Cellulosic fibre with a new functionality

Ingo Bernt
Kelheim Fibres GmbH

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Hohenstein Institute

Kelheim Fibres – The world leading manufacturer of speciality viscose fibres

Head Office	**Kelheim, Niederbayern**
Capacity	**~ 80.000 to/year**
Staff	**~ 500**
Turnover	**~ 160 Mio Euro**

R&D Background of most historically leading viscose producers

1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010

1936
Süddeutsche Zellwolle AG, Kelheim, start-up of viscose fibre production (**DANUFIL®**)

1968
Acquisition of a majority shareholding by **Hoechst AG**

1994
Joint Venture **Courtaulds European Fibres**

1999
Acordis Kelheim GmbH

2004:
Kelheim Fibres GmbH
Take-over by EQUI- Fibres GmbH

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A Very Special Material: Cellulosic Fibres

Unrivalled properties

-physiologically neutral, skin-friendly

- hydrophilic, perfect moisture management

- excellent dispersability

-restricted growth of micro organisms

-chemical stability, does not melt

-chemical reactivity (printability, processability, versatility)

- easy modifiable

- hydrogen bonding capability

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A Very Special Material: Cellulosic Fibres

Viscose fibre tool box
Fibre modifications for improved product properties

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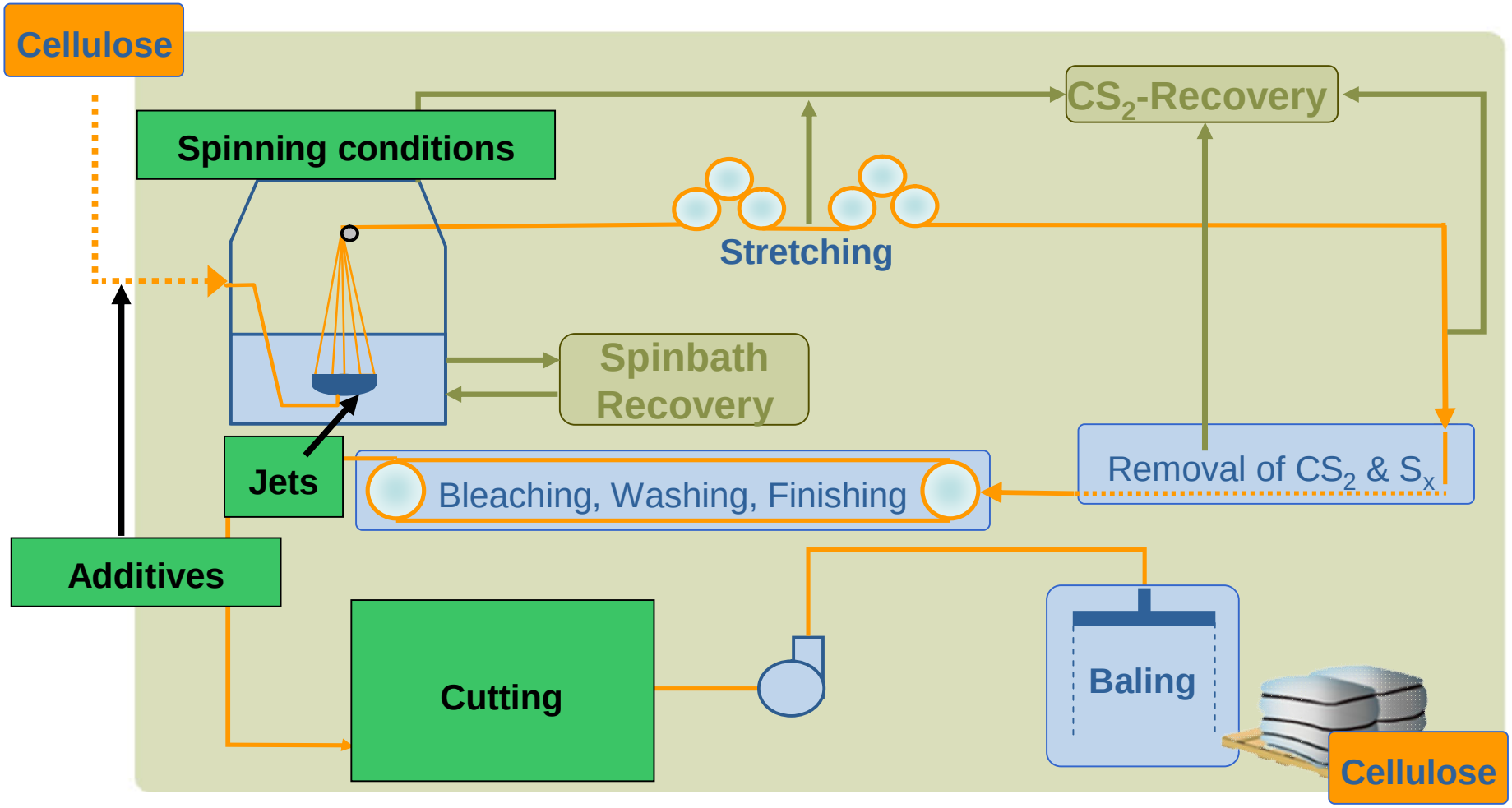
Viscose Fibre Process



