

Weld Line Characteristics of PC/ABS Blend.

II. Effect of Reactive Compatibilizer

Jong Cheol Lim,¹ Kuk Young Cho,² Jung-Ki Park³

¹Chemical R&D Center, Research Institute of Chemical and Electronic Materials, Cheil Industries Inc., 332-2, Gocheon-dong, Uiwang-si, Gyeonggi-do, 437-711, Korea

²Division of Advanced Materials Engineering, Kongju National University, 275, Budae-dong, Cheonan, Chungnam, 303-717, Korea

³Department of Chemical and Biomolecular Engineering and Center for Advanced Functional Polymers, KAIST, 373-1, Guseong-dong, Yuseong-gu, Daejeon, 305-701, Korea

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ABSTRACT: The effects of reactive compatibilizer and processing temperature on the morphology and the mechanical properties at the weld line of 60/40 (wt/wt) polycarbonate (PC) and acrylonitrile-butadiene-styrene (ABS) copolymer blends were investigated. Amine functionalized styrene/*n*-phenyl maleimide/maleic anhydride terpolymer (amine-SPMIMA) was used as the *in-situ* reactive compatibilizer for PC/ABS blend. Weld tensile strength increased as the content of amine-SPMIMA was increased. Weld

impact strength showed maximum value for the blend containing about 3% amine-SPMIMA. The variation in the mechanical property at the weld line was correlated with the change in the morphology of the blend. © 2008 Wiley Periodicals, Inc. *J Appl Polym Sci* 108: 3632–3643, 2008

Key words: weld line; morphology; PC/ABS; reactive compatibilizer

INTRODUCTION

Multiphase blends often require compatibilization to obtain useful properties; however, the relatively favorable interaction between polycarbonate (PC) and styrene/acrylonitrile (SAN) copolymer matrix of acrylonitrile-butadiene-styrene (ABS) apparently makes it possible to produce commercially useful materials without any compatibilizer.^{1–8}

However, under certain molding conditions, these uncompatibilized PC/ABS blends undergo significant coalescence of dispersed phase particles, and this leads to a severe deterioration of the properties of the blends.^{9–11} To alleviate this adverse effect of coalescence, compatibilization using appropriate additives is often employed to enhance adhesion between the blend components of PC/ABS blends.^{12–19}

An amine functionalized styrene-acrylonitrile (amine-SAN) polymer was proposed as a reactive compatibilizer for PC/ABS blends.^{20–24} This was based on the reaction of the secondary amine groups in amine-SAN and the carbonate groups in PC (see Fig. 1). To utilize this concept, Wildes et al.^{20–24} chose styrene/acrylonitrile/maleic anhydride (S/AN/MA)

terpolymer as a platform to form an amine functionalized compatibilizer by reactive extrusion with 1-(2-aminoethyl) piperazine (AEP).

Weld line is the visual and structural defect that occurs when two melt flow fronts meet in the injection molding process. The weakness of welded regions for the homopolymer systems can be minimized by adjusting molding condition such as melt temperature.^{25–35}

In the case of polymer blends, together with the effect of processing conditions, the morphology at the weld line should be considered. The rheological properties of the blend components and the compatibilization are important factors that control the morphology of the dispersed phase at the weld line.^{36–42}

Shieu et al.³⁸ examined the microstructure and tensile strength of the weld zone of PC/ABS blends prepared by two different welding techniques, i.e., hot plate welding and vibration welding. Fellahi et al.^{35,39,40} investigated the morphology and the tensile strength of weld-line specimens of nylon-6 and high-density polyethylene blend with and without an ionomer as a compatibilizer. Semba and Hamada⁴³ observed the etched samples of PC/ABS injection moldings using scanning electron microscopy and reported that a weld part with fine dispersion of ABS was found in the area below V-notch and the interface between the weld part and the part behind the weld part was the weakest part.

Correspondence to: J. K. Park (jungpark@kaist.ac.kr).

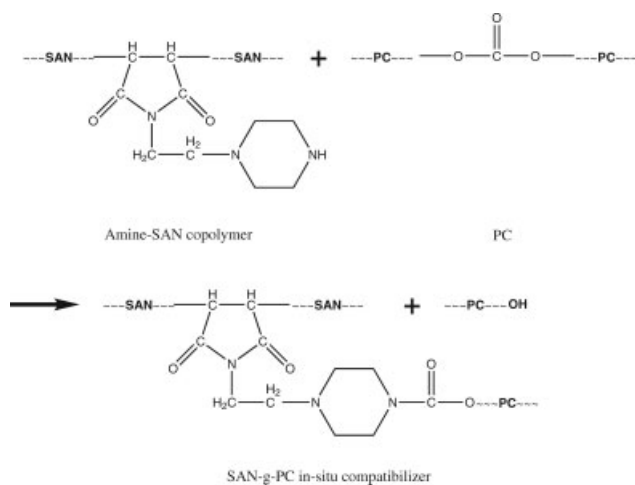


Figure 1 Schematic of the reaction of SANMA terpolymer with 1-(2-amino-ethyl) piperazine (AEP) to form amine-SANMA.

In the present study, the relationship between the morphology and the mechanical property at the weld line of the PC/ABS (w/w) 60/40 blend compatibilized with amine functionalized reactive compatibilizer was investigated. The effect of varying injection molding temperature was also studied.

EXPERIMENTAL

Materials

We chose styrene/*n*-phenyl maleimide/maleic anhydride (SPMIMA) terpolymer as the platform to form the amine functionalized compatibilizer, which is commercially available and known to be miscible with the SAN copolymer (see Fig. 2).

ABS was used in the form of blend of styrene-acrylonitrile copolymer (SAN) and ABS graft rubber concentrate (g-ABS).

A commercial grade of bisphenol-A polycarbonate (PC), two of SAN copolymer, a g-ABS rubber concentrate, and a SPMIMA terpolymer were used in this study. The PC was in granular form from Teijin Chemicals, Japan. SAN and g-ABS rubber concentrate powder were obtained from Cheil Industries, Korea. SPMIMA terpolymer in crushed form is produced by Denki Kagaku Kogyo Kabushiki Kaisha (DENKA), Japan. The composition and suppliers of the polymers used in this work are shown in Table I.

Preparation of amine-SPMIMA

SPMIMA was dry mixed with SAN copolymer to a composition of 50/50 wt/wt SPMIMA/SAN. Then 1.5 wt % of 1-(2-aminoethyl) piperazine (AEP) based on the content of SPMIMA/SAN was added to the dry SPMIMA/SAN mixture. Functionalization of the

SPMIMA terpolymer was carried out in a 40Φ (length/diameter ratio = 34.5) Berstorff intermediating corotating twin-screw extruder equipped with 10 heated barrel sections, vacuum vent (Zone 7), and die face pelletizer. The barrel and die temperature were 280 and 270°C, respectively. The screw was operated at 250 rpm and polymer mixture was fed at a rate of 35 kg/h. The vent stage had a water-cooled vacuum pump system operating at 20–50 mmHg. Devolatilization was required to remove residual AEP and water produced by the imidization.

