STUDIES ON THE POLY(4,4'-TEREPHTHANILIDEALKYLAMIDE)S (II)
Rheological properties and Fibre Performance

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ABSTRACT

Among other poly(4,4'-terephthanilidealkylamide)s (PTAA's), poly(4,4'-terephthanilideadipamide) (PTAd) gave clear critical concentration curves. For PTAA's with methylene units more than 6, the critical concentration (C*) seemed to be beyond the solubility limit of H_2SO_4. Under shearing conditions, the nematic domains were easily oriented and stretched in the direction of shear, and a fibrillar structure resulted. At low frequencies, a monotonous reduction of loss tangent ($\tan\delta$) was observed as concentration increased. At high frequencies, however, $\tan\delta$ was increased above C* again, and showed maximum at saturation concentration (Cs). With increasing temperature, viscosity of isotropic and anisotropic phases was normally decreased, while viscosity of biphases was increased. Plot of complex viscosity (η^*) against temperature based on rheological measurements exhibited a good correlation with phase diagram constructed by polarizing microscope observations. Rheological parameters suggested the optimum dope concentration of PTAd with inherent viscosity 2.02 at 30°C is in the vicinity of 19.2 wt%, which seemed to agree well with spinning experiments (around 19.4 wt%).

In general, effects of spinning and annealing conditions on the mechanical properties of PTAA fibres were most pronounced in PTAd fibre spun from anisotropic spinning dope.