



Clothing with the look of sportswear for everyday

Properties of clothing are influenced especially from the properties of the utilized fibres

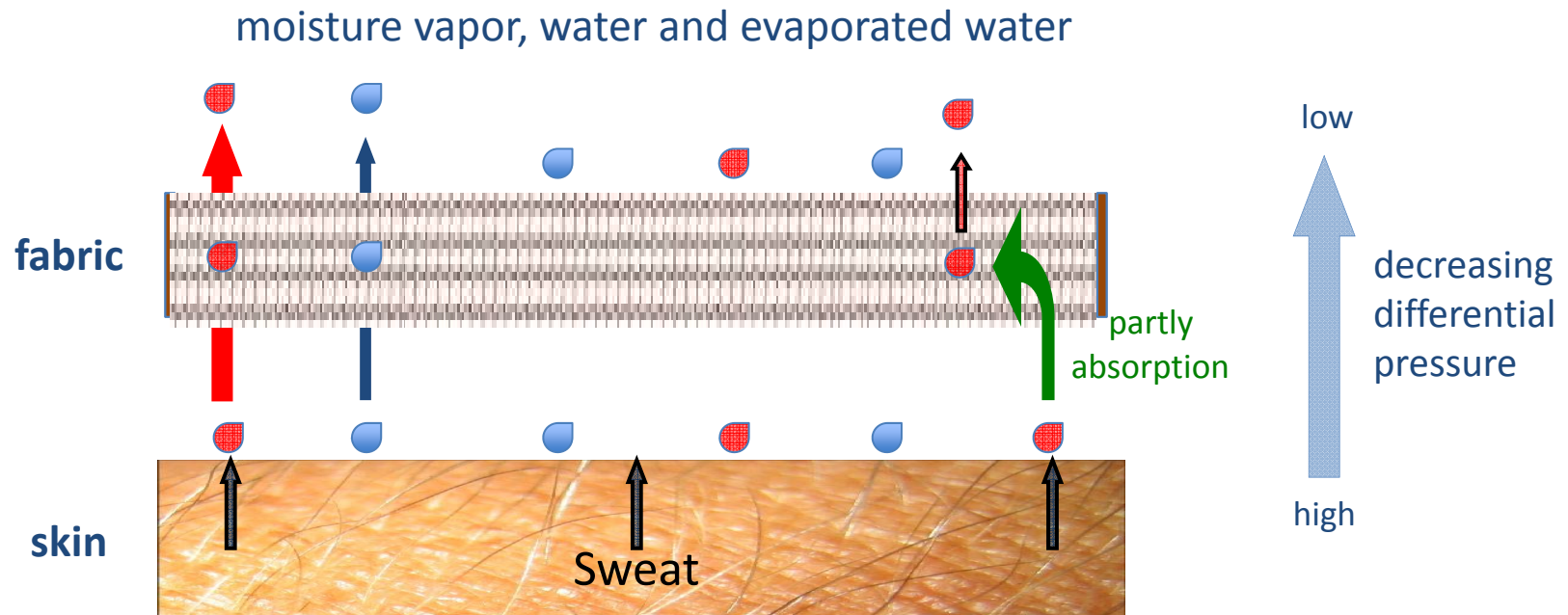
Fibres for functional sportswear:

Polyester, Polyamide, Polypropylen, Elasthan, Merino wool

Fibres for Athleisure: all chemical/synthetic and natural fibres

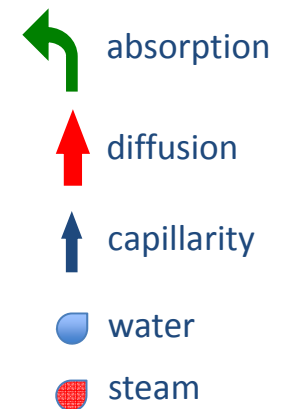
Terms: breathability, thermoregulation, dimensional stability, elasticity, softness, permeable membranes, evaporating of sweat, layered clothing

