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研究论文

高抗冲共聚聚丙烯的结晶动力学及形态

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摘要 用示差扫描量热仪(DSC)、偏光显微镜(PLM)和场发射扫描电镜(FESEM)对高抗冲共聚聚丙烯(HIPP)的非等温结晶行为、等温结晶动力学及结晶形态进行了系统研究, 并与均聚聚丙烯(iPP)进行了对比. 非等温热分析结果表明, HIPP的结晶和熔融温度均低于iPP. 等温结晶动力学分析结果表明, HIPP的半结晶时间、结晶活化能及分子链折叠端表面自由能均高于iPP. 研究结果表明, HIPP中的共聚组分与基体存在部分相容性, 并阻碍其结晶. PLM和FESEM研究结果表明, HIPP中存在大量均匀分散的橡胶粒子, 其直径约1~2 μm, 并具有核-壳结构. 增韧相在基体相中的良好分散与粘结, 以及有效核-壳增韧结构的形成是实现HIPP良好刚-韧平衡性能的关键. 这与HIPP的组成及聚合工艺密切相关.

关键词 高抗冲共聚聚丙烯 结晶动力学 形态

分类号 0631

Crystallization Kinetics and Morphology of High Impact Polypropylene

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Abstract Crystallization kinetics and morphology of high impact polypropylene(HIPP) and polypropylene homopolymer(iPP) were studied comparatively by differential scanning calorimetry(DSC), polarized optical microscopy(PLM) and field-emission scanning electron microscopy(FESEM) techniques. The crystallization and melting temperatures of HIPP are lower than those of iPP. The results of isothermal crystallization kinetics study indicates that the crystallization half-time($t_{1/2}$) of HIPP is longer, while its activation energy(ΔE) and chain folding surface free energy(σ_e) are higher, compared with those of iPP. These results show the partial compatibility between the copolymeric components and the matrix of HIPP, which hinders the crystallization of the matrix. The PLM and FESEM images of HIPP reveal that there are uniformly dispersed rubbery particles(*ca.* 1—2 μm in diameter) with a core-shell structure in the matrix of HIPP. The uniform dispersion, strong interfacial adhesion and core-shell morphology of the rubbery phase in HIPP matrix are the key factors for the superior toughness-rigidity balance of this material.

Key words High impact polypropylene Crystallization kinetics Morphology

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