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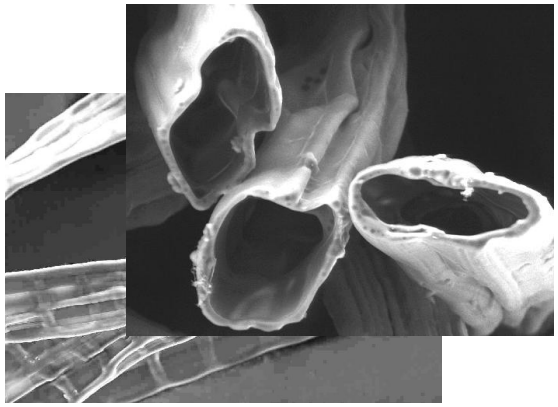
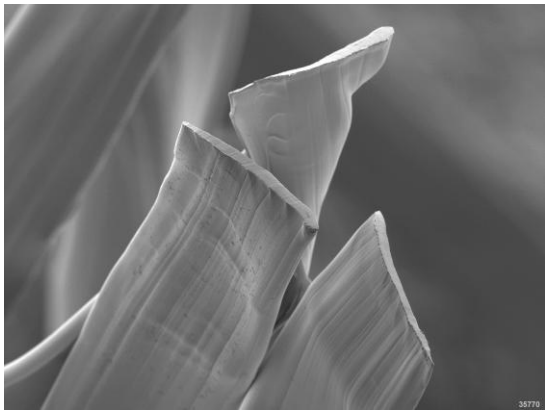
Viscose Fibre Modifications

