour of the correspondent uncompatibilized blend. The effect was clearly smaller for Rodrun contents of 20% or higher, due to the important presence of the brittle LCP and to the increase in the particle size of the blends with 30 and 40% Rodrun content. However, the ductility values for PEI/PAr–Rodrun blends are always higher than those of PEI/Rodrun blends. This delayed fracture agrees with the increased interfacial adhesion, modulus of elasticity and tensile strength of the ternary blends. All these experimental evidences prove the compatibilization effect of PAr in the PEI/Rodrun blends.

4. Conclusions

The change of the nature of the matrix by means of the addition of a second thermoplastic component miscible with the matrix and that can interact with the LCP, has been shown to be a valuable compatibilization method in thermoplastic/LCP blends. When a polyarylate (PAr) was added to the incompatible PEI/Rodrun blends, compatibilization was attained by means of the miscibility of PAr with PEI and of the interactions between PAr and Rodrun. This method led to the decrease in the interfacial tension between the matrix and the dispersed phase and as a consequence to an improved fibrillation of the Rodrun phase. As a consequence, the mechanical properties of the ternary PEI/PAr–Rodrun blends improved with respect to those of the corresponding PEI/Rodrun system. This gave rise, in the case of the blends with 20% Rodrun, to increases in the modulus of elasticity and the tensile strength of 30 and 20%, respectively, with respect to those of pure PEI.

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