OP-2-312

Wednsday, May 11, 2011, 06:00-06:20 pm
Room: Reda 5

COMPOUNDING OF POLYPROPYLENE WITH NATURAL FIBRES: IMPACT ON FIBRE DIMENSIONS AND IN SITU OBSERVATIONS OF FIBRE RUPTURE BY RHEO-OPTICS

A. Le Duc*, A. Perez, B. Vergnes, T. Budtova

MINES ParisTech, Centre de Mise en Forme des Matériaux (CEMEF) UMR CNRS/Ecole de Mines de Paris 7635 BP 207, 06904 Sophia Antipolis, France

**Corresponding author: anne.le_duc@mines-paristech.fr*

Polymer-fibre composite properties depend on the quality of fibres dispersion, and on the fibres final length and aspect ratio as well. During the compounding step, the fibres are broken and partially lose their reinforcing action. It is thus very important to understand the breakage mechanisms in order to control and to minimize their rupture. In this work, we are interested in composites made of polypropylene reinforced with natural fibres (cellulose II, flax).
Optical microscopy analysis of fibre dimensions after compounding allowed to build fibre size distributions. No significant influence of the initial fibre length on its final value in the composite after processing was observed. However, the fibre type and the presence of defects have more effect on their rupture.
In order to understand the mechanisms of rupture of these natural fibres, their behaviour was observed in situ by rheo-optics during flow in a non-Newtonian fluid. The fibres were placed in a highly viscous matrix to reproduce the stress conditions during compounding and to make correlations with obtained size distributions. The break-up of fibres was observed and different behaviours were qualitatively evidenced. Generally, all natural fibres studied are breaking by fatigue after an accumulation of strain, contrary to what is known for glass fibres. Flax fibres break around the kink bands while cellulose II fibres seem to break after numerous bending. The obtained results were then correlated to the mechanical properties of the composites.