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论文

在低频振动场中注射成型HDPE试样的力学性能及其形态控制

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摘要 利用自行研制的低频振动注射实验装置探讨HDPE振动注射试样力学性能和微观形态之间的关系．实验中对常规注射和振动注射成型的试样力学性能和微观形态进行了对比实验．SEM实验结果显示，振动注射制件芯层的形态由常规注射的球晶转变为垂直于振动波传递方向排列的片晶结构，在剪切层中同时存在串晶或柱状堆砌的片晶结构．频率的改变（0＜f＜2.33Hz）使晶粒细化，片晶有一定程度的取向，剪切层中的结晶度由常规的注射时的59.77%增回到振动注射时的67.67%，芯层的结晶度更是得到13.65%的提高，有利于充分挖掘材料的综合力学性能振动压力幅度（0＜P_A＜59.4 MPa）的增加则能明显地使片晶取向，片晶厚度增加，剪切层和芯层中的结晶度都有2%左右的增加，材料的拉伸强度提高，伸长率变小。

关键词 低频振动注射 HDPE 力学性能 串晶 柱晶

分类号

MECHANICAL PROPERTY AND MORPHOLOGY CONTROL OF INJECTION-MOLDED HDPE IN LOW FREQUENCY VIBRATION FIELD

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Abstract The self-made low frequency vibration injection-molding device was adopted to explore relationship between mechanical property and morphology for HDPE injected moldings,and the mechanical properties are bettered and the morphology can be controlled in the low frequency vibration force field. In the research the morphology and mechanical properties produced by conventional injection molding(CIM) were used to compare with which obtained via vibration injection molding(VIM). As for the vibration injection molding is concerned,the main vibration processing variables are vibration frequency and vibration pressure amplitude and the effect of tensile strength and morphology influenced by different vibration processing conditions. SE micrographs show the transformation of crystal from spherulite to lamellar is noticed,and the shish-kebab stucture and cylindrite structure were obtained in the shear layer via different vibration injection molding conditions. The changes of frequency (0＜f＜2.33 Hz) are beneficial to refine,orientate crystals and enhance the crystallinity in the shear layer from 59.77％ to 64.10％ produced by conventional injection molding and vibration injection molding,respectively,with shish-kebab structure in the shear layer. As a result the over-all mechanical properties are as a function of vibration frequency in vibration injection molding. The increase of vibration pressure amplitude(0＜P_A＜59.4 MPa)is favor in promotion of tensile strength of vibration injection molded specimens because of the obviously preferred orientation of crystals with about 2％ increase of crystallinity in both core and shear layers,and the cylindrite crystal structure occurs in the shear layer of vibration injection moldings. On the other hand,the elongation at break becomes small because of growing of the lamella scale in the core of vibration injection-molded specimens.

Key words Low frequency Vibration injection molding HDPE Mechanical property Shish-kebab structure Cylindrite

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