Athleisure



influencing variable

- air temperature
- air humidity
- wind force
- solar radiation

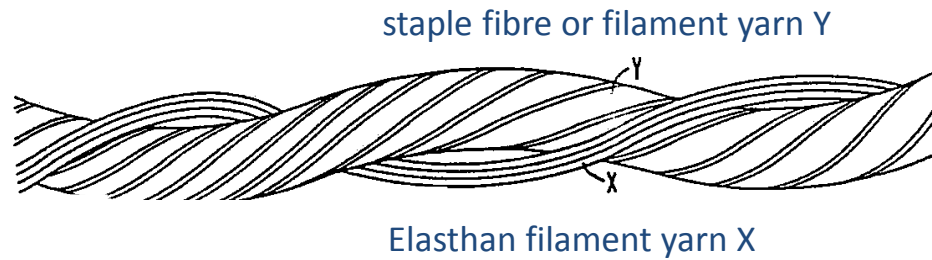


Breathability / Evaporating of water in clothing

Dimensional stability of fabrics - natural fibres: poor, synthetic fibres: high

Scratching the skin - the finer (fibre thickness) the less scratchiness

Elastic wrapped yarn



Elastic Core yarn



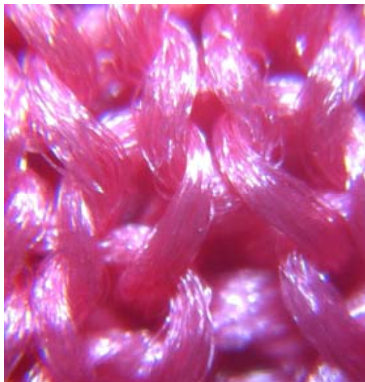
Dimensional Stability/Scratching/Elastic Yarns



Influencing variables which favour pilling

- knitting fabrics from staple fibre yarns
- fibre length, the shorter the more
- fibre blends, i.e. natural fibres with chemical fibres

filament yarns



Tendency of pilling: none

combed cotton



low

carded cotton



high

Pilling

Natural fibres

Cotton Wool Cashmere Mohair
Alpaka Angora Silk Linen

- staple fibres (excluding reeled silk) with varying length and fibre thickness
- high capacity for **moisture absorption**
- poor **shape retention**
- rarely electrostatically charged
- natural lustre

Chemical fibres

synthetic fibres and
cellulosic chemical fibres

Polyester POLYAMIDE ELASTHAN ACRYL
ViSCOSE Modal Lyocell Microfibre

- produced artificially with various thickness, length, cross sections, chemical modification with homogeneous properties as filament yarns or staple fibres
- synthetic fibres have **poor moisture absorpton** (excl. cellulosic chemical fibres)
- synthetic fibres have **high dimensional stability** (excl. cellulosic chemical fibres)
- fibres smaller 10 µm are categorized as **microfibres**
- artificial lustre

Natural fibres / Chemical fibres / Properties

ribbon-like twisted structure, dull luster



thickness 12 – 18 μm / the longer and finer the costlier

length: medium staple (carded) 26 - 30 mm

long staple (combed) 32 – 42 mm, type: Pima, Mako, Sea Island

until 20 % **moisture absorption** still dry to the touch

smooth, does not scratch the skin

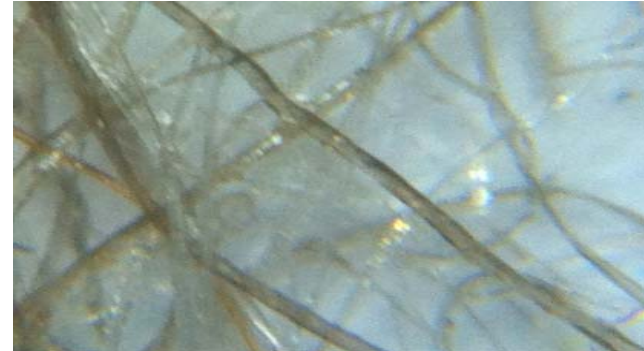
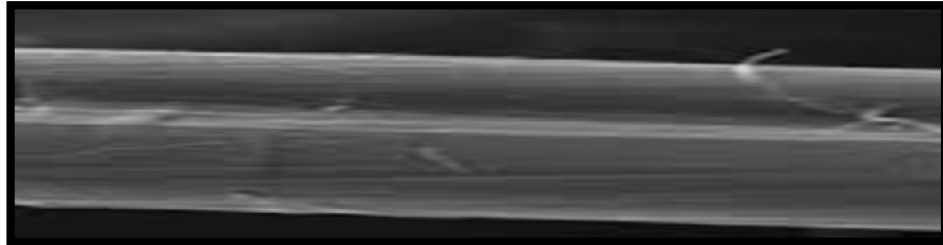
high pilling at short fibres (carded yarns)

