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VISCOELASTIC BEHAVIOUR AND FLOW INSTABILITIES OF BIODEGRADABLE POLY (?-CAPROLACTONE) POLYESTERS

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The viscoelastic behaviour of a number of commercial linear biodegradable polyesters - poly (?-caprolactone) (PCLs) with different molecular characteristics was investigated using both rotational and extensional rheometry. The variation of the zero-shear viscosity and relaxation spectrum with molecular weight was studied in detail. The damping function of these PCLs were also determined in order to model their viscoelastic behaviour using the classic Wagner constitutive equation. The measured damping functions were compared to that predicted by the classic Doi-Edwards tube model theory. They are shown to exhibit more strain thinning compared to that predicted by the Doi-Edwards theory. Finally, the PCL processing instabilities were studied by capillary extrusion using a number of capillary dies having various diameter and length-to-diameter ratios. Sharkskin and gross melt fracture was observed at different shear rates depending on the molecular characteristics of the resins and the geometrical details of the capillary dies.