Preparation of polymer blend

Materials were dry mixed to a desired composition before being melt blended in the above extruder. The blending temperature was regulated according

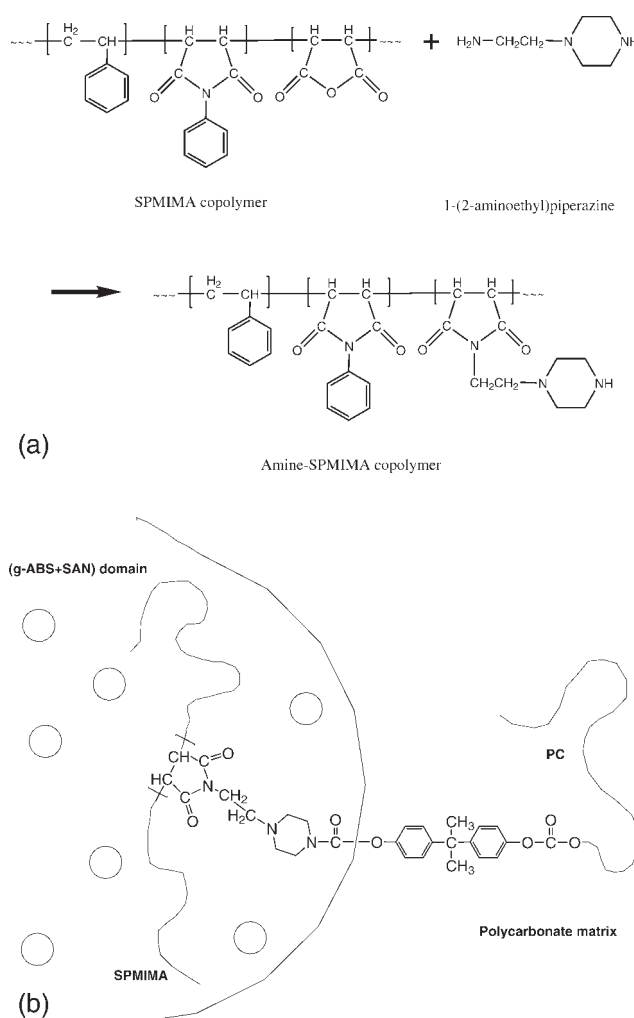


Figure 2 Schematic of (a) the reaction of SPMIMA terpolymer with AEP to form amine-SPMIMA, (b) PC/ABS blend compatibilized by SPMIMA-g-PC copolymers formed from the reaction of amine-SPMIMA with PC during melt processing.

TABLE I
Characteristics of the Materials Used

Material	M_w	Characteristics	Supplier
SAN	95,000	AN content: 24.5 wt %	Cheil Ind. Inc.
SAN-H	192,000	AN content: 27.5 wt %	Cheil Ind. Inc.
g-ABS	–	Core: PBD(58%), Shell: SAN	Cheil Ind. Inc.
SPMIMA	171,000	SM: 48.2%, PMI: 49%, MA: 2.8%	LG Chem
PC	25,000	Bisphenol-A type	Teijin

to the composition. The blend was then water cooled at room temperature, palletized, and stored.

A Haake torque rheometer PolyLab system Rheocord 300P and Rheomix 600P with standard rotors was used to make polymer blend and to measure torque as a function of time at 240–280°C and 60 rev min⁻¹ to characterize the melt rheology of the polymers and their blends.

Injection molding

Prepared pellets were dried in an air circulating oven at 80°C over 12 h to remove residual moisture. Dried pellets were then fed into an injection molding machine (IDE140ENII: LG, Korea) with a clamping force of 100 tons. The PC/ABS blends were injection molded at three different injection molding temperatures, 240, 260, and 280°C, respectively. A double-gate mold was used to provide a weld line (cold weld type) in the specimen.

Mechanical properties

The tensile properties of injection-molded specimens were obtained by using a universal tensile machine (Instron 4467) with a crosshead speed of 5 mm/min at room temperature.

The specimens for impact properties were prepared according to ASTM D256 ($L \times T \times W = 64 \times 3.2 \times 12.8 \text{ mm}^3$) by using the same injection molding machine employed in the tensile specimen. Impact strength was measured with a Toyoseiki impact tester at room temperature.

Morphological measurement

A small rectangular strip of PC/ABS sample is placed in liquid nitrogen for more than 10 min, and then fractured manually. The freeze fractured surfaces were then subjected to chemical treatment, by which ABS component was etched out. The solution for etching treatment was the mixture of sulfuric acid 240 g, distilled water 60 g, and potassium dichromate 10 g. The treatment time was 10 min at solution temperature of 75°C. After the etching treatment, the specimens were washed in water. Etched-out surfaces were then treated with a gold-

palladium layer and examined in JEOL JSM-840A scanning electron microscope.

Samples cut from the mold gate and weld zone of injection molded polymer blend containing rubber particles were trimmed and polished into a trapezoid shape suitable for ultramicrotomy and then stained with an aqueous OsO₄ solution overnight. Slices of less than 80 nm thickness were cut transverse to the flow direction of polymer blends using ultramicrotome. To observe the domain structure of PC/ABS blends, thin sections were further stained with RuO₄ vapor. The microstructure of the weld zone was studied using a JEOL JEM-2000EX II transmission electron microscope.

Differential scanning calorimetry

A TA Instruments DSC-2910 differential scanning calorimeter was used with a scanning rate of 20°C/min.

Dynamic mechanical analysis

The dynamic mechanical testing of the injection molded specimens was conducted with a Rheometric Scientific dynamic mechanical thermal analyzer (model MK II) at a fixed frequency of 1 Hz, a heating rate of 3°C/min, and an oscillation amplitude of 64 μm.

RESULTS AND DISCUSSION

Compatibility of SAN/SPMIMA and PC/SPMIMA blends

Since relatively large amount of amine-SAN polymer is indispensable to make test specimens via melt extrusion and injection molding, large quantity of functionalized polymer compatible with SAN copolymer should be polymerized. However, it is very difficult to polymerize S/AN/MA terpolymer in such a quantity with laboratory scale reactors, and thus we have selected commercially available SPMIMA terpolymer as the base material for preparing the amine functionalized compatibilizer for PC/ABS blend.

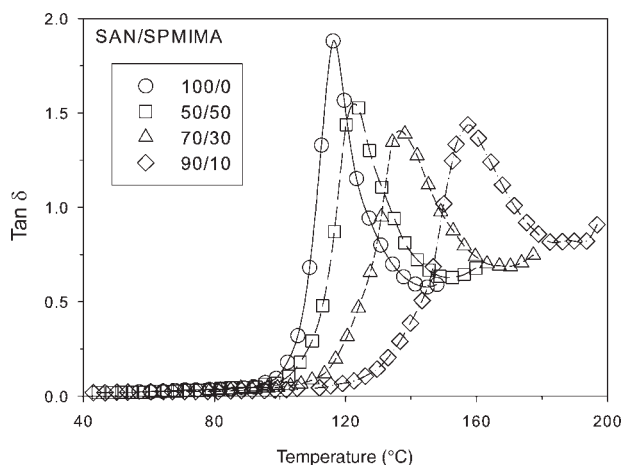


Figure 3 Temperature dependence of $\tan \delta$ (1 Hz) of SAN/SPMIMA blends.

