



Nanofibers, technology and applications

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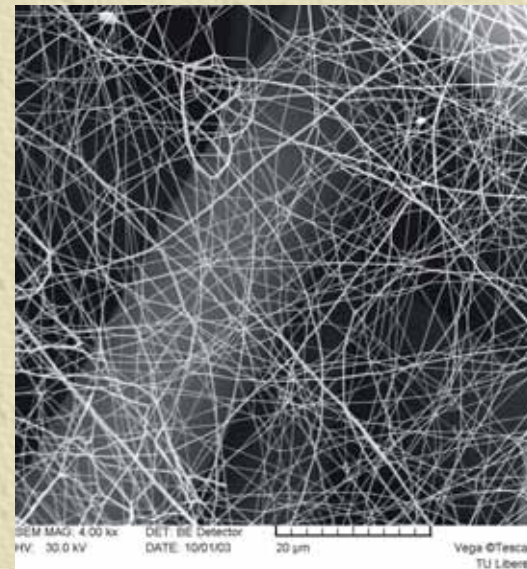


What is electrospinning?

Electrospinning is the process using electrostatic forces to form a fine filament of the polymer solution.

What is nanofiber?

Fiber with diameter in nano meter range.
Many types of polymers were processed into nanofibers of 50 to 1000 nanometers in diameter, several orders of magnitude smaller than conventional fiber spinning.





NANOFIBERS

✦ Properties

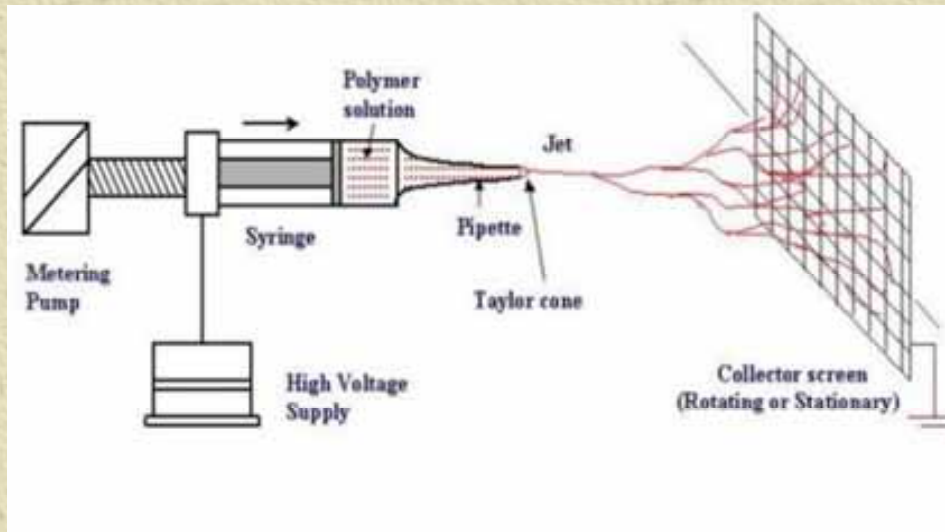
- large specific surface area
- high porosity
- small pore size
- diameter range (50 – 1000) nm

✦ Material

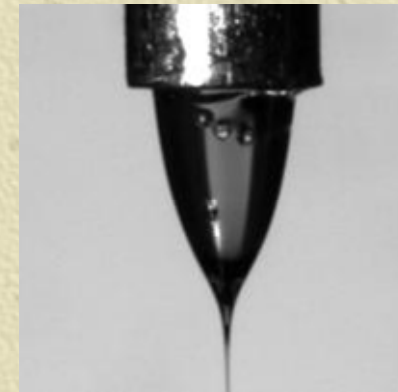
- Polymer solutions or melts
- More than 30 polymers, including polyethylene oxide, DNA, polyaramids, and polyaniline, have been electrospun.
- These fibers can be made of variety organic (nylon, polyester, acryl) or biological polymers (proteins, collagens).
- PVA, PS, PAN, but also peptide amphiphiles or cellulose.



