

DECLARATION OF PROPERTIES

Nanostructured material SpurTex VS 85

Specification of the product:

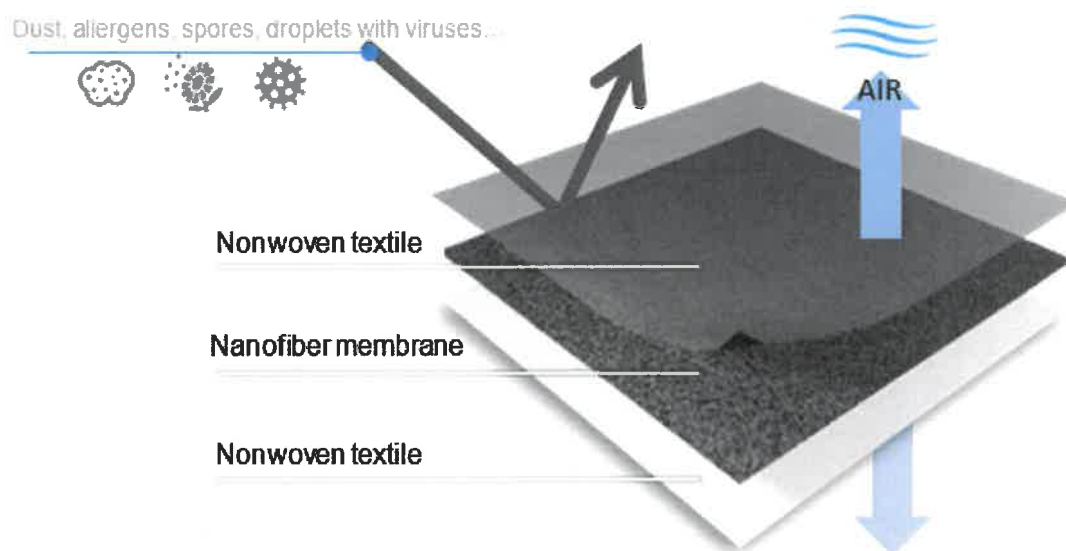
Nanostructured air filtration disposable material **SpurTex VS 85** for disposable face masks, respirators and half masks.

Name and address of the manufacturer:

SPUR a.s.
tr. T. Bati 299
764 22 Zlín
Czech Republic

Object of the declaration:

Nanostructured air filtration materials focusing on improvement of filtration properties first of all in the area of ultrafine particle separation (10 – 400 nm).



References to the relevant standards used and references to the other technical specifications the material was tested according to:

SpurTex VS 85 possess filtration properties in accordance with EN 149 class FFP3, NIOSH class N99 and furthermore very good efficiency in maximum penetrating particle size (MPPS) value defined by EN 1822 in the area of ultrafine particles separation.

Table 1: Classification of SpurTex VS 85 in accordance with EN 149 class FFP3, NIOSH class N99

Description	Rating	Filtered 400 nm airborne particles at 30 l/min air flow	Filtered 300 nm airborne particles at 95 l/min air flow	Pressure drop at 30 l/min air flow	Pressure drop at 95 l/min air flow
Requested value defined by EN 149	FFP3	99 %		< 100 Pa	< 300 Pa
Requested value defined by NIOSH	N99		99 %	< 100 Pa	< 300 Pa
Reported value for SpurTex VS 85	FFP3, N99	> 99 %	> 99 %	60 - 90 Pa	< 250 Pa

NIOSH = National Institute for Occupational Safety and Health (USA)

Filtration efficiency of SpurTex VS 85 in the area of ultrafine particle separation measured in accordance with EN 1822 are depicted in figures 1 and 2. Respiration intensity at flow 30 l/min (face velocity 5.7 cm/s) corresponds to breathing at normal walk, respiration intensity at flow 95 l/min (face velocity 19 cm/s) corresponds to breathing at running. Nanostructured material SpurTex VS 85 ensures very good filtration efficiency at low pressure drops.

