

多相流和计算流体力学

高密度聚乙烯等温结晶的流变行为

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摘要 用旋转流变仪研究了高密度聚乙烯的等温结晶行为, 发现结晶速率对夹具表面粗糙度存在依赖性, 随着表面粗糙度的增加, 结晶速率先增加后减小. 粗糙度的增加增大了样品与夹具间的接触面积, 减小了热阻, 同时界面间可能积存的气泡使得界面热阻较大, 都影响着结晶速率. 对于相同表面粗糙度的铝、黄铜和不锈钢三种材质的夹具, 相应的结晶速率排序为: 铝最快, 黄铜居中, 不锈钢最慢. 我们研究发现HDPE样品的结晶速率对夹具的表面能不敏感, 而夹具的导热系数越大, 热阻越小, 结晶速率越大.

关键词 [高密度聚乙烯](#) [等温结晶](#) [表面粗糙度](#) [热阻](#) [表面能](#)

分类号

Rheological behavior of isothermal crystallization for high-density polyethylene[

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Abstract

Isothermal crystallization behavior of high density polyethylene (HDPE) was studied experimentally by using a rotary rheometer with parallel plates fixtures. It was found that the crystallization rate depended on the surface roughness of the fixtures with the same chemical composition. As the surface roughness increased, the crystallization rate first increased then decreased which meant that there was a range of surface roughness where the crystallization rate could reach a maximum value. Surface roughness effectively enhanced the interfacial area and decreased heat resistance, but possibly trapped air pockets in the valley of the rough surface produced a considerable interfacial heat resistance, both affecting the crystallization rate of HDPE. The isothermal crystallization rate decreased in sequence as the HDPE specimen contacted with aluminum, brass and stainless steel plates whose surface roughness were on the same level. The sample crystallizes more quickly on the fixtures with higher heat conduction coefficient, thus lowering heat resistance.

Key words [high-density polyethylene](#) [isothermal crystallization](#) [surface roughness](#) [heat resistance](#) [surface energy](#)

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