Cross sections

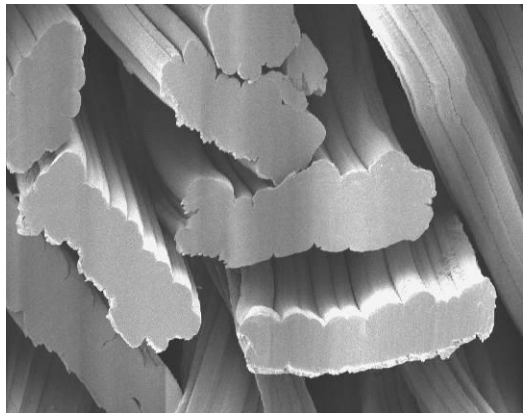
hollow flat
Bramante / Dante



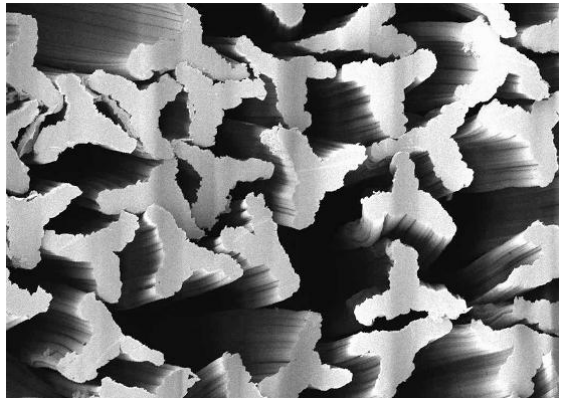


flat 1:20
Bellini

regular round
Danufil®



flat 1:4
Viloft®



trilobal
Galaxy®

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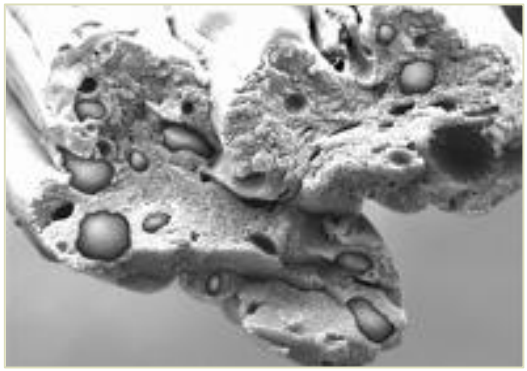
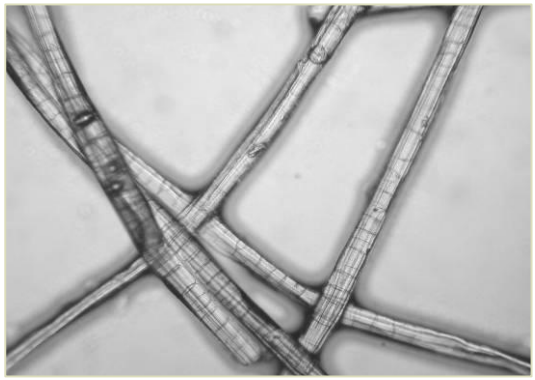
Viscose Fibre Modifications

Functionalization

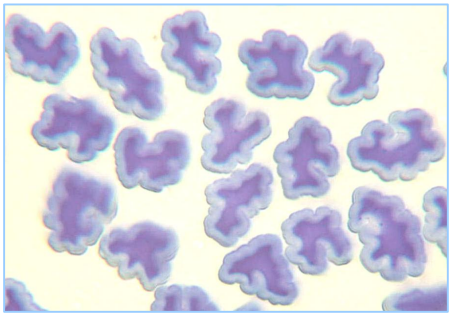
Incorporation of additives



Extra absorbency



Chemical modification:



- Anionic fibres (Verdi)
- Cationic fibres (Deep Dye)
- Ion exchange fibres

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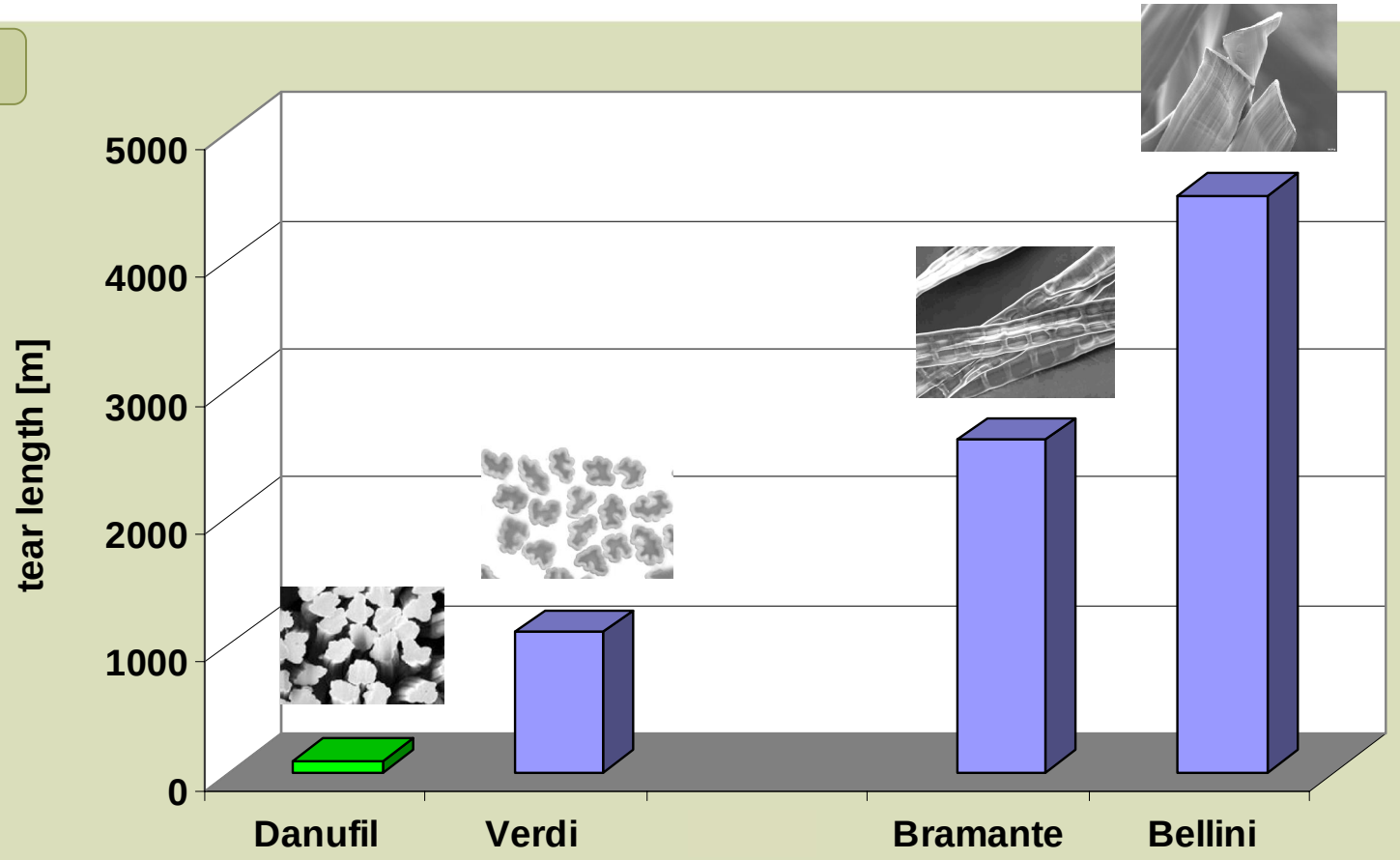
Cellulosic fibres with new functionalities