bio certificate ensures organic cultivation, does not guarantee

later toxins were used in dyes

Cotton / Baumwolle / CO / Cellulose

polygonal oval cross section, smooth surface, varyity thickness



fibre thickness 15 – 25 μm

fibre length 20 – 40 mm

low elasticity, high creasing tendency

scratchy to the skin

no pilling

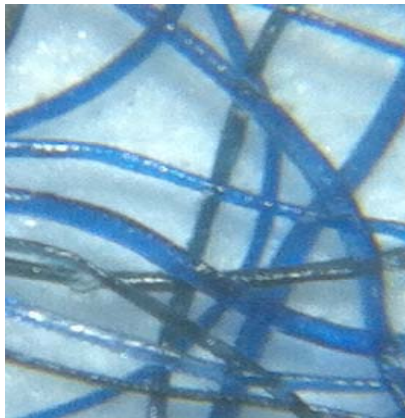
other properties resemble cotton

Linen / Leinen / LI / Cellulose

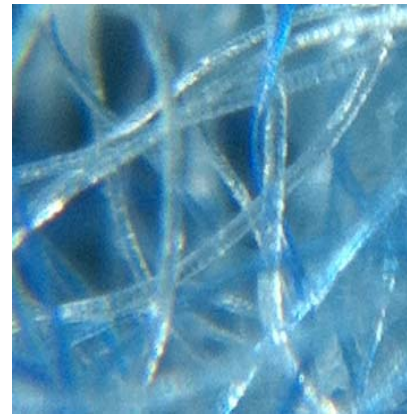
round cross section, varying diameter, squamous rough surface, dull



Fibre structure



Crossbred wool



Merino wool

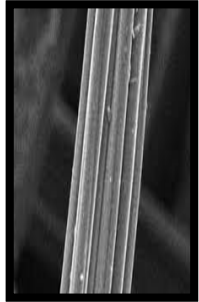
fibre thickness Merino 17 – 25 μm / Crossbred 25 – 40, the longer and finer the more expensive
fibre length varying - staple length approx. 60 mm

until 30 % **moisture absorption** still dry to the touch
scratching due to thickness and rough surface

felting tendency when washed because of the squamous surface

pilling tendency high at high rate of short staples

Wool / Schurwolle



Viscose



Modal



Lyocell



Modal



Lyocell

- fibre thickness 10 μm / 13 μm / 17 μm
- more absorbent than cotton
- until 30 % moisture absorption still dry to the touch

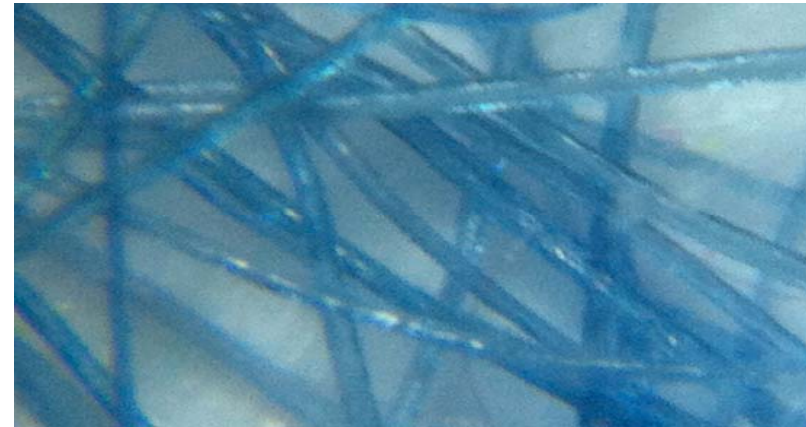
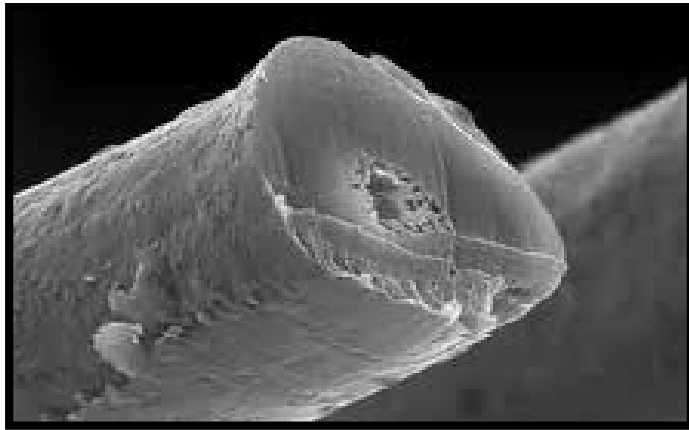
Viscose: fibre strength 25 cN/tex - strength when wet only 15 cN/tex

