

论文

PTW对PA1010/PP共混物的增容作用

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摘要:

为了增加聚酰胺1010/聚丙烯(PA1010/PP)共混物的相容性, 提高共混物的力学性能, 采用一种新型的反应型增容剂乙烯-丙烯酸丁酯-甲基丙烯酸缩水甘油酯共聚物(PTW)进行增容, 通过扫描电镜(SEM)、力学性能、傅里叶变换红外光谱(FTIR)和差示扫描量热(DSC)测试, 研究了PTW对PA1010/PP共混物的增容作用. 结果表明, 随着PTW的加入, 共混物的相区尺寸明显变小, 当PA1010/PP/PTW质量比为70:30:7时, 分散相尺寸细小而均匀, 表明PTW有较好的增容作用. FTIR结果表明, PTW上的环氧基团和PA1010在熔融共混中发生了化学反应. DSC研究结果表明, PA1010的结晶温度随PTW的加入而降低, 说明PTW对PA1010结晶有抑制作用. 另外, PTW的加入使PP的结晶温度下降, 当PTW质量分数为5%时出现2个结晶峰, 即出现异相成核结晶和均相成核结晶, PP均相成核结晶的出现从另一个方面说明, 在PA1010基体中分散相PP尺寸非常细小. 当PTW质量分数为7%时共混物的力学性能最佳, 干态冲击强度达到13.93 kJ/m<sup>2</sup>, 是未加增容剂时的2倍, 拉伸和弯曲性能基本不变. PTW的增容机理在于其分子链中的甲基丙烯酸缩水甘油酯能与PA1010发生化学反应, 而乙烯链段与PP有较好的亲和性, 从而降低界面张力, 减少相区尺寸, 大幅度提高力学性能.

关键词: 聚酰胺; 聚丙烯; 乙烯-丙烯酸丁酯-甲基丙烯酸缩水甘油酯共聚物; 共混; 增容机理

Compatibilization Effect of PTW on Polymer Blends of PA1010/PP

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Abstract:

In order to improve the compatibility and the mechanical properties of Polyamide1010 and Polypropylene(PA1010/PP)blends, a novel reactive compatibilizer ethylene-butylacrylate-glycidyl methacrylate terpolymer(PTW) was used to compatibilize the blends. The compatibilizing effect of PTW on PA1010/PP blends was investigated by means of scanning electron microscopy(SEM), Fourier transform infrared(FTIR),mechanical testing and differential scanning calorimetry(DSC), respectively. It was found that with increasing the PTW content, the size of the dispersed PP particles decreased obviously, when the mass ratio of PA1010/PP/PTW is 70:30:7, the domain size showed a fine and uniform dispersion in the matrix,indicated PTW had an effective compatibilization effect on PA1010/PP blends. FTIR results show that the epoxy groups of PTW react with the end group of PA1010 in the blending process. DSC results show that the addition of PTW decreased the crystallization temperature of PA1010, indicate that PTW has an inhibition effect on the crystallization of PA1010. On the other hand, with increasing the mass fraction of PTW content, the crystallization temperature of PP became lower too, when the mass fraction of PTW was 5%, two crystalline peaks appeared, the crystallization of PP at the lower temperature should be assigned to homogeneous nucleation, the other one was heterogeneous nucleation. The appearance of howogennous nucleation demonstrated that the size of PP particles was very fine in the matrix from the other hand. When the mass fraction of PTW was 7%, the blend had the best comprehensive property and the izod impact strength of dried samples was 13.93 kJ/m<sup>2</sup>, which is 2 times that for the binary PA1010/PP blend. Meanwhile, the flexural strength, tensile strength and modulus can be maintained at a relative high level. The compatibilization mechanism of PTW lied in the chemical interactions occuring between the end group of PA1010 and epoxy groups of PTW during the blending process, and the compatibility between PP and ethylene groups of PTW. And hense the addition of PTW decreased the interfacial tension and the domain size dramatically, improved the mechanical properties greatly.

扩展功能

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Keywords: Polyamide1010; Polypropylene; Ethylene-butylacrylate-glycidyl methacrylate terpolymer (PTW); Blend; Compatibilization mechanism

收稿日期 2009-04-03 修回日期 网络版发布日期

DOI:

基金项目:

国家自然科学基金(批准号: 50533050, 50873063, 20874064)资助.