To compatibilize ABS and PC by the reactive scheme, the secondary amine group, which can react with carbonate unit in PC, must be incorporated into a polymer which is miscible with the SAN matrix of ABS. Therefore, the compatibilities of SPMIMA terpolymer with SAN and PC were investigated.

SAN/SPMIMA blends with SPMIMA content of up to 50% were prepared via melt extrusion with a twin screw extruder and injection molding. It was difficult to obtain SAN/SPMIMA blends of SPMIMA terpolymer content over 50% by melt extrusion and injection molding because of SPMIMA terpolymer being highly brittle. As can be seen from the result of dynamic mechanical analysis (see Fig. 3), the blends of SAN with SPMIMA terpolymer show only single T_g in any blend composition investigated. TEM image of SAN/SPMIMA blend in Figure 4 shows no phase separation of SAN and SPMIMA.

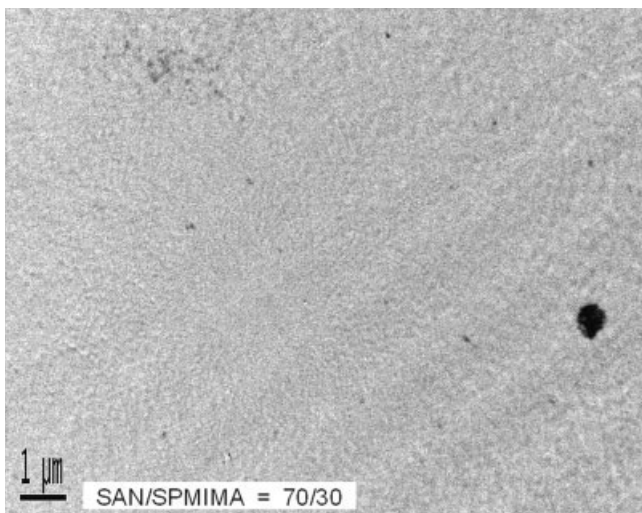


Figure 4 TEM image of SAN/SPMIMA = 70/30 blend.

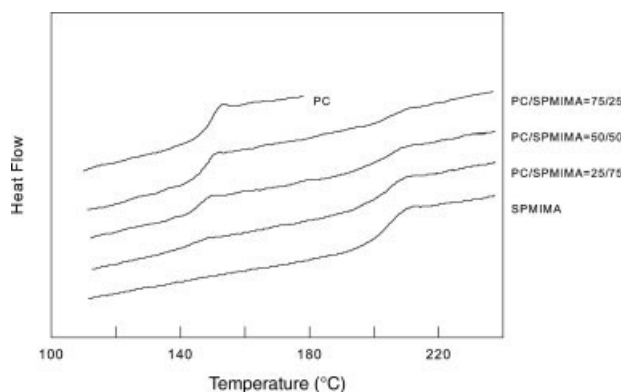


Figure 5 DSC thermogram of PC/SPMIMA blends.

This implies that SAN and SPMIMA are miscible, at least for the condition adopted in this study.

PC/SPMIMA blends were also prepared by melt extrusion with a twin screw extruder. However, pelletizing and injection molding were impossible since the melt extruded strand was unstable due to the brittleness of SPMIMA terpolymer and the incompatibility between the component polymers. DSC thermogram of PC/SPMIMA blends show two separated glass transition temperatures which are almost same as those of individual polymer (see Fig. 5). TEM image of PC/SPMIMA blend (see Fig. 6) shows obvious phase separation. From these results, we can conclude that PC and SPMIMA can not form fully miscible blend.

PC/SAN blends with unmodified SPMIMA and amine-SPMIMA

Fracture of PC/ABS blend, owing to the presence of rubber component, results in severe deformation of fractured surfaces. So, it is very difficult to character-

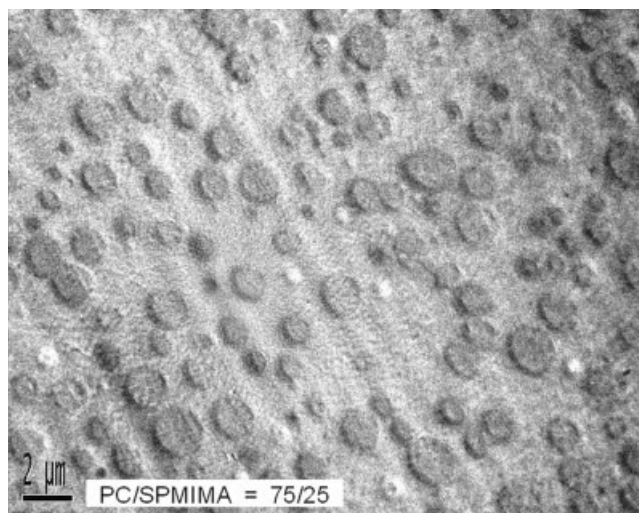


Figure 6 TEM image of PC/SPMIMA = 75/25 blend.