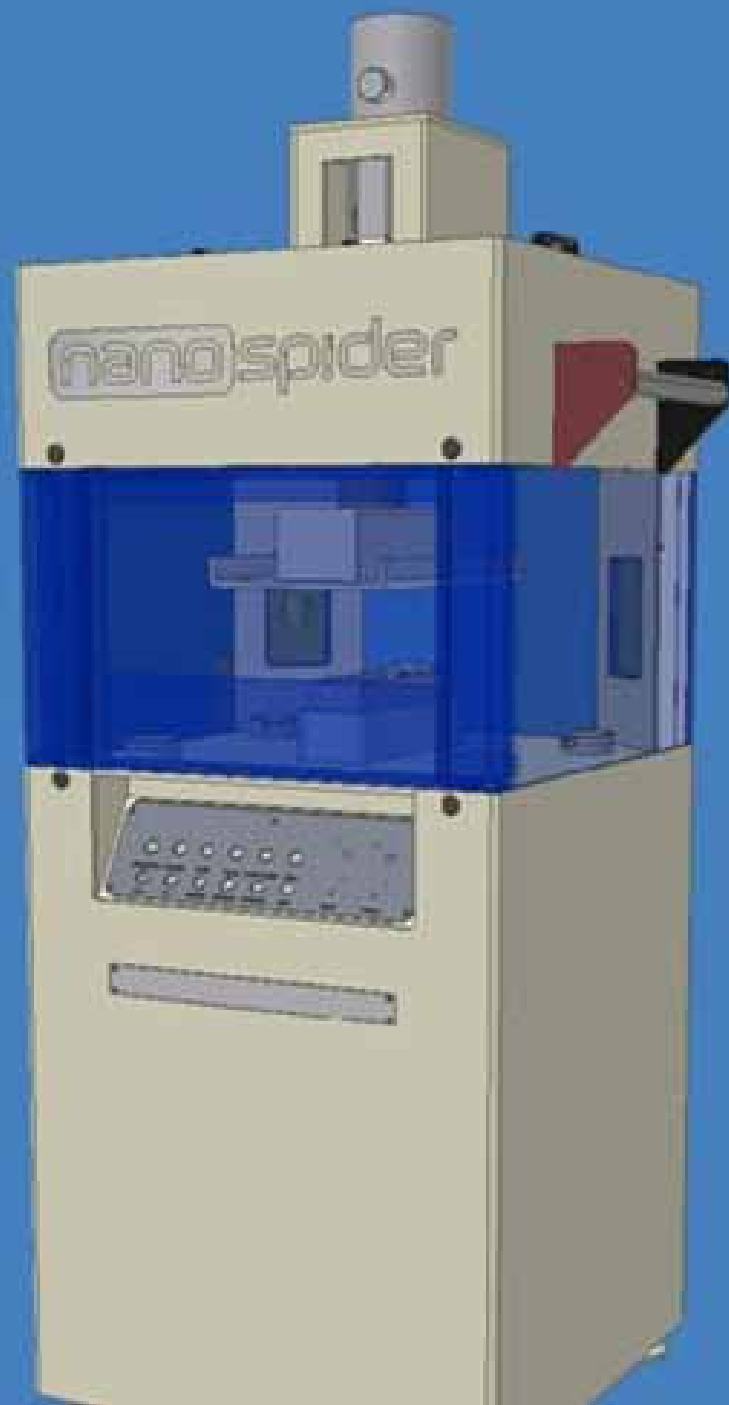
Technology of nanofibers – Electrospinning technology