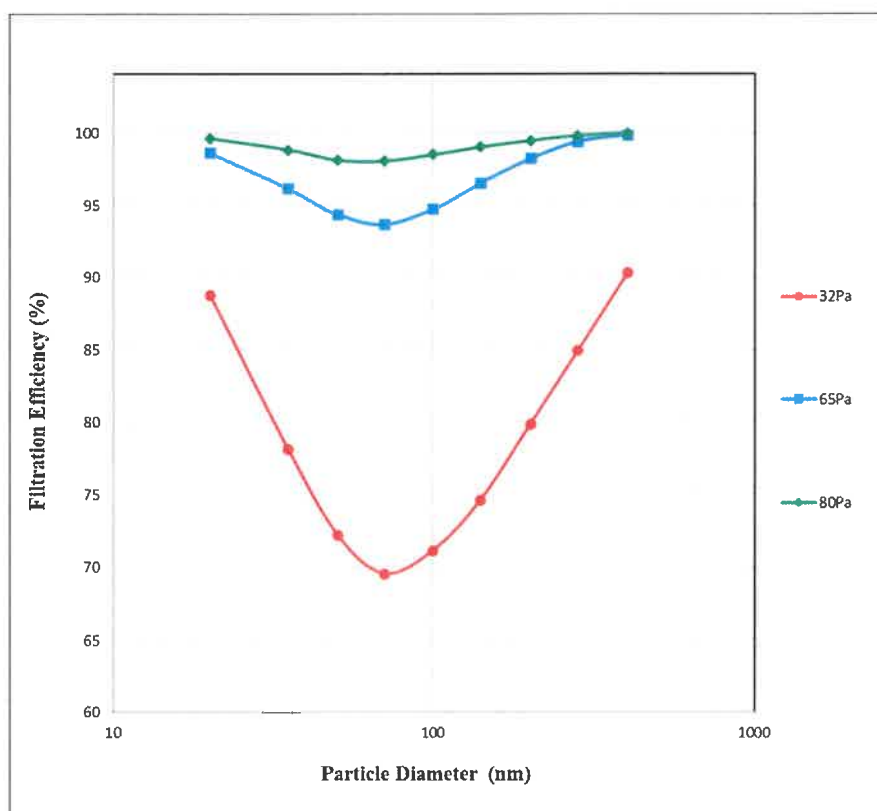


Figure 1: Filtration efficiency for SpurTex VS 85 at air flow 30 l/min

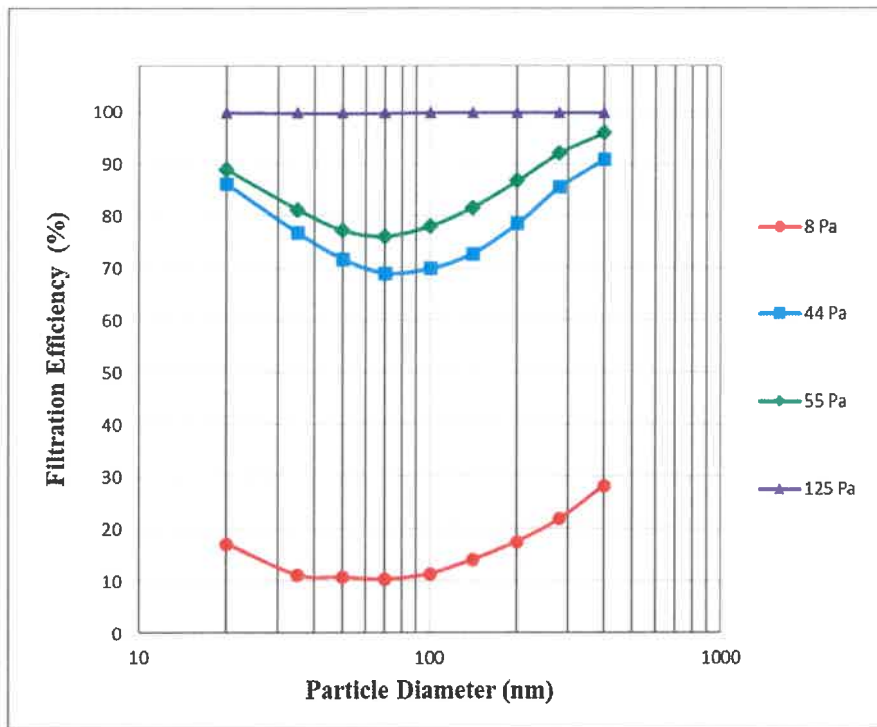


Figure 2: Filtration efficiency for SpurTex VS 85 at air flow 95 l/min

For the better visualization the surface of nanostructure from the figure 2 for materials with pressure drop 125 Pa and 8 Pa are presented in SEM pictures (figures 3 and 4). The values were measured at face velocity $19 \text{ cm}\cdot\text{s}^{-1}$. It is rather surprising that even very low area mass ($0.06 \text{ g}\cdot\text{m}^{-2}$, Fig. 4) is capable of more than 10% capture of ultra-fine particles.