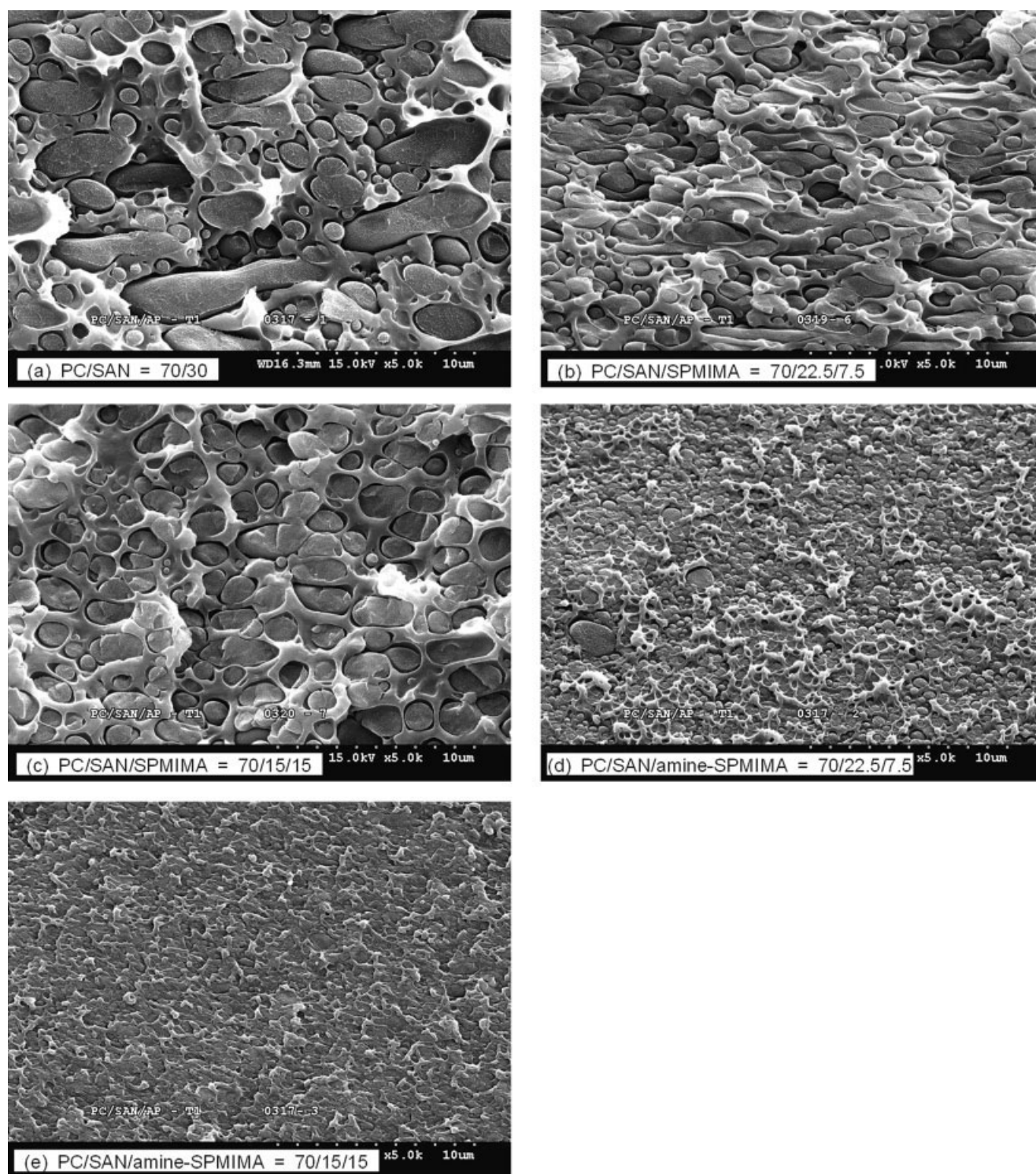


Figure 7 SEM micrographs for the blends melt-blended in Haake torque rheometer (250°C at a rotor speed of 60 rpm); (a) PC/SAN (70/30), PC/SAN/SPMIMA = (b) 70/22.5/7.5, (c) 70/15/15, PC/SAN/amine-SPMIMA = (d) 70/22.5/7.5, (e) 70/15/15.

ize the morphology of the fractured surface of PC/ABS blend. Therefore, the morphology of PC/SAN blend without rubber was investigated.

PC/(SAN + SPMIMA terpolymer) blend of 70/30 wt/wt ratio without compatibilizer and with

unmodified SPMIMA terpolymer or amine-SPMIMA were melt blended in Haake torque rheometer at a speed of 60 rpm and temperature of 250°C for 15 min. Samples weighing ~ 3 g were taken from the center part of the melt and then quenched in ice

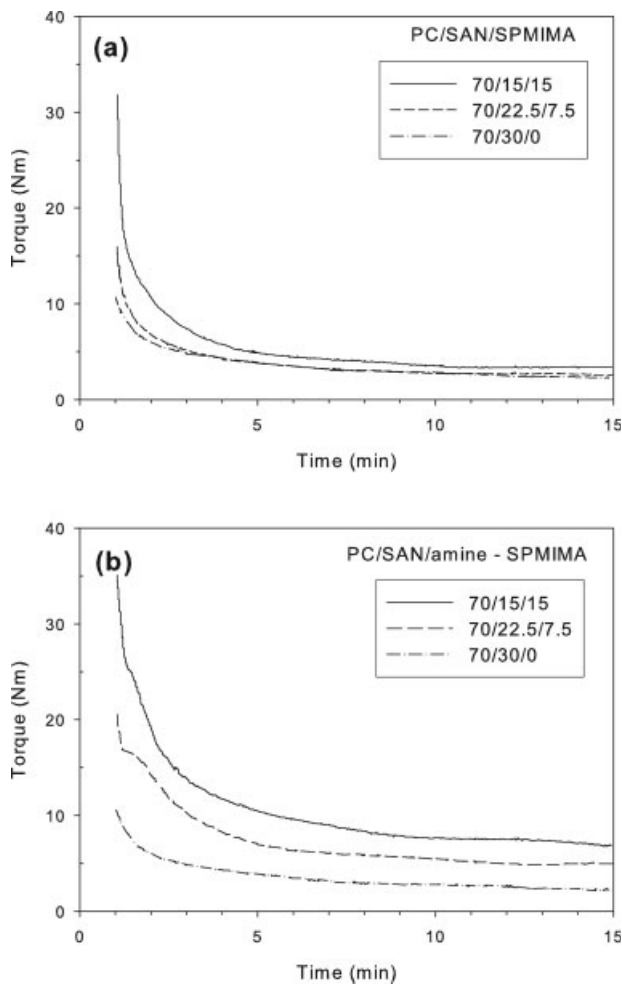


Figure 8 Torque versus time for the melt blends (Haake torque rheometer, 250°C at a rotor speed of 60 rpm) of PC/SAN/SPMIMA; (a) unmodified SPMIMA, (b) amine-SPMIMA.

water. Each sample was placed in liquid nitrogen for more than 10 min, and then fractured manually. Freeze fractured surfaces were analyzed by SEM. The resulting micrographs exhibited decreased domain size of dispersed phases from amine-SPMIMA compatibilized blends compared with the ones from uncompatibilized blends or blends with unmodified SPMIMA terpolymer (see Fig. 7). Slight decrease in the domain size in the blend with unmodified SPMIMA terpolymer compared with uncompatibilized blend is also found. This can be attributed to the elevation of domain phase viscosity by the incorporated viscous SPMIMA terpolymer [see Fig. 8(a)]. The torque values obtained from Haake torque rheometer show that the melt viscosity for the blend with unmodified SPMIMA terpolymer increases as the content of SPMIMA is increased.

The melt viscosity of reactively compatibilized blends generally increases with the formation of graft or block copolymer during melt processing.^{44,45}

In this study, the torque values show that the melt viscosity of the blends compatibilized with amine-SPMIMA are much higher than that of the blends with unmodified SPMIMA of same amount [see Fig. 8(b)]. Also, a shoulder peak is observed in the graph at the early stage of melt blending indicating that some kinds of reactions have taken place during this period.

PC/ABS blends with unmodified SPMIMA and amine-SPMIMA

PC/g-ABS/(SAN + compatibilizer) blends in a 60/12/28 wt/wt/wt ratio were prepared via melt extrusion with a twin screw extruder and injection molding. Figure 9 shows temperature dependence of $\tan \delta$ peaks of PC/g-ABS/SAN/SPMIMA blends. As can be seen in the Figure 9(a), the blends show two distinct $\tan \delta$ peaks. The peak at about 150°C corresponds to the glass transition of PC matrix and the other one to that of SAN phase in ABS (g-ABS/SAN/SPMIMA) domain. The T_g of PC in PC/ABS