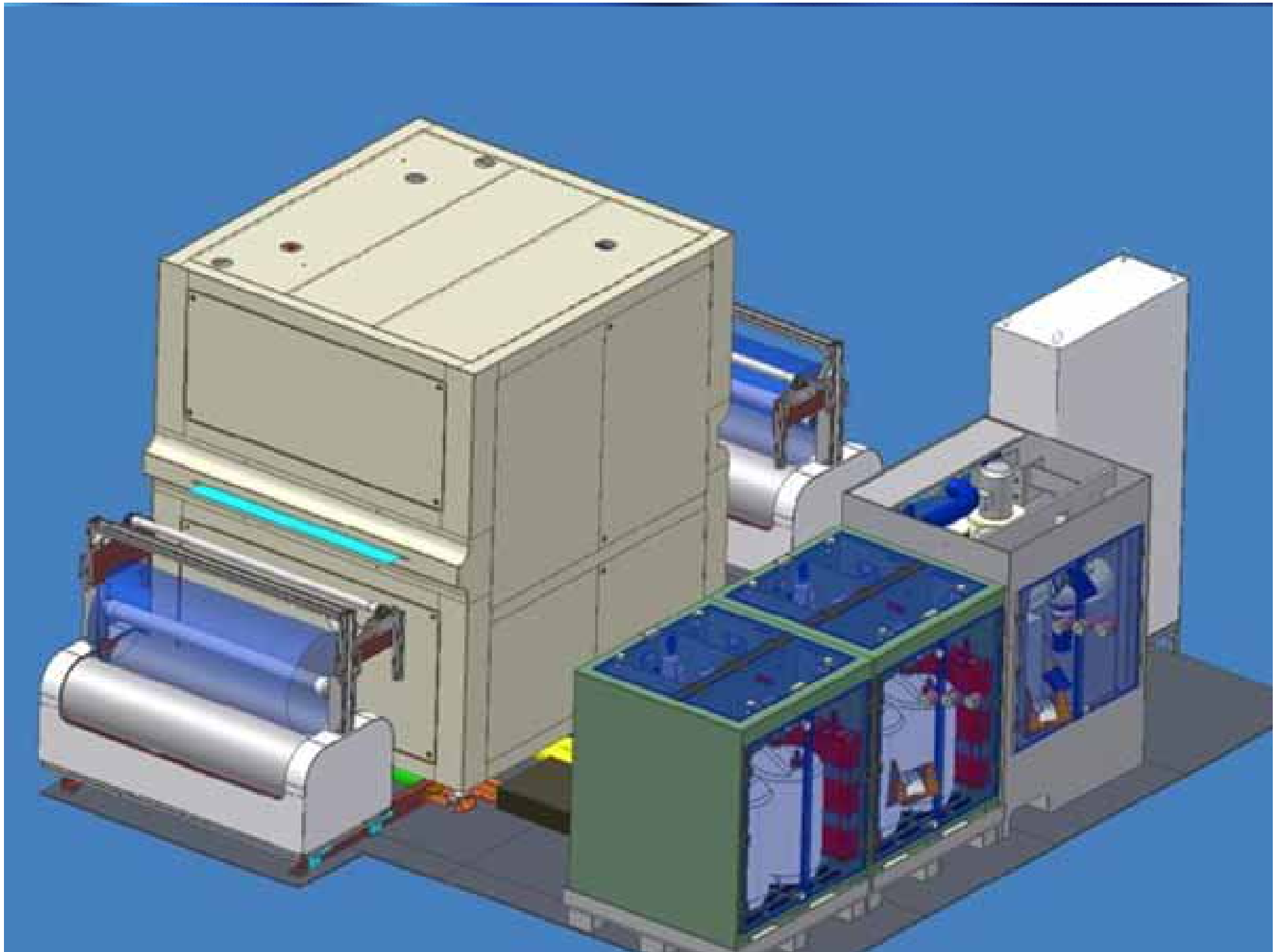


0.1 - 1gramms per hour



In the electrospinning process a high voltage is used to create an electrically charged stream of polymer solution or melt. A high voltage electrode is linked with the polymer solution. The solution is then spun through a capillary. Due to high voltage electric field between the tip of capillary and a grounded collector, Taylor cone is formed at the tip of capillary producing sub-micron in diameter fibres. Fibres solidify as the polymer solvent evaporates and create an interlinked fiber layer on the surface of the collector.

