Editorial corner – a personal view

Towards nanofibrillar single polymer composites

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In their recent review ‘How Nano Are Nanocomposites?’ (*Macromolecules*, **40** (2007) 8501–8517) Schaefer and Justice concluded that: ‘Composite materials loaded with nanometer-sized reinforcing fillers are widely believed to have the potential to push polymer mechanical properties to extreme values. Realization of anticipated properties, however, has proven elusive... With the exception of reinforced elastomers, nanocomposites have not lived up to expectations. Although claims of modulus enhancement by factors of 10 exist, these claims are offset by measurements that show little or no improvement...’.

Obviously, today we can hardly be happy with the mechanical performance of polymer composites reinforced with nano-sized fillers of various origins. For this reason, in addition to the attempts to overcome the encountered problems, new routes to create polymeric materials with improved properties have to be searched. Attractive alternative in this respect seems to be the *preparation of polymers themselves as nano-sized materials*, as for example electrospinning does. This elegant technique has the disadvantage that not that much can be done practically with the fine nanofibers.

The concept of microfibrillar composites (MFC), developed during the last decade, leads to the nanofibrillar composites (NFC), which are reinforced with polymer nanofibrils with diameters in the range of 50–150 nm. The latter can be isolated in a neat form after selective dissolution of the sec-

ond blend component, even after preparation of fabrics or knitted articles from the blend yarn. The neat nanofibrils can be used as a starting material for preparation of nanostructured single polymer composites (SPC) applying the one- or two constituent approach.

Very recently we demonstrated the superior mechanical properties of the new poly(ethylene terephthalate) (PET) nanofibrillar SPC prepared via hot compaction using one constituent – the modulus is competitive with that of the glass fiber/PET (40/60 by wt) composites.

In conclusion, the MFC and NFC concept makes possible the conversion of any polymer in a neat nano- or microfibrillar form and to apply these materials for the preparation of one- or two constituent SPC via hot compaction. The final one-constituent nanocomposite is manufactured starting from nano-sized material only, a case which seems to be very rare if not unique.

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