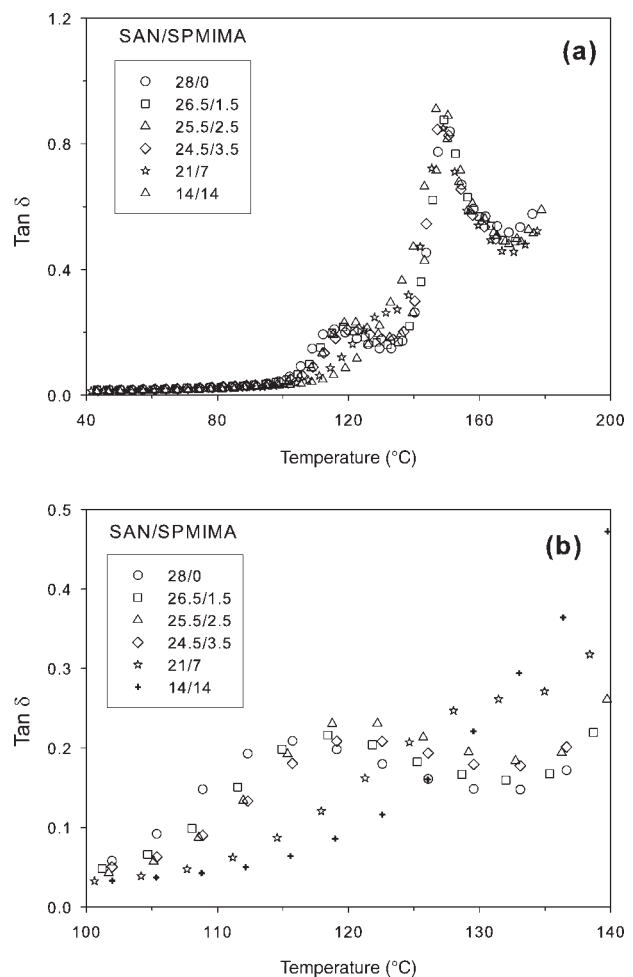


Figure 9 (a) Temperature dependence of $\tan \delta$ of PC/g-ABS/SAN/SPMIMA blends, (b) magnification graph.

blend with unmodified SPMIMA terpolymer hardly changes with the composition of ABS. Magnification of the region near T_g corresponding to SAN phase [Fig. 9(b)] shows that the T_g of SAN phase in ABS domain varies similarly to the value which can be expected from that of SAN/SPMIMA blend shown in Figure 3. It can also be seen that the peak area hardly changes. These results indicate relatively good compatibility between SPMIMA terpolymer and SAN and, on the contrary, poor compatibility between PC and (SAN + SPMIMA) phase in PC/ABS blend with unmodified SPMIMA terpolymer.

Figure 10 shows the change in $\tan \delta$ peaks with temperature for PC/ABS/SAN/amine-SPMIMA blends. There are also two distinct peaks corresponding to the glass transition of SAN phase in ABS domain and PC matrix, respectively. T_g of PC does not change with the composition of ABS phase, as in the case of PC/ABS blend with unmodified SPMIMA. Interestingly, the T_g of SAN phase does not change significantly either. This is an indication that amine-SPMIMA is not fully incorporated into ABS phase. Instead, the peak area responsible for the glass transition of SAN phase decreases with increasing content of amine-SPMIMA and we can see no damping peak corresponding to the SAN phase when only half of SAN is replaced by amine-SPMIMA, that is, from 28 to 14%. This could be due to the fact that SAN intrinsically has higher affinity to another polymer, presumably amine-SPMIMA in this case, and the two polymers form a homogenous separate domain which gives intermediate T_g value. The T_g of the SAN/amine-SPMIMA blend can be similar to that of PC. When we gather up the results from dynamic mechanical analysis, it seems that amine-SPMIMA reacts with PC and forms a separate phase together with corresponding amount of SAN, which is undistinguishable from PC by dynamic mechanical analysis results.

The results presented above support our hypothesis that the addition of the amine-SPMIMA to PC/ABS blends leads to the formation of graft copolymer during melt processing as proposed in Figure 2(b). So this reactive compatibilizer can be used to control the morphology of PC/ABS blend by some reduction in the interfacial tension between PC and the SAN matrix of ABS or by reducing the frequency of domain coalescence through a steric stabilization mechanism.⁴⁶

Mechanical strength and morphology at the weld line

In previous study,⁴⁷ we have reported that ABS domain phase coalescence became severe and so mechanical strength at the weld line of PC/ABS blend decreased with increasing injection molding temper-

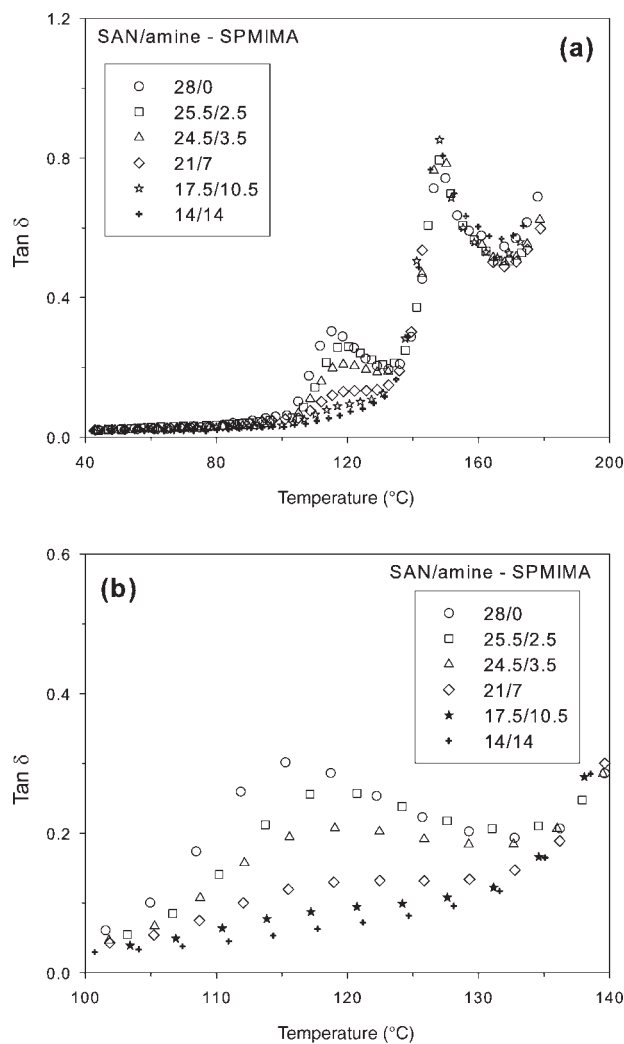


Figure 10 (a) Temperature dependence of $\tan \delta$ of PU/g-ABS/SAN/amine-SPMIMA blends, (b) magnification graph.

ature. From the observation of the morphology of freeze fractured surface at the weld line before and after tensile test, we confirmed that the crack propagated along the weak region behind the weld part where the domain phase coalescence was significant due to the poor compatibility between PC and SAN. Low weld line strength of PC/ABS blend is attributed to the poor morphology at the part behind the weld line where the fracture initiated from the vicinity of V-notch, propagated along.