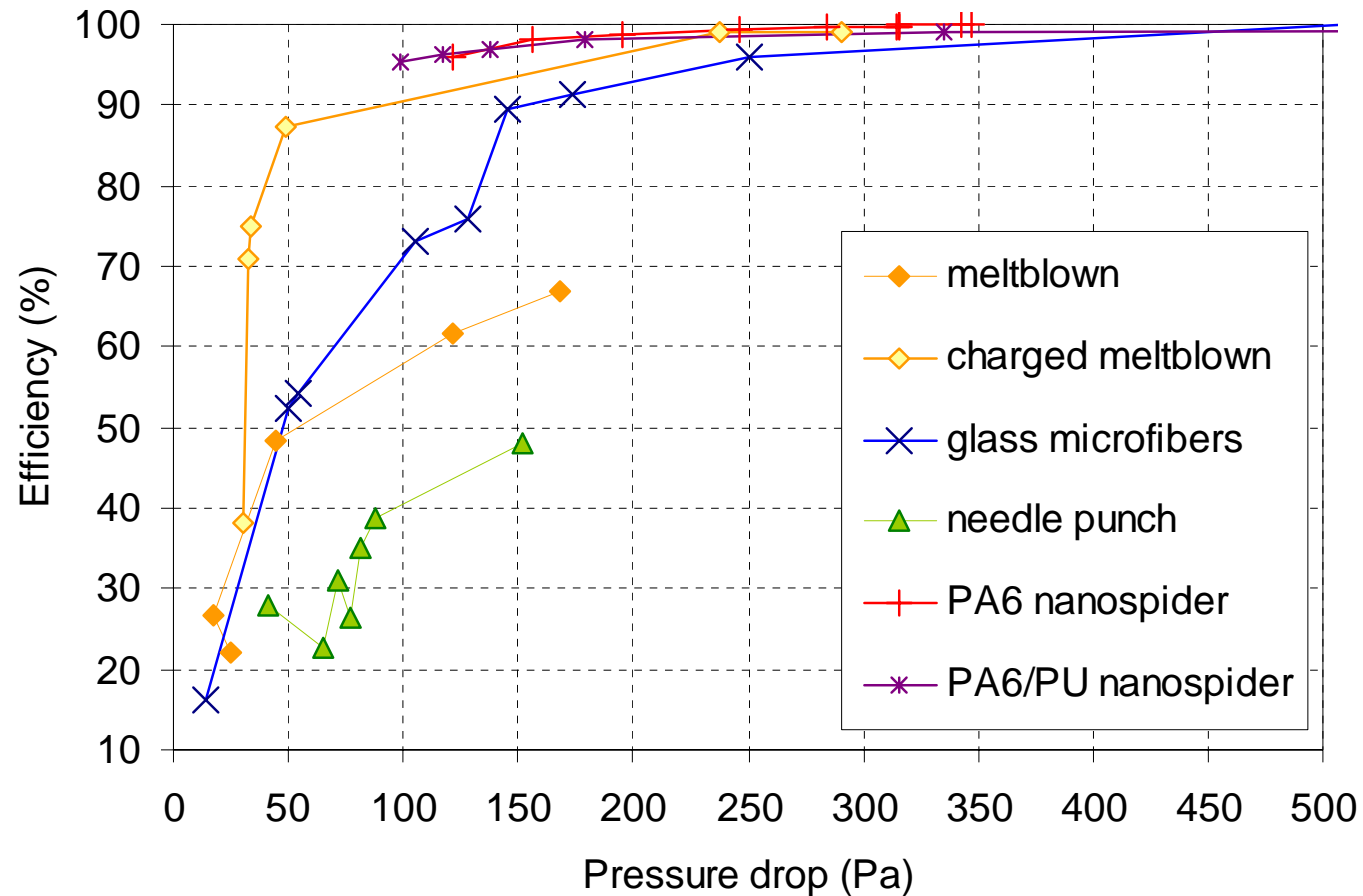




NANOFIBRES APPLICATIONS

- Air and liquid filters
- Wound dressings
- Tissue engineering
- Surface modifications
- Sound absorptive materials
- -etc