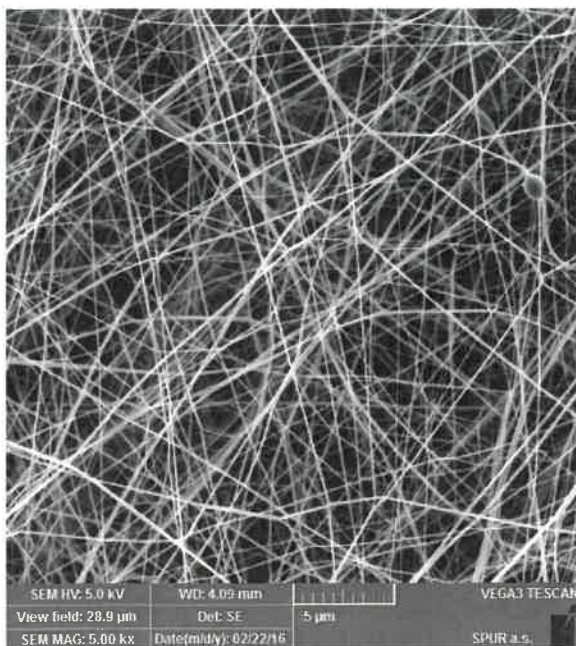


Figure 3: PVDF nanostructure, $\Delta p = 125 \text{ Pa}$, magnification 5,000×

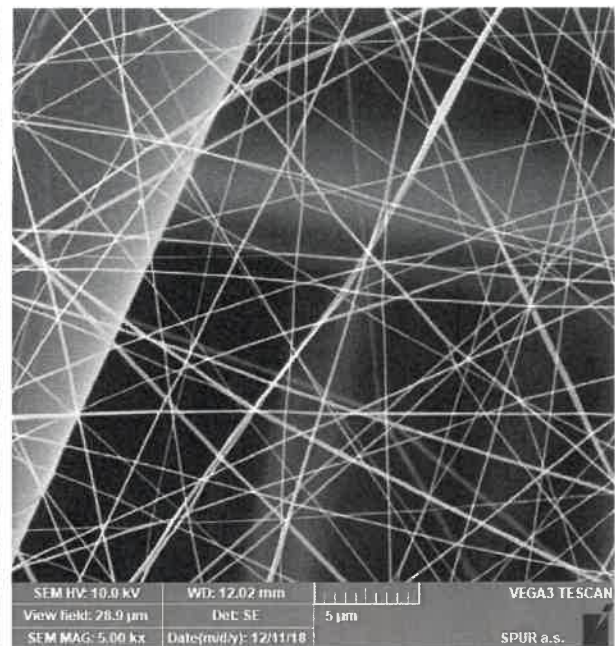


Figure 4: PVDF nanostructure, $\Delta p = 8 \text{ Pa}$, basis weight = $0.06 \text{ g}\cdot\text{m}^{-2}$ only, magnification 5,000×

Additional information:

Filtration material SpurTex VS 85 is disposable. After several hours (2 - 4 hours in dependence on environment) of face mask or respirator wearing harmful particles can be concentrated into the nanostructure. The nanostructure does not possess antibacterial properties.

For cutting of face mask elements the laser application is recommended.

In the ultrafine particle size range, the filtration efficiency was determined as a function of particle diameter. A 1 g.l^{-1} ammonium sulphate solution was nebulized (AGK 2000, PALAS, Germany), a monodisperse size fraction was selected using an Electrostatic Classifier (Goliath, ICPF AS CR, including Vienna type DMA), and particle concentration upstream and downstream the filter (face velocities 2.5, 5.7, 19.0 and 55 cm.s^{-1}) was recorded by two condensation particle counters (both UCPC 3025 A, TSI, USA). The filtration efficiency was determined at nine mobility diameter fractions: 20, 35, 50, 70, 100, 140, 200, 280 and 400 nm. Each filtration efficiency values and corresponding pressure drops were measured repeatedly at steady state of experimental lay out. The MPPS for all samples were evaluated and used for material characterization. Ammonium sulphate particles have been before filtration process uncharged so the mechanism of electrostatic capture cannot be fulfilled.

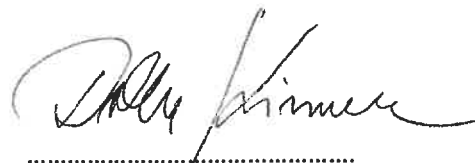
The development and specification of filter media for air filtration applications in range of maximum penetrating particle size (MPPS) in accordance with EN 1822 are the most followed features in present. Air filtration materials used for ultra-fine particles separation have good capture properties in the range from 10 to 400 nm. They are manufactured first of all from borosilicate microfibers fixed by means of acrylic resin binders now. Very brittle character of glass fibers is the reason of suspicion on rather poor healthy and ecological properties of these filters because carcinogenic rod chips from these products can be created. On the contrary application of nanostructures prepared from flexible polymeric nanofibers do not possess any environmental risk and in comparison with glass fiber products attain even better filtration efficiencies at the same pressure drops. Nanostructures are prepared by state-of-the-art fiber forming technology in electrostatic field.

Signed for and on behalf of company:

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Signature

Place and date of issue:

In Zlin, January 16, 2020