

Factors influencing the small-scale melt spinning of poly(ϵ -caprolactone) monofilament fibres

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Abstract: Some of the main factors affecting the small-scale melt spinning of poly(ϵ -caprolactone), PCL, monofilament fibres have been studied. These factors included spinning temperature, extrusion rate, take-up rate and draw ratio. The underlying influence of the polymer's own characteristic properties, in particular its chemical structure, transition temperatures (T_g , T_m) and crystallizability, were also interpreted within the context of the melt spinning process. Physically, the as-spun fibres obtained were uniform in diameter and smooth in surface appearance. They were also semi-crystalline (>50%) in morphology. Mechanically, however, they were still very weak and highly extensible. Subsequent off-line cold-drawing at room temperature introduced the required degree of molecular orientation to reinforce the fibres, yielding tensile strengths of approaching 300 MPa. PCL fibres of precisely controlled physical dimensions and matrix morphology are attracting increasing interest for use in biomedical applications. This paper describes how this control can be achieved through the processing operation.

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