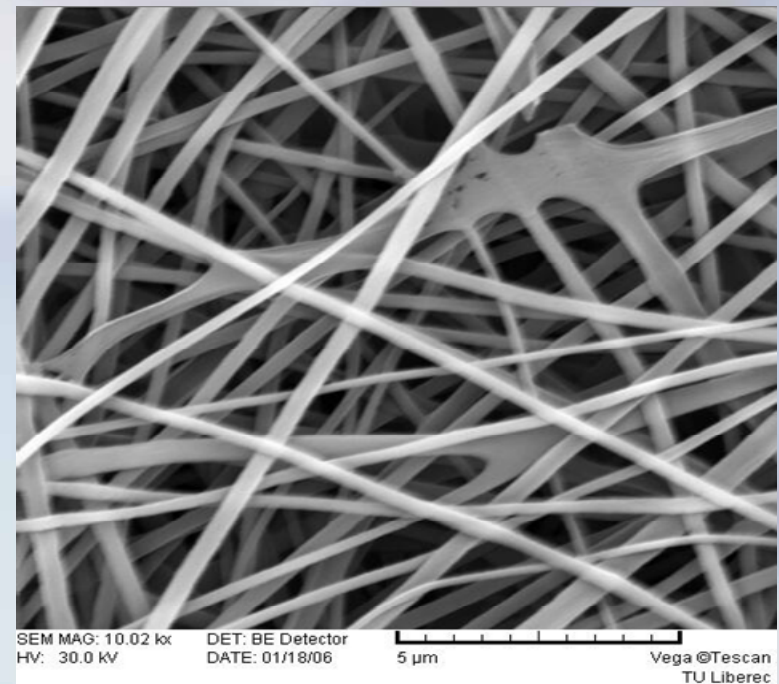
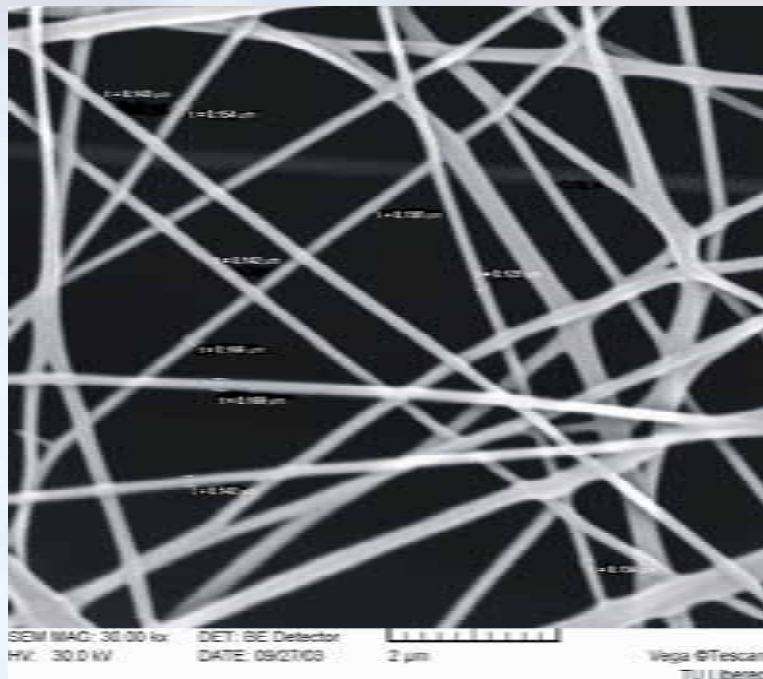
Air filtration properties of various materials