Improved mechanical properties in paper and nonwovens

Paper



Rapid-Köthen sheets 80g/m² from 100% viscose fibre 6mm

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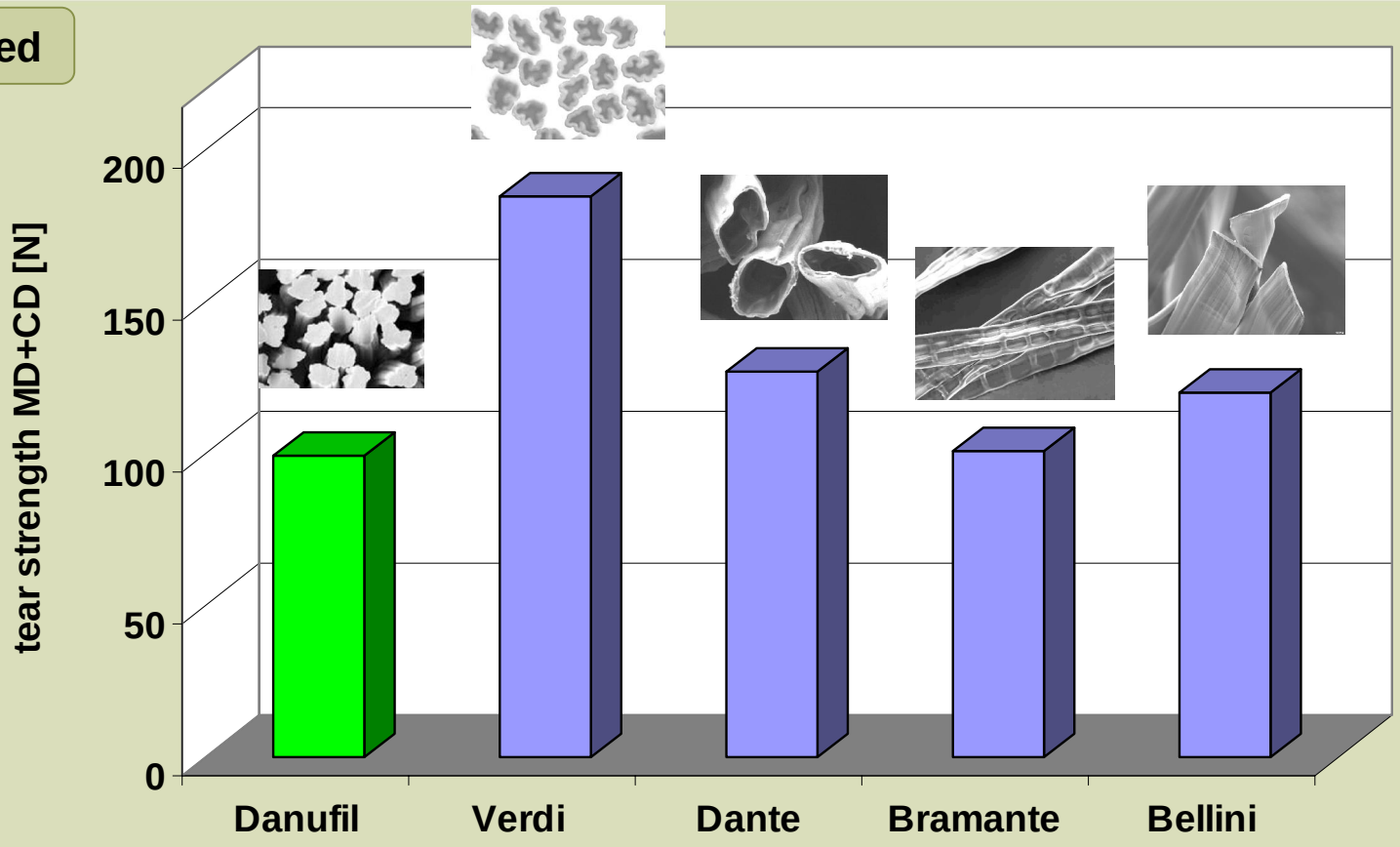
Improved mechanical properties in paper and nonwovens

