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Editorial corner – a personal view
From bulk to nano-sized polymers with controlled nano-morphology

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There are enough evidences nowadays for the failure of the concept of nanocomposites – the expectations for drastic improvement of mechanical properties using extremely low filler concentrations (around 1%) were not realized. To the main reasons for this situation belong: poor dispersion, poor interfacial load transfer, process-related deficiencies, poor alignment, poor load transfer to the interior of filler bundles, the fractal nature of filler clusters.

Due to a generic property of nano-sized materials they agglomerate strongly, and the problem of poor dispersion seems to be practically non-soluble. For this reason it was suggested to convert polymers themselves into nano-sized materials, instead of blending them with nano-fillers. This idea seems to be realistic having in mind the characteristic features of polymers as materials: (i) a large and flexible variety of processing techniques (in melt, in solution, during polymerization), (ii) they can be blended with other polymer(s), (iii) due to presence of variety of functional groups they are capable to establish chemical bonds of different strength (covalent, hydrogen bonding, ionic), (iv) due to the chain character of macromolecules it is possible to realize different spatial conformations resulting in different properties. This set of 'tools' can be used for modification of polymers towards creation materials with new or improved properties instead of a simple blending.

After converting the bulk polymer into nanofibrils there are many opportunities for their further application: (i) as nanofibrillar polymer-polymer composites (via compression molding of the drawn blend before removing the second polymer), and after removing of the second blend component, (ii) using the neat nanofibrils as starting material for nanofibrillar single polymer composites, (iii) or as materials for biomedical applications (scaffolds in the regenerative medicine, or carriers for controlled drug delivery), particularly if the second polymer is water soluble, (iv) as well as for technical purposes (as nanofilters or electroconductive nanowires), a.o.

Recent findings demonstrated that the final nanomorphology can be controlled via *hydrogen bonding* between the blend partners: individual, not mutually connected 'endless' nanofibrils in case of no H-bonding, or a 3-D nanofibrillar nanoporous network if H-bonding is possible.

What the science and technology of polymer nanocomposites concerns, the new results allows us to formulate and realize the *concept of converting instead of adding*.

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