Wound dressings



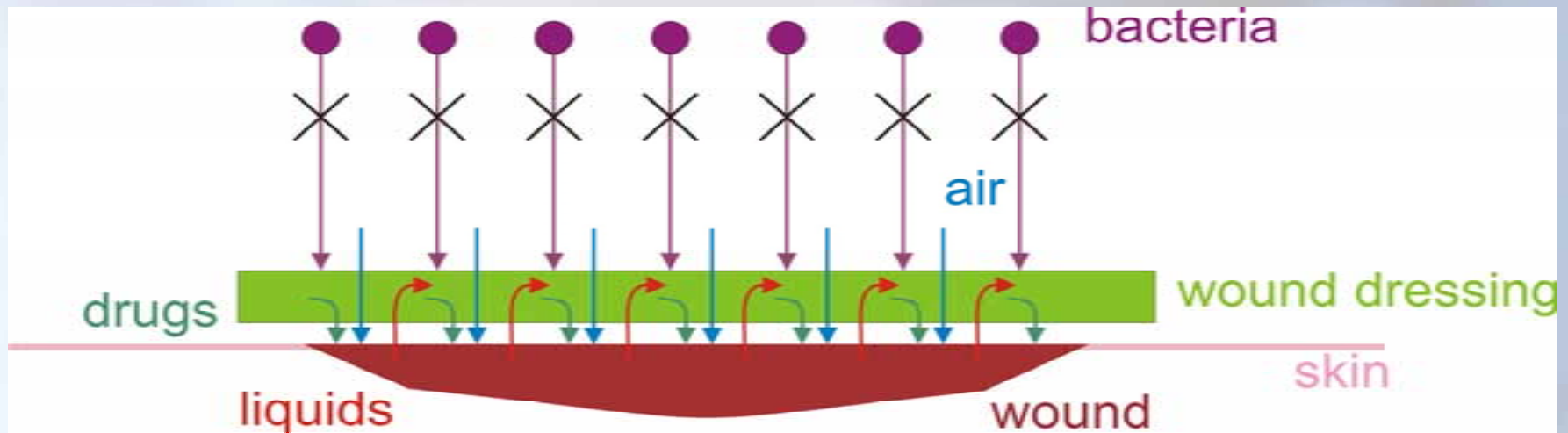
Nanofibers



Wound dressings - functions

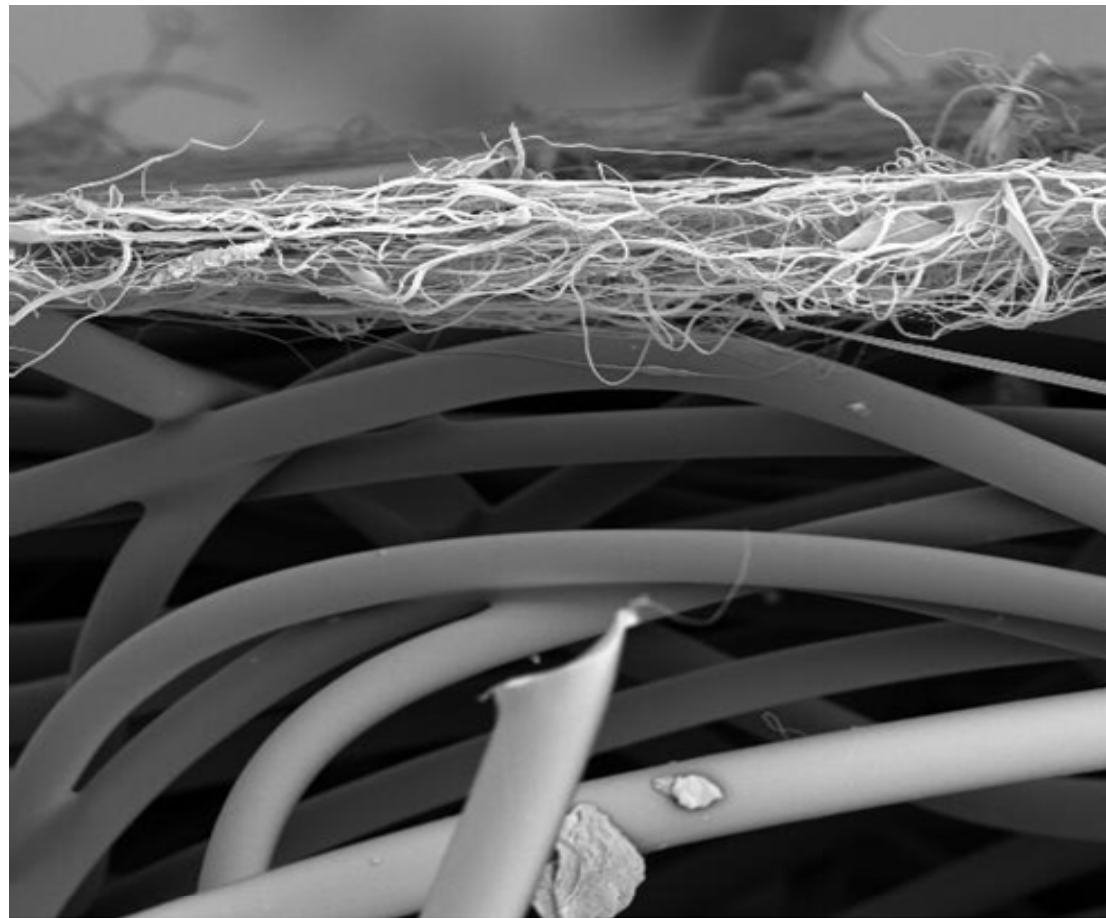


Function of wound dressing



Sound absorptive materials

Profile: Nanofibrous layer is applied by the electro spinning proces to the basic fibrous material