Spunlaced



Spunlaced nonwoven 80g/m², made with identical machine settings

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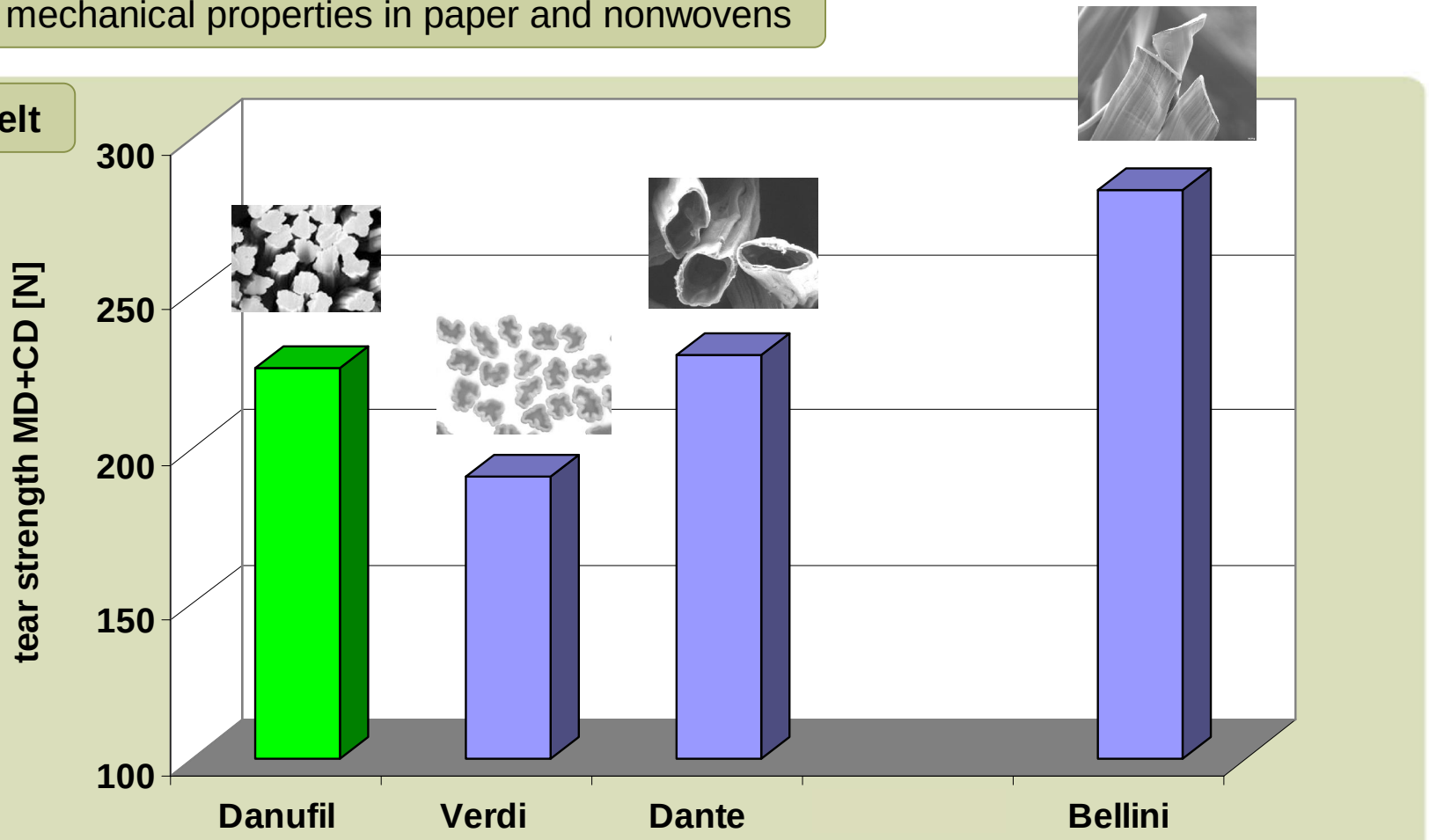
Needlefelt