Modal: fibre strength 35 cN/tex - strength when wet 20 cN/tex

Lyocell: fibre strength 36 cN/tex - strength when wet 29 cN/tex

Viscose/Modal/Lyocell

round cross section, smooth surface with small scales, soft handle, hollow core



fibre thickness 13 – 28 μm

fibre length 50 – 300 mm

the longer and finer the more expensive

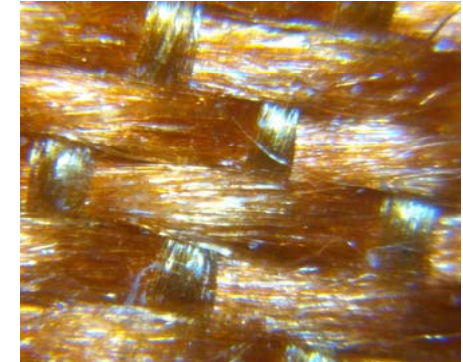
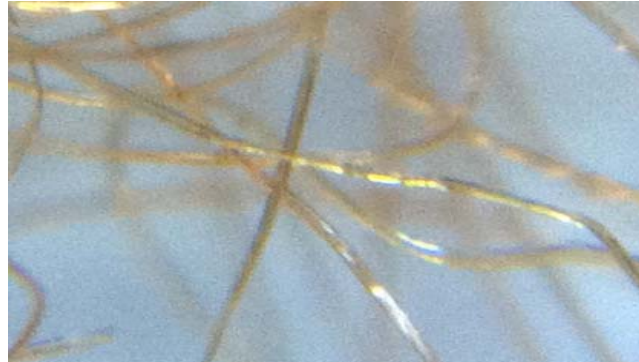
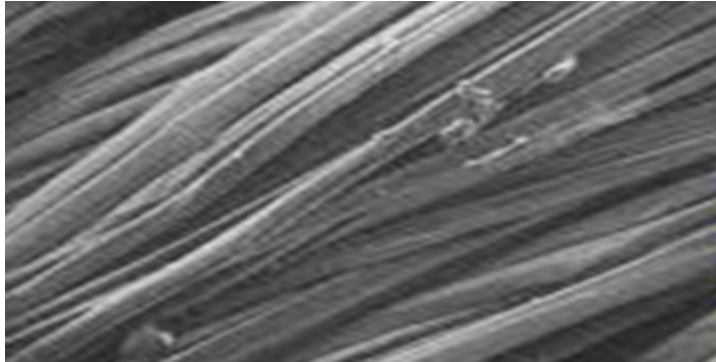
20 natural colours

no pilling

very good heat insulation because of the fibres hollow core

Alpaka /AL / Keratin

elliptical to triangular cross sections, smooth surface, special luster



atlas weave

fibre thickness 10 – 18 μm

reeled silk (natural silk) endless, twined / most expensive silk

schappe silk (waste from reeled silk) length 50 – 160 mm

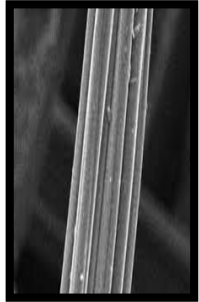
noil silk (waste from schappe silk) length 10 – 50 mm

tussah silk (wild silk) length 40 – 100 mm

until 30 % moisture absorption still dry to the touch

reeled and schappe silk do not pill; bourette and tussah silks pill slightly

Silk / Seide / SE / Keratin



Viscose



Modal



Lyocell



Modal



Lyocell

- fibre thickness 10 μm / 13 μm / 17 μm
- more absorbent than cotton
- until 30 % moisture absorption still dry to the touch

