Editorial corner – a personal view

H-bonding – a chance for novel nano-sized polymers

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Hydrogen bonds are by far not the strongest interactions in chemistry – they are about 10 times weaker than the covalent bonds between the atoms but still some 3–5 times stronger than the van der Waals forces. While the establishment of covalent or ionic bonds results in creation of new compounds differing in their chemical composition, the H-bonding is responsible for the formation and preservation of the 3-D shape of molecules, particularly in the case of macromolecules, and thus determining to a great extent the functional properties of the latter. For example, the double helical structure of DNA is due largely to H-bonding, similarly to the secondary structures of proteins. This type of bond occurs also in inorganic molecules, such as water and it is the main reason for the peculiar properties of water.

Many polymers are strengthened by hydrogen bonds in their main chains. Among the synthetic polymers the best known example are polyamides, while the greatest effect observed is in aramide fibre. H-bonds are also important in the structure of cellulose and derived polymers in its many different forms in nature, such as wood and natural fibers (cotton and flax).

Hydrogen bonding in polymer blends is a topic of great interest to polymer scientists because such systems have many potential applications. For example, introducing functional groups to one component to make it capable of forming hydrogen bonds to another, thereby enhancing miscibility of otherwise immiscible blends, is one of the major achieve-

ments during the past 20 years of polymer science, as stated in a recent review on hydrogen bonding in polymer blends (DOI: [10.1002/pola.22632](https://doi.org/10.1002/pola.22632)).

The H-bonding, as reported recently (DOI: [10.3144/expresspolymlett.2011.46](https://doi.org/10.3144/expresspolymlett.2011.46)), represents a powerful instrument for creating a desired final nano-morphology during the conversion of bulk polymers into nano-sized materials. It was established that this morphology is of two basic types: (i) as individual not interconnected smooth nanofibrils, or (ii) as 3-D nanofibrillar nanoporous network. The first type is realized when in the starting polymer blend no H-bonding exists, and the second type – when H-bonds between the blend partners are formed. What is more, via suppressing the H-bonding in the second case it is possible to obtain the first type of nano-morphology, i.e. not interconnected individual nanofibrils.

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