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Editorial corner – a personal view

Polymeric nanofibers for medical applications: A real disco

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Polymeric nanofibers produced from biocompatible and biodegradable materials are being investigated for a variety of applications in the 21st century. They have significant application potential in the field of medicine. Polymeric nanofibers as scaffolds for tissue engineering, wound dressings, or drug delivery systems offer production variability and a huge number of flexible structures with changes in morphology, topography, or internal structure. The uniqueness of polymeric nanofibrous materials for medical applications is that their structure very closely mimics the tissue's extracellular matrix.

The spinnability of a polymer liquid (solution or melt) into the form of nanofibers depends on many parameters, and the essence of spinnability as a property of a polymer liquid is still not easily defined. Obviously, it is necessary to use a certain force for polymer liquid transformation and to overcome the force from the liquid surface tension, which keeps the liquid in the form with the lowest free surface energy. But the properties of materials in general, including nanofibers, are determined by their structure and chemical composition. Thus the choice of the base material, *i.e.*, the polymer, is crucial for polymeric nanofibrous materials.

Popular biocompatible and biodegradable polymers for the formation of nanofibers for medical applications are aliphatic polyesters, especially the well-spinnable polycaprolactone (PCL) (https://doi.org/10.1016/j.progpolymsci.2010.04.002), which has outstanding properties (https://doi.org/10.1016/j.compscitech. 2010.01.010). However, the crystal morphology and molecular orientation – internal structure of PCL nanofibers has rarely been investigated. The known information on PCL indicates that under normal conditions (temperature, humidity) in the post-process time (storage), there are changes in the internal structure, the arrangement, and the surface. The internal arrangement, which can basically be described by the degree of crystallinity, changes rapidly after processing (cold recrystallization occurs). The surface of such biodegradable materials is certainly also rebuilt due to air humidity in the post-processing time. In the case of initially hydrophobic PCL nanofibers, this is manifested by a change in water wettability over time. Then moisture penetrates inside and degradation, which is led by hydrolysis, has space to express itself. Amorphous parts prefer to decompose, and secondary restructuring – rearrangement – occurs in the decomposed parts. Not only the surface but also the volume changes.

Polymeric nanofibers are extremely interesting in general, but if they are made of biodegradable aliphatic polyesters, they undergo almost constant changes in their arrangement and, therefore, their internal structure. And when they are subjected to an external stimulus such as sterilization, the effect can be even more complex. We should not think of polymer nanofibers as stable, unchanging solid materials. Inside polymeric biodegradable nanofibers, there is still going on a real disco.

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