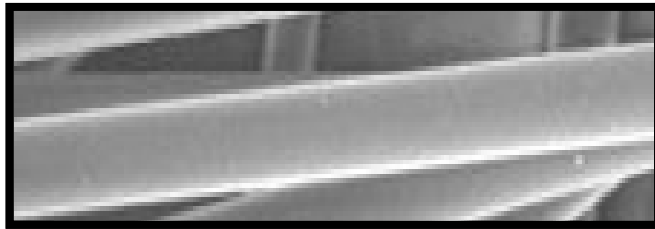
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Viscose/Modal/Lyocell

smooth surface, uniform thickness, synthetic luster



can be used to produce different fibre types for different applications, e.g. low pilling, antibacterial, low flammability, high elasticity with different cross sections etc.

high elasticity / crease-resistant

max. **0,5 %** moisture absorption

good moisture transport, dries quickly

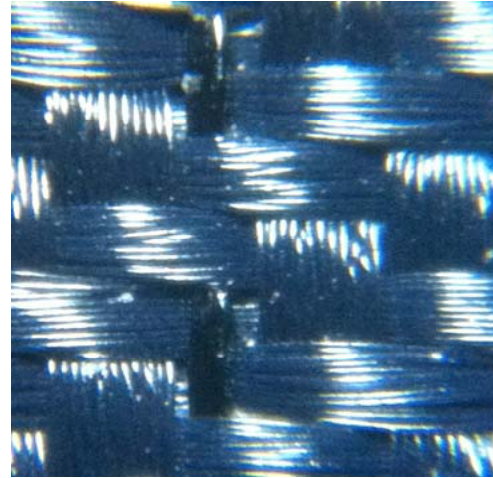
high scent absorption, but lower for antibacterial types

Polyester / PES / Oil

smooth surface, uniform thickness, synthetic luster



Polyamide 6.6 (nylon) stocking



high elasticity / low creasing

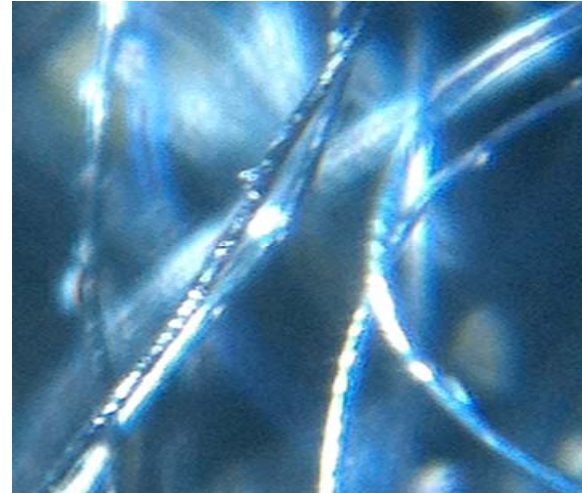
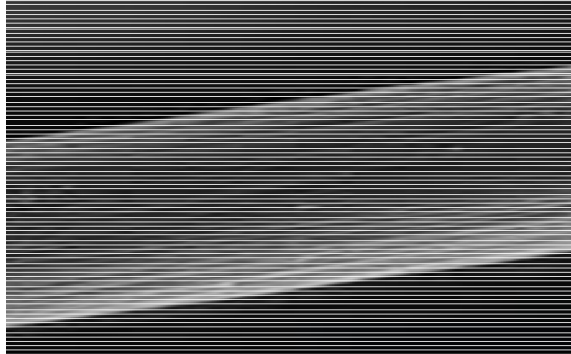
max. 4 % moisture absorption

very high abrasion resistance and dimensional stability even when wet

Polyamide 6.6 with better elasticity than Polyamide 6

Polyamide / PA

bean-shaped or t-shaped cross section, uniform thickness
rippled surface, similar to wool



