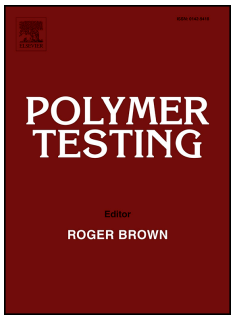

Melt fracture of polyisobutylenes

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Material Behaviour

Melt fracture of polyisobutylenes

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Abstract

The processability of different grades of polyisobutylene (PIB) was investigated using a capillary rheometer. Direct focus was given to the occurrence of melt fracture phenomena, such as sharkskin and gross melt fracture (GMF). The influence of molecular weight (MW) of PIB, temperature and die entrance angle on melt fracture was examined in detail. Due to their highly elastic nature, high MW PIBs were found to exhibit gross melt fracture instability even at low shear rates, rendering their processing an impossible task. An increase in temperature resulted in postponing both instabilities (sharkskin and gross) to higher shear rates, thus making their processing easier. Finally, decreasing the entrance angle below a critical value resulted in postponing the onset of GMF to higher shear rates.

Keywords: Polyisobutylene, capillary extrusion, sharkskin, gross melt fracture

1. Introduction

Melt fracture phenomena, such as sharkskin (small amplitude periodic distortions occurring on the surface of the melt), stick-slip or oscillating melt fracture (alternating smooth and distorted surfaces) and gross melt fracture (GMF) (large amplitude/ chaotic distortions affecting the whole volume of the melt), have been known to occur during the extrusion of certain polymers when the wall shear stress exceeds a critical value [1]. These phenomena cause problems in the processing of polymers by setting an upper limit to the throughput applied during extrusion [2].