Chemical modifications of softwood kraft fibre networks towards an absorption product

Fibre modifications

In the absorption core of a diaper, wood fibres form a porous network.

An important property of this fibre network is its ability to maintain the porous structure when exposed to both liquid and pressure. This is to a large extent dependent on individual fibre properties, such as the dimensional stability.

In this study, fractionated softwood kraft fibers have been reacted with difunctional epoxides in order to introduce crosslinks in the fibre walls. The modification was carried out under solvent-minimized conditions on fibres activated with sodium hydroxide.

Three crosslinkers, of which one was a synthesised cationic molecule, were used. Different solvent systems, temperatures, crosslinker concentrations and reaction times were studied.

Results

The reactions were performed in acetone, isopropanol and water at 80-140°C for 10-60 min using a crosslinker concentration of 0.25-1.0 mmol/g fibres.

The modification introduced crosslinks in the fiber walls as shown by lower water retention values (WRV). The crosslinking also altered the network properties of the fibres and higher wet bulk and better structure recovery after wet compression were noted (figure 1,3).

Multivariate evaluation of the results indicates that longer reaction times are favourable as well as the use of acetone as solvent. A longer reaction time does not require the highest temperature for an improved structure recovery (figure 2).

According to the evaluation, the amount of crosslinker is not decisive for a high wet bulk when isopropanol is used as solvent. The cationic crosslinker showed a higher WRV compared to the non cationic crosslinkers.

Conclusions

• Crosslinking of fibres increases the wet bulk and the structure recovery
• Longer reaction times are favourable to improve the structure recovery of the fibre network
• The method confirms an evident correlation between the wet bulk and the water retention value (WRV)