Needlefelt nonwoven 210g/m², made with identical machine settings

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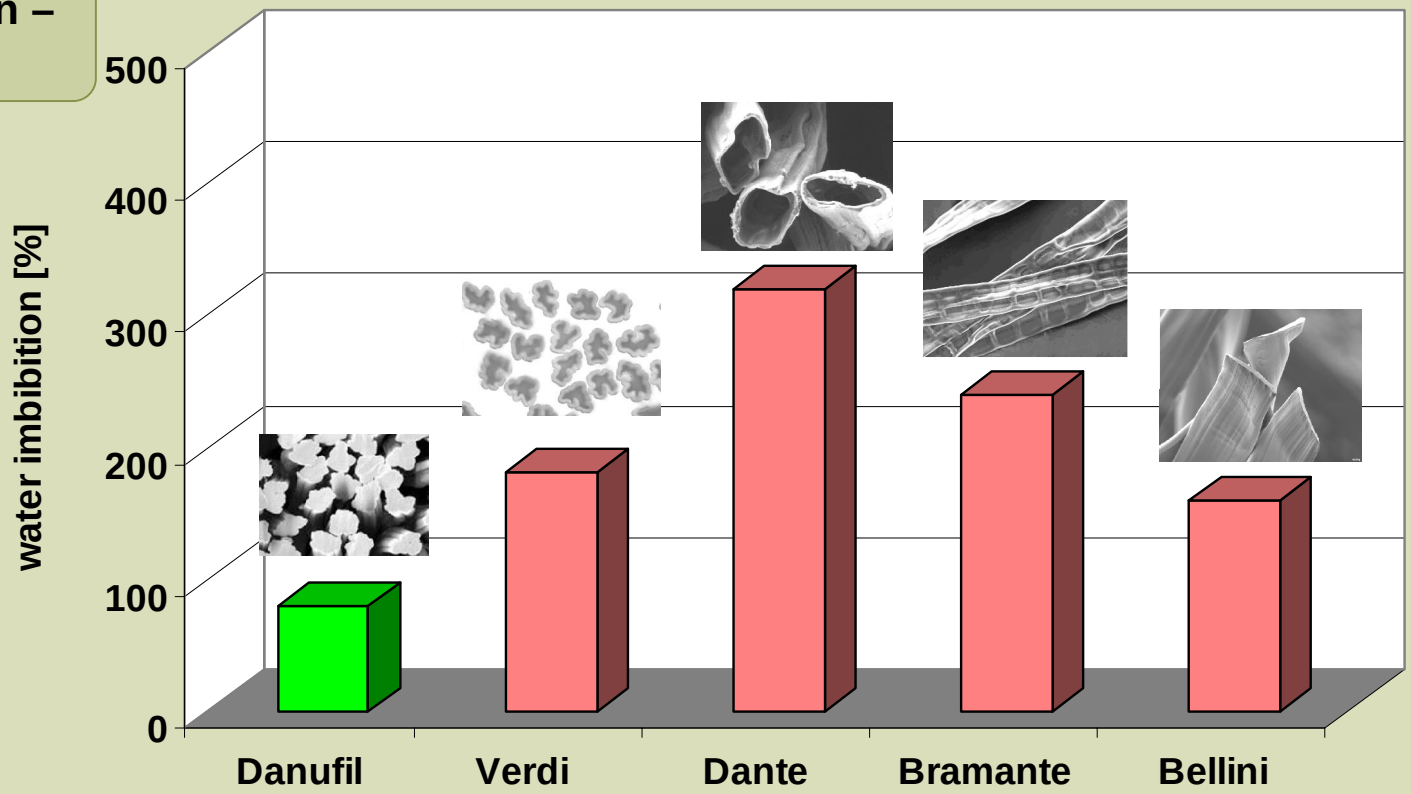
Cellulosic fibres with new functionalities