Figure 11 shows the influence of unmodified SPMIMA terpolymer content on the weld line strength of PC/g-ABS/SAN/SPMIMA blends. As can be seen in Figure 11(a), a slight increase in weld tensile strength is observed as small amount (less than 2.5%) of SPMIMA is added. This increase in weld tensile strength may be due to the change in the dispersion state of ABS domain with incorporation of SPMIMA, which can be predicted from the

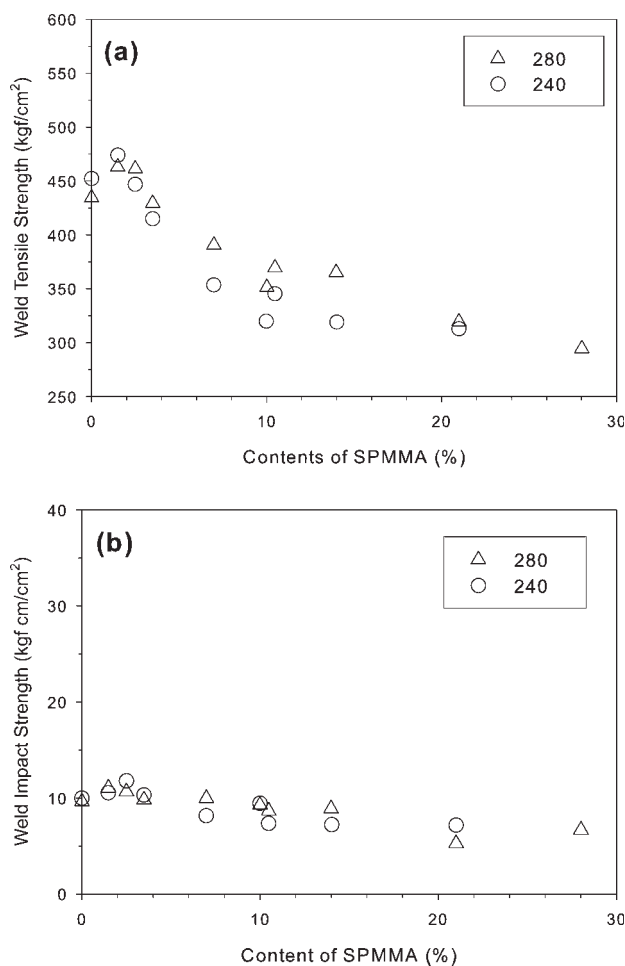


Figure 11 Influence of injection molding temperature and content of unmodified SPMIMA terpolymer on weld line strength of PC/g-ABS/SAN/SPMIMA = 60/12/28-y/y blends; (a) weld tensile strength, (b) weld impact strength.

morphology of PC/SAN/SPMIMA blends shown in Figure 7(b,c). In case of the blends containing over 2.5% SPMIMA, weld tensile strength drastically decreases with SPMIMA terpolymer content. For example, in case of 280°C, it decreases from 463 kgf/cm² at 2.5% of SPMIMA to 296 kgf/cm² at 28% SPMIMA. Weld impact strength shows similar trend with weld tensile strength [see Fig. 11(b)]. When the injection molding temperature is 240°C, it decreases from 11.7 kgf cm/cm² at 2.5% of SPMIMA to 7.2 kgf cm/cm² at 21% of SPMIMA. The decrease in weld line strength with SPMIMA content could be caused by several reasons, such as poor adhesion at the weld interface due to the high glass transition temperature of SPMIMA terpolymer, the embrittlement caused by increase in brittle SPMIMA content, the low compatibility between PC and SPMIMA, and so on. Slight increase in weld line strength of PC/ABS blend with unmodified SPMIMA terpolymer can be observed with increasing injection molding temperature. This could be explained by the fact that higher

melt temperature somehow changes the shape or size of “V-notch” in such a way that the notch is less sharp or deep.

Figure 12 shows the plots of weld line strength versus the content of amine-SPMIMA in PC/g-ABS/SAN/amine-SPMIMA blends molded at three different injection molding temperature. Weld tensile strength increases with increasing content of amine-SPMIMA, which contradicts to the result from the blend with unmodified SPMIMA. This implies that amine-SPMIMA plays an important role in improving weld line characteristics of PC/ABS blend. Weld impact strength increases sharply, going through a maximum value at about 3% of amine-SPMIMA, and then decreases as the content of amine-SPMIMA is further increased. Weld impact strength at maximum point is almost three times higher than the case without compatibilizer. We can see that there is almost no decrease in weld line strength with injection molding temperature, which contrasts to the result of previous study, in which high molecular

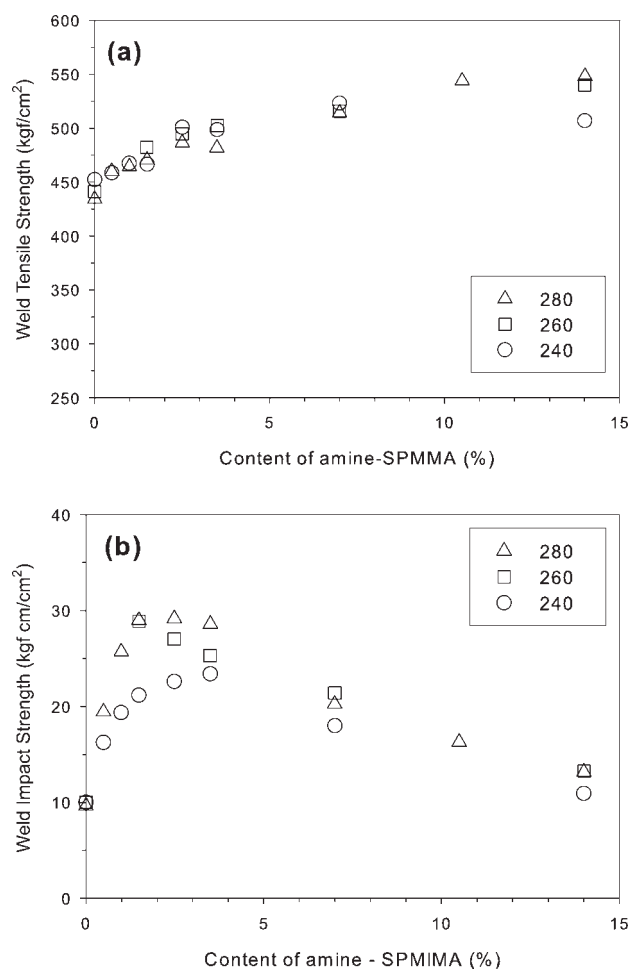


Figure 12 Influence of injection molding temperature and amine-SPMIMA content on weld-line strength of PC/g-ABS/SAN/amine-SPMIMA = 60/12/28-z/z blends; (a) weld tensile strength, (b) weld impact strength.