high bulk, high crimp

high *pilling* in blends with wool

acrylic filaments are basis for carbon fibres,

acrylic filaments are converted by pyrolyse into carbon fibres

Acrylic / PAN / Oil

mostly round cross section, very fine, smooth surface

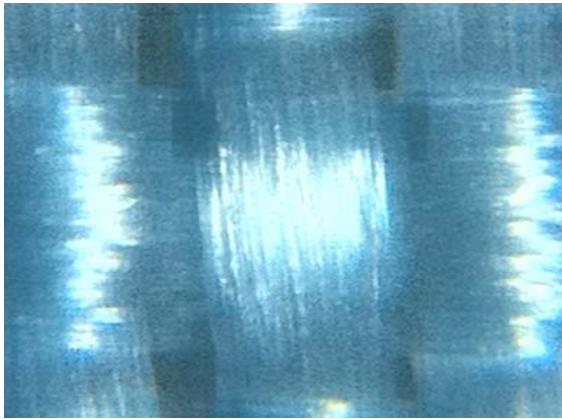
brands

Polyester : Trevira Finess, Diolen Soft, Fortrel Microspun

Polyamide : Timbrelle, Tactelle

Acrylic : Microsupreme

Cellulose : Tencel MICRO



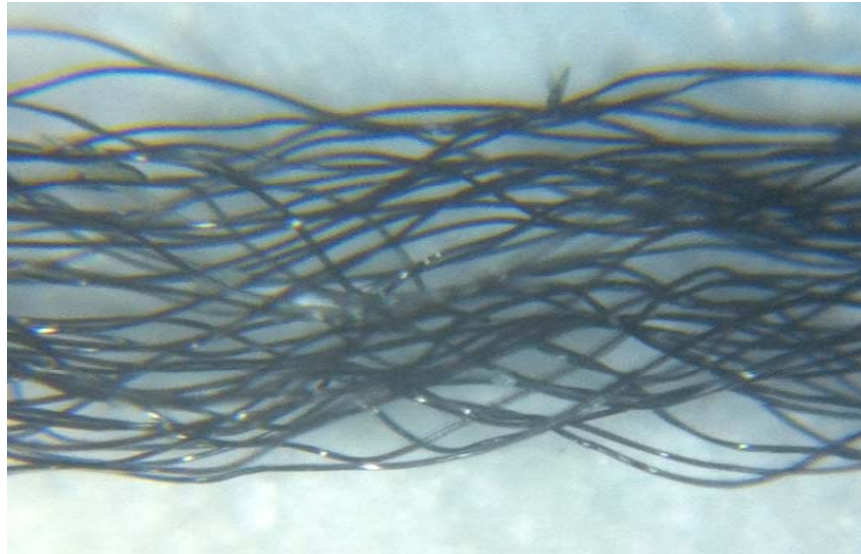
fibre thickness 3 μm – 8 μm

very soft

used in production of very fine woven and knitted fabrics

Microfibres

round cross section, smooth surface, dull luster



low strength

elasticity until 500 %

Filaments

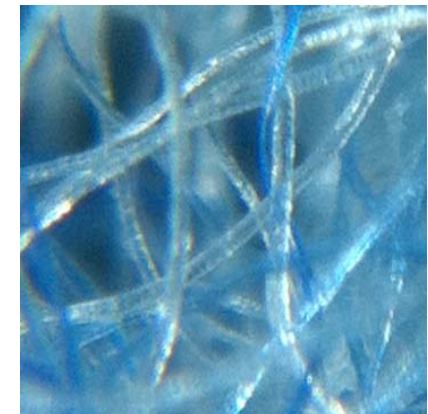
Elasthan / EL / Oil



light microscope with LED



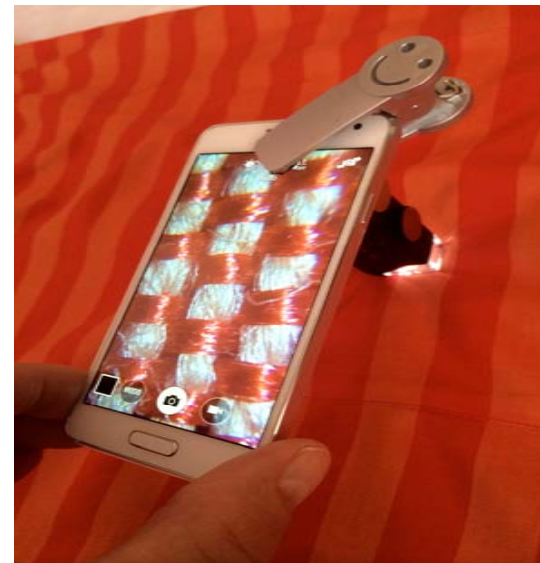
reference table



fibres



Universal Adapter



smart phone / adapter / microscope

Fibrascopy / Identifying of fibres



smart phone
adapter / Fibrascope



manual



reference table
natural fibres/chemical fibres

Fibrascopy-Set:

- light microscope (Fibrascope) 60-100x
- universal adapter
- reference table
- manual, with the most important fibre properties and many microscopic photographs

Fibrascopy