Improved absorbent properties

Water imbibition – single fibre



water imbibition; DIN 53814

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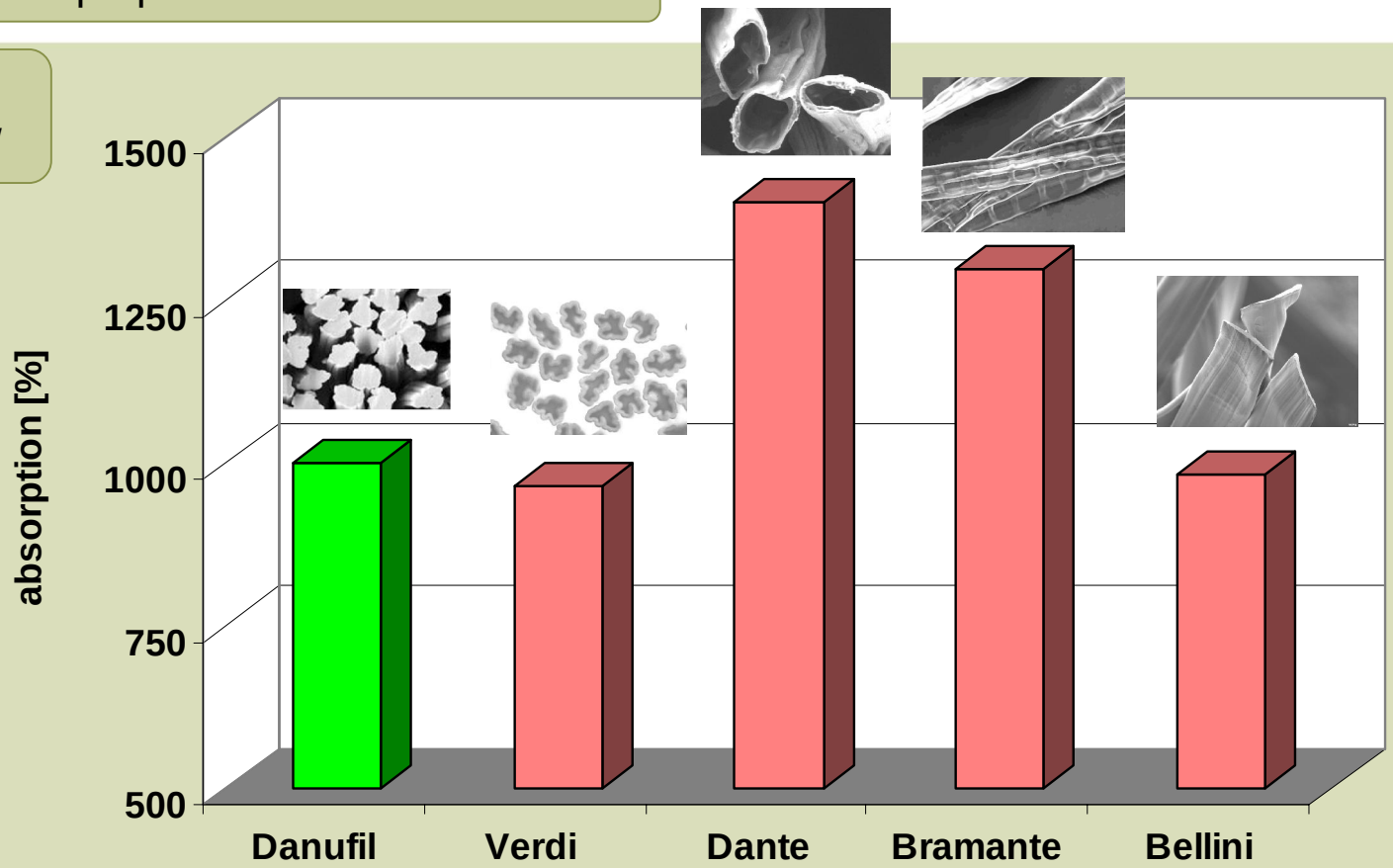
Cellulosic fibres with new functionalities

Improved absorbent properties

Absorption – Spunlaced NW



Spunlaced nonwoven 80g/m², made with identical machine settings
Absorption- and desorption properties of nonwovens; DIN 53923
Hohenstein Institute