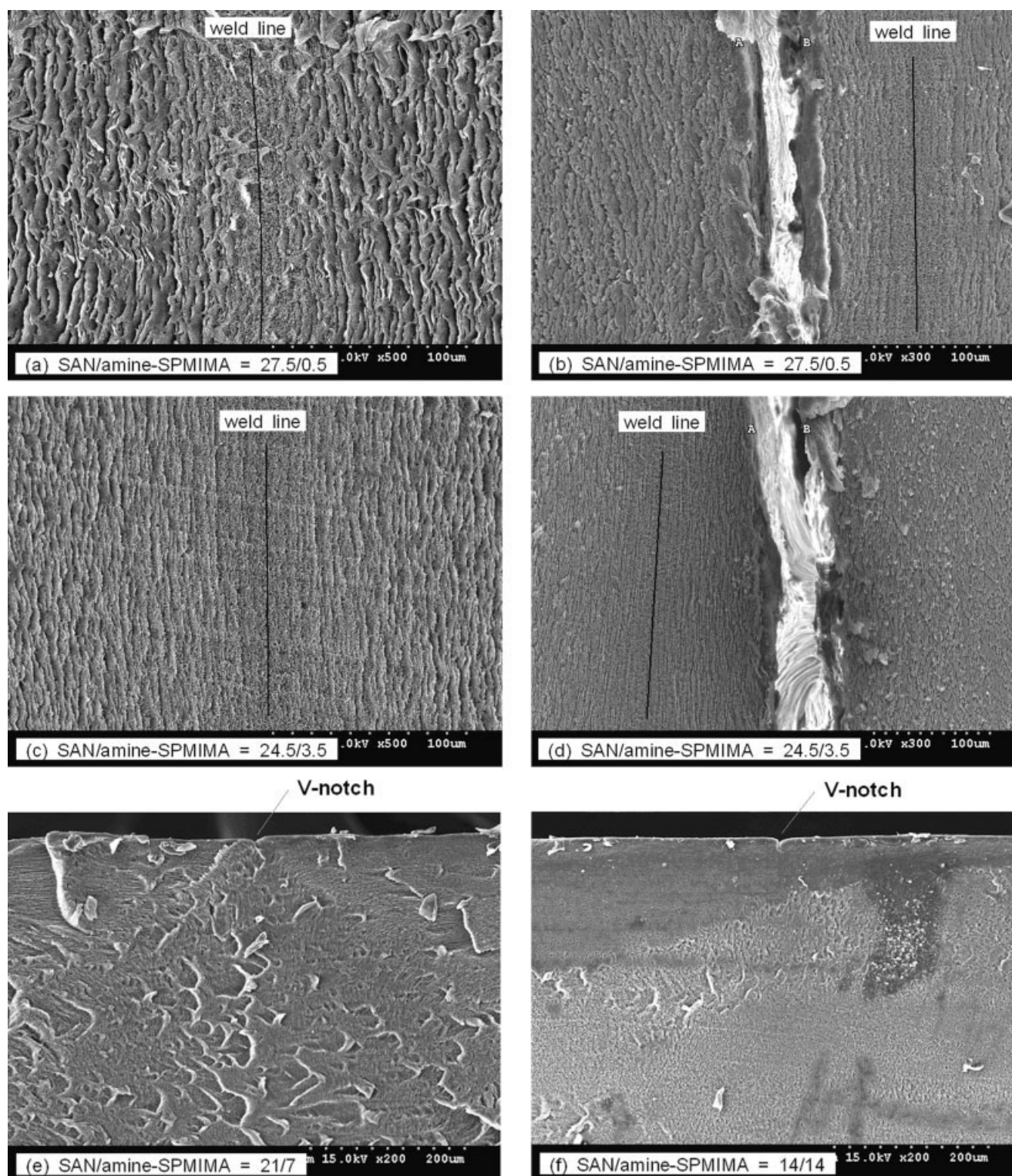


Figure 13 SEM photographs of the cross section at the weld pan of PU/g-ABS/SAN/amine-SPMIMA = 60/12/28- z/z blend molded at the injection molding temperature of 240°C; (a) $z = 0.5$, before tensile test, (b) $z = 0.5$, after tensile test, (c) $z = 3.5$, before tensile test, (d) $z = 3.5$, after tensile test, (e) $z = 7$, before tensile test, (f) $z = 14$, before tensile test.

weight SAN or PMMA was used.⁴⁷ Rather, weld impact strength increases as the injection molding temperature increases from 240 to 280°C. These changes in mechanical properties at the weld line

could be explained by looking at the morphology at the weld line of PC/ABS blend.

It can be seen that the size of ditch, that is the size of ABS domain, becomes smaller as the reactive

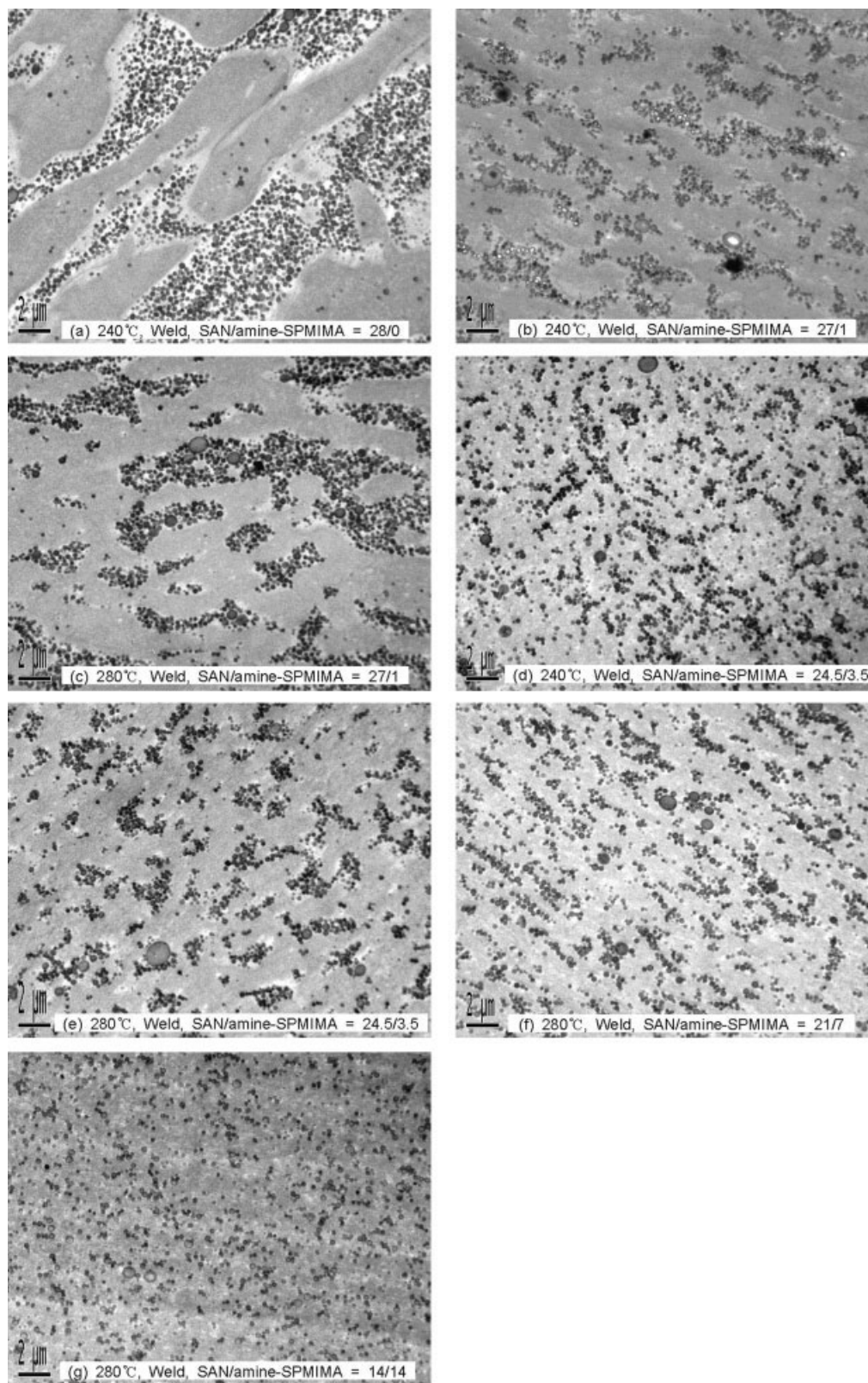


Figure 14 TEM images of weld part of PC/g-ABS/SAN/amine-SPMIMA = 60/12/28- z/z blends molded at the injection molding temperature of 240 and 280°C; (a) 240°C, $z = 0$, (b) 240°C, $z = 1$, (c) 280°C, $z = 1$, (d) 240°C, $z = 3.5$, (e) 280°C, $z = 3.5$, (f) 280°C, $z = 7$, (g) 280°C, $z = 14$.

