# NANOFILTERS are born – March 24, 2022

# We are accelerating the production of effective nanofiber drapes and launching a challenge to engage households and businesses in the production of drapes

The University is responding to the severe shortage of effective protective equipment with further innovation. We produce filters made of nanomaterial that people can put into cloth drapes with pockets. The idea substantially increases the effectiveness of cloth drapes against viruses and, most importantly, will greatly accelerate the supply of drapes with an effective nanolayer to the population. The 'Filter Drapes for All' challenge should also help significantly.

"We can thus immediately triple our current production of face masks with nanotextiles," says Josef Šedlbauer, head of the chemistry department. "The filters are also more durable, so they last about twice as long," he adds.

The new device, which was assembled and tuned in record time by a team from the Department of Textile and Single Purpose Machines at the Faculty of Engineering of the Technical University of Liberec and which produces a nanolayer for drapes, is a laboratory device optimised for a production rate of 3.5 metres of material per minute on a strip of half a metre width. It thus produces material for about 6,000 drapes per day.

"Much less material is needed for the filters than for the whole cloth, and there are no unusable scraps, which also makes production more efficient. We are talking about 20,000 filters for the drapes per day," calculates Jaroslav Beran, the head of the team that commissioned and operates the nanoliner. It is now in patent proceedings. It is also much less time-consuming to cut the material into rectangles of filters than to sew a whole drape.

One intermediate step is added, namely sealing the edges of the filter so that it does not fray when inserted into the pockets of the cloth drapes.

"We have already obtained two high-frequency welding machines from external companies that responded promptly to our call. They are fast to work with," says David Lukáš, who with his team is behind the patented technology for producing nanofibres by wetting the polymer solution with alternating current. The new nanofibre technology is based on this principle. The finished nanomaterial, he says, can be inserted into the pockets of the drapes people make at home from cotton or other materials.

#### We are launching a website for "drapers"

For example, they can be inspired by the pattern published on the website rousky.tul.cz. There you will also find a video tutorial on the production of this drape, summarizing reports on the effectiveness of the filter layers and much more information on the drapes. They will also get answers related to the production of the pocketed drapes. The basic, and in fact the only, requirement is that the filter pocket size must be 15 x 20 cm. The website will also serve as a contact network between companies that are able to produce filters from other materials and people who make cloth drapes.

# I'm protecting you and myself

The nanolayer we produce at TUL is optimized for 50-90% capture of virus-sized particles. However, its use is a one-time application. The cotton drape has no effective capture, but it copes better with moisture and can be easily washed and reused.

"The nanofibre filter drape combines the advantages of both. In the evening, you put the cotton drape in the washing machine or boil it in hot water and change the nanofiber filter layer," says Josef Šedlbauer. "According to our measurements, the effectiveness of a cotton drape with a filter layer is comparable to that of a facial nano-dress," adds David Lukáš.

#### Companies get involved, people are already sewing

This method of production puts into play a large number of companies that, while they can produce flat nanomaterial or even other effective filter material, are not equipped to make complete drapes out of it.

"It is not that difficult to adapt the production so that the final product is rectangles of fabric. We therefore call on companies to come on board. It's a way to fundamentally improve the supply of value-added, effective filter layers to people across the country. Such drapes not only protect those around them, but they also protect the wearer much more effectively," Professor Šedlbauer appeals, adding that people across the country are already sewing the drapes and are ready, now it is the turn of companies to supply the filters.

## TUL produces material and drapes exclusively for the region

For more than a week, the Technical University in Liberec has been producing around a thousand drapes a day for the Liberec Region and additional kilometres of nanomaterial, which are used by external companies to make drapes for the Region. The idea to help supply the population with these protective devices was the result of cooperation between the team of the Chemistry Department of the Faculty of Science and Humanities and the team of the Textile and Single Purpose Machines Department of the Faculty of Engineering. The Faculty of Textiles has also been involved, and its departments are sewing drapes made of cotton or a material that is a mixture of nano- and microfibres.

But thousands of drapes a day are not nearly enough to meet demand even in the region. That's why our scientists are now coming up with the challenge of Drapes with a Filter for All. As the rector of TUL Miroslav Brzezina pointed out, the challenge is to help transfer the initiative to the companies that produce non-woven fabrics, the university cannot run the production of drapes and filters in the long term.

"We are answering a flood of questions these days. People ask where they can buy drapes or filter material from us. We are pleased with the trust that the public places in the Technical University of Liberec, but I would like to stress that our university supplies all the material under the coordination of the regional crisis staff only to the Liberec Region. There is a state of emergency in force and it is a commitment that we must keep," says Miroslav Brzezina.

#### **Photos**