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#### 参考文献:

[1]GAO Ge(高歌), WANG Jing-Yuan(王静媛), MA Rong-Tang(马荣堂), et al.. Polymer Materials Science And Engineering(高分子材料科学与工程)

[J], 1999, 15(1): 114—117

[2]Zhang Xiao-min, Li Gang, Wang Dong-mei, et al.. Polymer

[J], 1998, 39(1): 15—22

[3]Zhang Xiao-min, Yin Zhi-hui, Na Tain-hai, et al.. Polymer

[J], 1997, 38(24): 5905—5912

[4]Zhang Xiao-min, Li Gang, Li Jing-shu, et al.. Die Angewandte Makromolekulare Chemie

[J], 1997, 248: 189—200

[5]Zhang Xiao-min, Li Xing-lin, Wang Dong-mei, et al.. Journal of Applied Polymer Science

[J], 1997, 64: 1489—1498

[6]Zhang Xiao-min, Yin Jing-hua. Macromol. Chem. Phys.

[J], 1998, 199: 2631—2634

[7]YANG Shi-hai(杨石海), SHENG Jing(盛京). Chemical Industry and Engineering(化学工业与工程)

[J], 2003, 20(6): 407—411

[8]Yan Li-Tang, Sheng Jing. Polymer

[J], 2006, 47: 2894—2903

[9]ZHONG Shao-Ming(钟绍明), ZHU Xing-Yuan(朱兴元), XIE Zhi-Min(谢志民), et al.. Polymer Materials Science And Engineering(高分子材料科学与工程)

[J], 2005, 21(1): 255—259

[10]MA Gui-Qiu(马桂秋), LOU Jie(娄杰), ZHANG Ding-Hao(张丁浩), et al.. Acta Polymer Sinica(高分子学报)

[J], 2008, 1: 18—26

[11]Xie Zhi-min, Zhang Ding-hao, Sheng Jing, et al.. Journal of Applied Polymer Science

[J], 2002, 85: 307—314

[12]ZHANG Xiao-Min(张晓民), WANG Dong-Mei(汪东梅), YIN Jing-Hua(殷敬华). China Plastics(中国塑料)

[J], 1996, 10(4): 10—13

[13]Zhang Xiao-min, Yin Jing-hua. Polymer Engineering and Science

[J], 1997, 37(1): 197—204

[14]DUAN Jian-Hua(段建华), ZHANG Zeng-Min(张增民). China Plastics(中国塑料)

[J], 1995, 9(6): 40—44

[15]ZHANG Ai-Ling(张爱玲), ZHANG Bao-Yan(张宝砚), WU Yan-Ying(吴艳英), et al.. Polymer Materials Science and Engineering(高分子材料科学与工程)

[J], 2001, 17(6): 71—74

[16]Li Yuan-ming, Zhang Bao-yan, Feng Zhi-liu, et al.. Journal of Applied Polymer Science [J], 2002, 83: 2749—2754

[17]LI Yuan-Ming(李远明), ZHANG Bao-Yan(张宝砚), WANG Jun(王俊). Journal of Functional Polymers(功能高分子学报) [J], 2002, 15(1): 1—5

[18]LI Zhi-Jun(李志君), XIE Xu-Ming(谢续明), GUO Bao-Hua(郭宝华). Chemical Journal of Chinese Universities(高等学校化学学报) [J], 2004, 25(10): 1941—1944

[19]HUANG Bo-Fen(黄伯芬), ZOU Xiu-Wen(邹修文), WANG Ying(王樱). China Plastics Industry(塑料工业) [J], 2006, 34(12): 49—52

[20]CHEN Guang-Xin(陈广新), LIU Jing-Jiang(刘景江). Acta Polymer Sinica(高分子学报) [J], 1999, 5: 557—563

[21]FU Shu-Ren(傅树人), CHEN Dao-Da(陈道达). Polymer Communications(高分子通讯) [J], 1983, 2: 99—103

[22]Paul D. R., Bucknall C. B.. Polymer Blends [M], Beijing: Science Press, 2004: 363—377

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