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研究简报

高取向聚对苯二甲酸乙二酯纤维的热收缩应力

谢昕，李鑫，王荣民

西北师范大学高分子研究所; 中国纺织科学研究院; 西北师范大学高分子研究所 兰州

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摘要

关键词 热收缩应力 半晶PET 取向 三相模型

分类号

THERMAL STRESS OF HIGHLY ORIENTED POLY(ETHYLENE TEREPHTHALATE)

XIE Xin[1],LI Xin[2],WANG Rongmin[1]

1 *Institute of Polymer of Northwest Normal University; Lanzhou* 730070;2 *China Textile Academy; Beijing* 100025

Abstract The isothermal shrinkage stress of highly oriented semi—crystalline poly(ethylene terephthalate)(PET) fiber was studied in the temperature range from 102℃ to 221℃. The data of the isothermal shrinkage stress on logarithmic time scales could be simply shifted to obtain a superimposed curve when the temperature was not above 186℃. The relationship between the shih factors and the experiment temperatures could be described satisfactorily by the Williams—Landel-Ferry equation with C_1=71．9 and C_2=511．7. Therefore,the increasing of shrinkage stress with treated time,resulted from the release of“frozen”stress in the oriented polymer materials,was resulted from the activation of the segments due to the glass transition. The much higher values of C_1 and C_2 than those of the non—crystalline materials were due to the higher stiffness of the molecules contributed to the stress increasing,which were constrained by the crystallization and the chain entanglement in a highly oriented semi-crystalline polymer. It was also proven by a wide α-relaxation peak up to 170℃ indicated by the tan δ-temperature curve. When the temperature was equal to or higher than 186℃,the decreasing of the isothermal shrinkage stress could be observed after it reached the maximum stress. According to the three-phase model of PET fiber provided by Prevorsek,such high tenperature stress relaxation was due to the viscose flow of the extended non—crystalline molecules located between micro—fibrils. which was also indicated by the α'-relaxation from 180℃ to 250℃.

Key words Thermal shrinkage stress Semi-crystalline poly（ethylene terephthalate） Orientation Three-phase model

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通讯作者 李鑫