

PATENT CLAIMS

1. Composite multi-layer textile (1), comprising at least one
5 nanofibre layer (11) with nanofibres with diameters below
100nm and one support layer (12) with microfibres with
diameters below five microns, wherein the layers (11, 12) were
produced by electrospinning and the multi-layer textile (1)
shows an overall transmittance (T%) at $\lambda = 555$ nm greater
10 than 50%,
characterized in that
the at least one nanofibre layer (11) and the support layer (12)
are fused, forming solid domains (Ds) in the multi-layer textile
(1), at closed areas of a pattern used in the production process,
15 wherein the solid domains (Ds) are separated from each other
or connected, showing defined shapes, with regular or irregular
spatial distribution, while the fibre morphology of nanofibres of
the nanofibre layer (11) and microfibres of support layer (12) is
preserved on top of the open areas beside the solid domains
20 (Ds), attaining an overall transmittance of the entire multi-layer
textile (1) greater than that given by the sum of the individual
layers (11, 12).
2. Composite multi-layer textile (1) according to claim 1, wherein
25 the multi-layer textile (1) comprises a pattern layer (13) with a
pattern (130) of closed and open areas, on top or bottom of the
dual layer (11, 12) and the solid domains (Ds) are formed at
contact positions of the nanofibre layer (11), the support layer
(12) and the patterned layer (13).
- 30 3. Composite multi-layer textile (1) according to claim 1, wherein
the multi-layer textile (1) comprises a nanofibre layer (11)
sandwiched between two outer support layer (12, 12'), showing

solid domains (Ds) at fused position of all three layers (11, 12, 12').

4. Composite multi-layer textile (1) according to claim 2, wherein
5 the patterned layer (13) is fused sandwiched between two pairs
of a nanofibre layer (11, 11') and support layer (12, 12').
5. Composite multi-layer textile (1) according to one of the
preceding claims, wherein the solid domains (Ds) are formed as
10 contact areas, connecting nanofibre layer (11, 11'), support
layer (12, 12') and if available the patterned layer (13), showing
thicknesses between 1 μm and 100 μm .
6. Composite multi-layer textile (1) according to one of the
15 preceding claims, wherein the solid domains (Ds) show maximal
lateral widths between 10 μm and 100 μm at its widest points.
7. Composite multi-layer textile (1) according to one of the
preceding claims, wherein the pattern of solid domains (Ds) on
20 the multi-layer textile (1) has a value between 30% and 70% of
the total surface of the multi-layer textile (1).
8. Composite multi-layer textile (1) according to one of the claims
2 to 7, wherein the transversely thickness of the patterned layer
25 (13) varies between 1 μm and 100 μm and the patterned layer
(13) is based on a woven polymeric mesh.
9. Composite multi-layer textile (1) according to one of the claims
2 to 7, wherein the transversely thickness of the patterned layer
30 (13) varies between 1 μm and 100 μm and is formed by a
thermoplastic material with a number of through holes as
openings and a lattice-like structure as connection webs, while
at least 30% of the total surface of the thermoplastic material is
open.
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10. Composite multi-layer textile (1) according to one of the preceding claims, wherein the nanofibre layer (11, 11') comprises chitosan/polycaprolactone nanofibres and the support layer (12, 12') comprises polyester/polyurethane microfibrils.

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11. Method for production of an optically transparent multi-layer textile (1), which shows an overall transmittance (T%) at $\lambda = 555 \text{ nm}$ greater than 50%

characterized by the steps:

- 10 - subsequent electrospinning of a nanofibre layer (11, 11') and a support layer (12, 12') on a belt (2) of a production setup (0) in a electrospinning step (I) either on a patterned collector of the electrospinning apparatus or on a supplied patterned layer/porous substrate layer (13), both showing open and closed areas,
- 15 - transport of the belt (2) with coated multiple layers to a hot press or calender (3) and subsequent
- implementation of a thermo-mechanical treatment step (II) at elevated Temperature (T_1) higher than room temperature and pressure (p_1) for a minimum time interval (Δt), wherein the
- 20 layers (11, 11', 12, 12', 13) are fused at closed areas either of the collector pattern or a pattern (130) of the patterned layer/porous substrate layer (13), forming a multiplicity of solid domains (Ds) in the multi-layer textile (1), before
- 25 - a cooling step (III) is carried out at lowered Temperatures ($T_2 < T_1$) and pressures ($p_2 < p_1$).

12. Method for production of a transparent multi-layer textile (1) according to claim 11, wherein the thermo-mechanical

30 treatment step (II) is carried out at pressures (p_1) of at least 1000 N/cm^2 , most preferred greater or equal 1500 N/cm^2 , temperatures (T_1) of at least 70°C , most preferred greater or equal 80°C .

13. Method for production of a transparent multi-layer textile (1)
according to claim 11 or 12, wherein the time interval (Δt) of at
least up to a one-digit number of seconds, preferred greater or
5 equal to 10 seconds, most preferred 30 seconds is selected.
14. Method for production of a transparent multi-layer textile (1)
according to one of the claims 11 to 13, wherein the patterned
collector of the electrospinning apparatus is formed by a metallic
10 mesh or a perforated metal sheet and builds a part or is
integrated in the belt (2).
15. Method for production of a transparent multi-layer textile (1)
according to one of the claims 11 to 13, wherein the patterned
15 layer/porous substrate layer (13) is based on a woven polymeric
mesh or formed by a thermoplastic foil with a number of
through holes as openings and a lattice-like structure as
connection webs, while at least 30% of the surface is open.
- 20 16. Method for production of a transparent multi-layer textile (1)
according to one of the claims 11 to 15, wherein two support
layers (12, 12') are fused in a patterned way to one nanofibre
layer (11), forming the solid domains (Ds) at the closed areas of
the used pattern.
- 25 17. Method for production of a transparent multi-layer textile (1)
according to one of the claims 11 to 15, wherein two pairs of
nanofibre layer (11, 11') and support layer (12, 12') are fused at
the closed areas of the pattern (130) of the patterned
30 layer/porous substrate layer (13).
18. Method for production of a transparent multi-layer textile (1)
according to one of the claims 11 to 17, wherein timely after the

cooling step (III), the resulting multi-layer textile (1, 1', 1'', 1''') is rolled onto a roll (4).

- 5 19. Use of a multi-layer textile (1, 1', 1'', 1''') according to one of the claims 1 to 10 as part of a facial mask as a medical device and/or as personal protective equipment.