SEM MAG: 500 x
HV: 30.0 kV

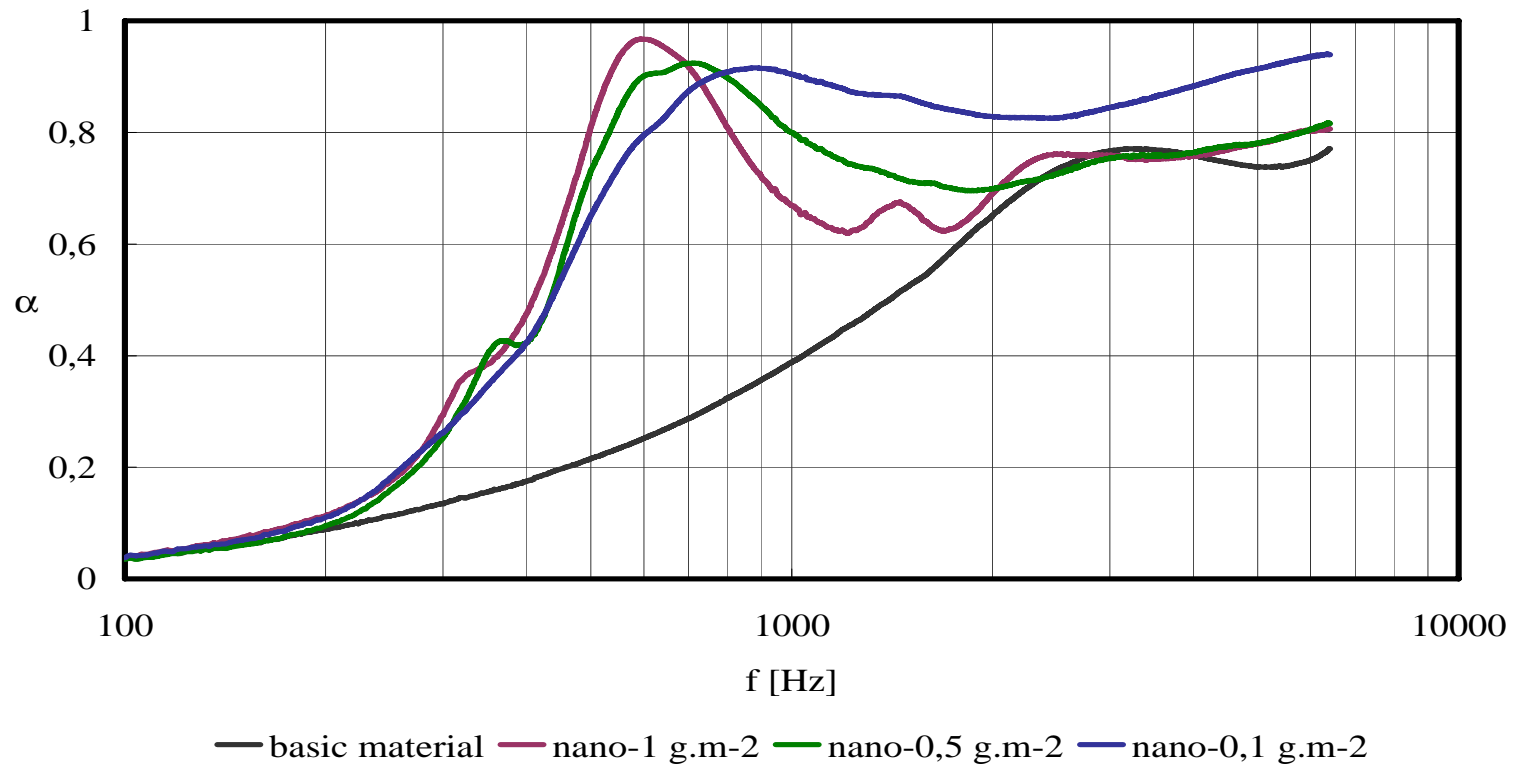
DET: BE Detector
DATE: 05/13/05

100 µm

Vega ©Tescan
TU Liberec

Sound absorption - nanofibres

Basic fibrous material with the nanofibrous layers of different area densities (colored curves)
vs.
Basic material without the nanofibers (black curve)



Thanks for Your Attention