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Editorial corner – a personal view

The role of electrospun nanofibers in the fight against the COVID-19

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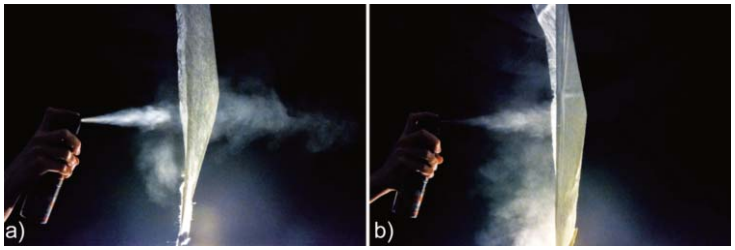
There is no doubt that the filtration efficiency of polymeric nanofiber mats is excellent (Figure), as they can adsorb submicronic and nanosized particles (https://doi.org/10.1016/j.coco.2019.06.003). For instance, the particles of aerosols are in this range (https://doi.org/10.11648/j.ijema.20150306.11). The viruses are typically in the range of 20–200 nm, in which classical microfilters are not very efficient, but nanofibrous nonwoven can filter out more than 99% of such particles (https://doi.org/10.1016/j.seppur.2018.01.002). Face masks play a crucial role in the protection against respiratory viruses (https://doi.org/10.3144/expresspolymlett.2020.41).

When we started working on high-throughput nanofiber spinnerets in cooperation with another department from our university, we named one of our first methods 'Corona Electrospinning' (https://doi.org/10.1016/j.eurpolymj.2015.11.028) because the shape of the spinneret with the forming fiber jets reminded us of a medieval crown. Meanwhile, the throughput of the lab-scale spinneret topped 1200 ml/h in AC mode (https://doi.org/10.1016/j.eurpolymj.2015.11.028). With another related method called 'High-Speed Electrospinning' (https://doi.org/10.1016/j.ijpharm.2015.01.025), our close colleagues reached over a 1500 ml/h throughput.



Filtration performance of a 20 g/m^2 spunbond nonwoven (a) and the same textile combined with a 4 g/m^2 nanofiber layer (b).

At the time, we had no idea that Corona Electrospinning could one day be a means of fighting the coronavirus. We do not see what the future holds, and we do not even recognize exactly how much trauma the COVID-19 pandemic is causing in society, but face masks are expected to become part of our everyday lives for a long time to come. The high-quality mask has become of extreme value.

With the increased throughput, the price of nanofibers drops, not to mention that only a thin layer is needed (https://doi.org/10.1016/ j.jcis.2018. 07.021). A single spinneret can produce material for thousands of masks per day. Several companies are present on the market with industrial-size nanofiber production equipment. Still, so far, no satisfactory production capacities have been built worldwide.

It is heartwarming to see that around the world, researchers are putting their machines into battle, and make masks for hospitals and the civilian population, which is a vigorous indicator of the coherence and real power of free and independent scientific centers.

Will the current crisis bring a breakthrough in building large electrospun nanofiber production capacities for making these advanced masks? The knowledge and the technology are available.

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