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FIBRE DYNAMICS OF CONCENTRATED SUSPENSIONS OF SHORT FIBRE FILLED POLYMERS

ABSTRACT

Rheological experiments have been conducted on concentrated suspensions of short glass fibres in a polypropylene and a polybutene under simple shear transient flows. A stress and a rate controlled rheometer with plate-plate geometry have been used. The viscosity and the normal stress differences have been shown to depict overshoots in stress growth experiments, as well as when the flow was reversed. However, for the reverse flow experiments negative normal stress differences have been observed.. Filled polypropylene have been burned, fibres have been recovered and they have been introduced in a polybutene considered as purely viscous Newtonian fluid. The filled polybutene exhibited a similar behaviour compared to that of the filled polypropylene. A model constituted with Folgar-Tucker model for the fibre dynamic and the Lipscomb model for the constitutive equation has been used to predict the steady-state and transient data. This model developed for dilute or semi-dilute suspension is able to qualitatively predict the transient observations. However, an important shift was observed between the experimental and the predicted deformation corresponding to the overshoots.. This implies that experimental fibre dynamics is strongly slower than predicted by the model. Fibre-fibre interactions will be discussed and a slip factor introduced in the Folgar-Tucker model will be shown to improve the fits.