compatibilizer is incorporated [see Fig. 13(a,c)]. However, the crack still propagates along the part behind the weld line [see Fig. 13(b,d)], and as the content of amine-SPMIMA is further increased, it becomes difficult to identify the location of the weld line [see Fig. 13(e,f)].

As can be seen in the TEM micrograph of the weld region in PC/ABS blend compatibilized with amine-SPMIMA (see Fig. 14), the dispersion state of ABS domain is enhanced with increasing amine-SPMIMA content. With low amount of amine-SPMIMA (1%), PC/ABS blend shows considerably improved morphology at the weld line when molded at injection molding temperature of 240°C [see Fig. 14(a,b)], but slight phase coalescence is still observed at high injection molding temperature [see Fig. 14(c)]. As the content of amine-SPMIMA is increased up to 3.5%, the dispersion state of ABS domain is drastically enhanced even at high injection molding temperature [see Figure 14(d,e)]. With higher amount of amine-SPMIMA over 3.5%, there is almost no change in dispersion state of ABS domain [see Fig. 14(f,g)]. This is an indication of good compatibility and probable reactions between amine-SPMIMA and PC.

The impact strength depends on the phase morphology and intrinsic ductility of component polymers. With increasing amine-SPMIMA content, the dispersion state of ABS domain is remarkably improved. However, due to the brittle characteristics of SPMIMA terpolymer, toughness of blend system might decrease. Combining these two conflicting effects, weld impact strength increases with adding small amount of amine-SPMIMA, and then decreases with further incorporation of amine-SPMIMA over a critical value. Slight increase in weld impact strength at high injection molding temperature might be due to the probable change in shape or size of "V-notch" and good adhesion at the weld interface with increasing temperature.

Weld line strength vs. flowability

The injection molding of large and complex part requires the use of materials with high processibility at moderate injection molding temperature. Melt flow index (MFI) measurement is a simple method to predict the flowability of polymer materials. As the melt viscosity of blend increases, MFI of the blend decreases.

Figure 15 shows the plots of weld impact strength versus MFI, measured at 250°C and 10 kg, for PC/ABS blends with varying amount of high molecular weight SAN (SAN-H) or amine-SPMIMA. In the blend with high molecular weight SAN [Fig.15(a)], weld impact strength increases from 10.4 to 16.7 kgf cm/cm² as the MFI value decreases, i.e., as the con-

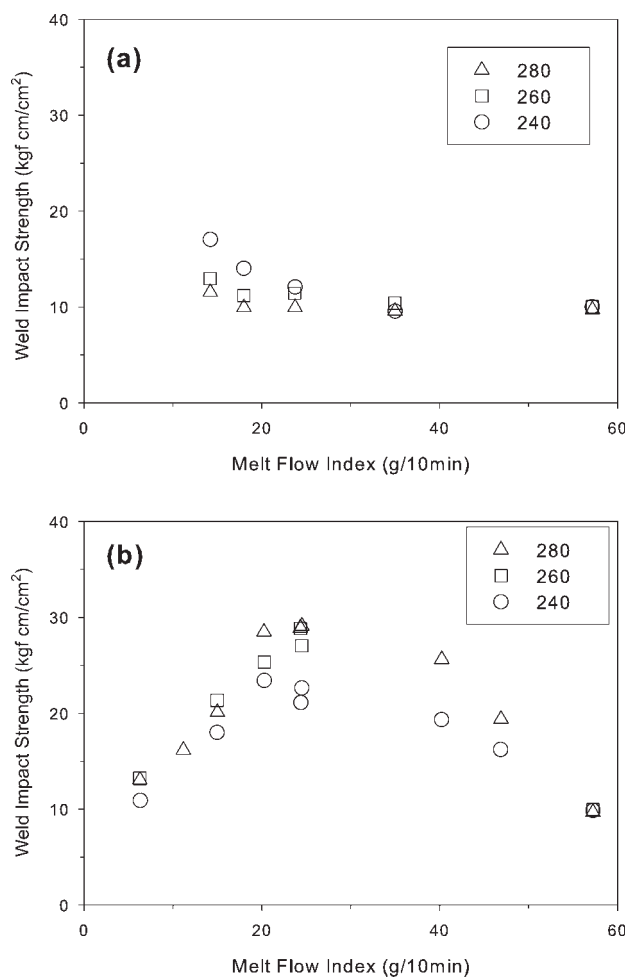


Figure 15 Weld impact strength versus melt flow index (MFI, 250°C, 10 kg) for PC/ABS Blends compatibilized with; (a) high molecular weight SAN (SAN-H), (b) amine-SPMIMA.

tent of high molecular weight SAN is increased at injection molding temperature of 240°C. However, the blends molded at 280°C show almost no change in weld impact strength with MFI value. This is the result of unstable morphology near weld line due to the poor compatibility between PC and SAN or severe domain phase coalescence at high temperature.⁴⁷

To increase the weld line strength of PC/ABS blend without any compatibilizer, it is necessary to use high molecular weight SAN. The use of high molecular weight SAN results in viscosity increase of PC/ABS blend. Therefore, high injection molding temperature is required to mold large and complex parts. However, in case of PC/ABS blend with high molecular weight SAN, the increase in injection molding temperature can induce the decrease in weld line strength of molded part due to the domain phase coalescence. These two contradicting situations make it very difficult to find the optimum processing condition.

In the case of the blend compatibilized with amine-SPMIMA [Fig. 15(b)], a maximum value of weld impact strength, about 30 kg cm/cm, is achieved in the specimens with the MFI value ranged from 20 to 30, molded at 280°C. This range of MFI value corresponds to the compositions where the dispersion state of ABS domain is drastically enhanced even at high injection molding temperature, i.e., about 3% of amine-SPMIMA content. In this case of PC/ABS blend with amine-SPMIMA, we can increase temperature to mold large and complex parts because weld line strength does not decrease with injection molding temperature.

CONCLUSION

In this study, we investigated the effects of reactive compatibilizer and processing temperature on the morphology and mechanical properties at the weld line of PC/ABS blend. Enhanced dispersion of ABS domain was observed when amine-SPMIMA reactive compatibilizer was incorporated. The increase in weld line strength was attributed to the enhanced morphology at the part behind the weld line where the fracture propagated along. Considering both processibility and weld line strength, PC/ABS blends compatibilized with amine-SPMIMA has advantages over the blend with high molecular SAN.

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