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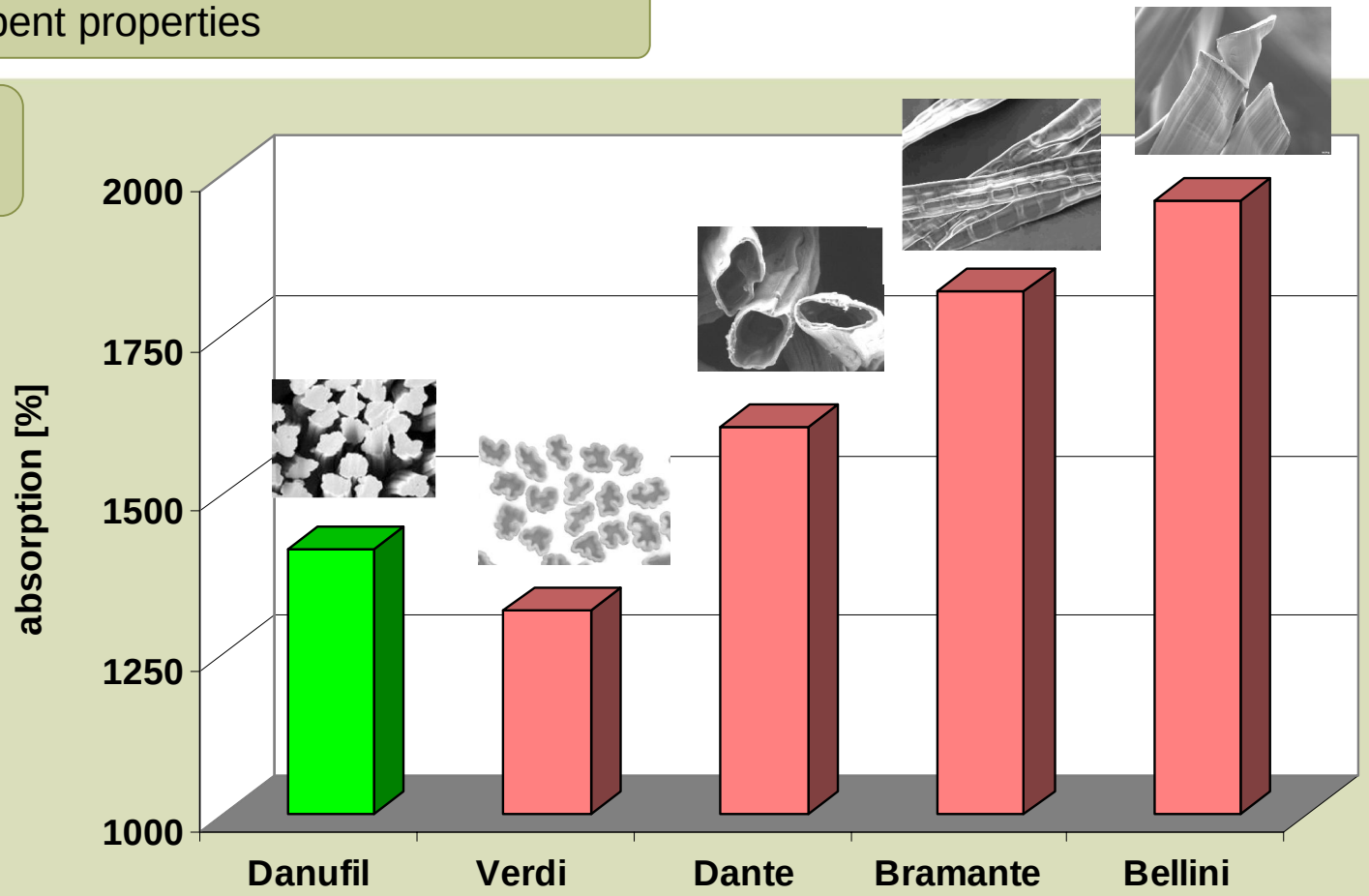
Cellulosic fibres with new functionalities

Improved absorbent properties

Absorption – Needlefelt NW



Needlefelt nonwoven 210g/m², made with identical machine settings
Absorption- and desorption properties of nonwovens; DIN 53923
Hohenstein Institute

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Cellulosic Fiber with a new Functionality

Jan Beringer

Dornbirn Man-Made Fiber Conference | 14 - 16 September 2011 | Dornbirn | Austria

COMPETENCE IN TEXTILES

Possible Application Areas of these new Fibers

Unique water and humidity sorption properties for

- **Clothing physiology**
  - High vaporous and liquid sweat uptake
  - Protective Clothing against Cold
  - Cooling effects

- **Wipes**

- **Self extinguishing / reduced flammability Clothing**

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Application in Clothing Physiology

Why Protective Clothing against cold ?

- Insulation against cold is the main function of this PPE
- Workers sweat in this PPE if the metabolic rate the suit was designed for (acc. to EN 342) is exceeded
- Wet insulation layer results in vastly reduced thermal resistance (R_{ct}) values
- Fibers with higher vaporous and liquid water uptake should have a clear advantage !

… Quod erat demonstrandum - What was to be proven …

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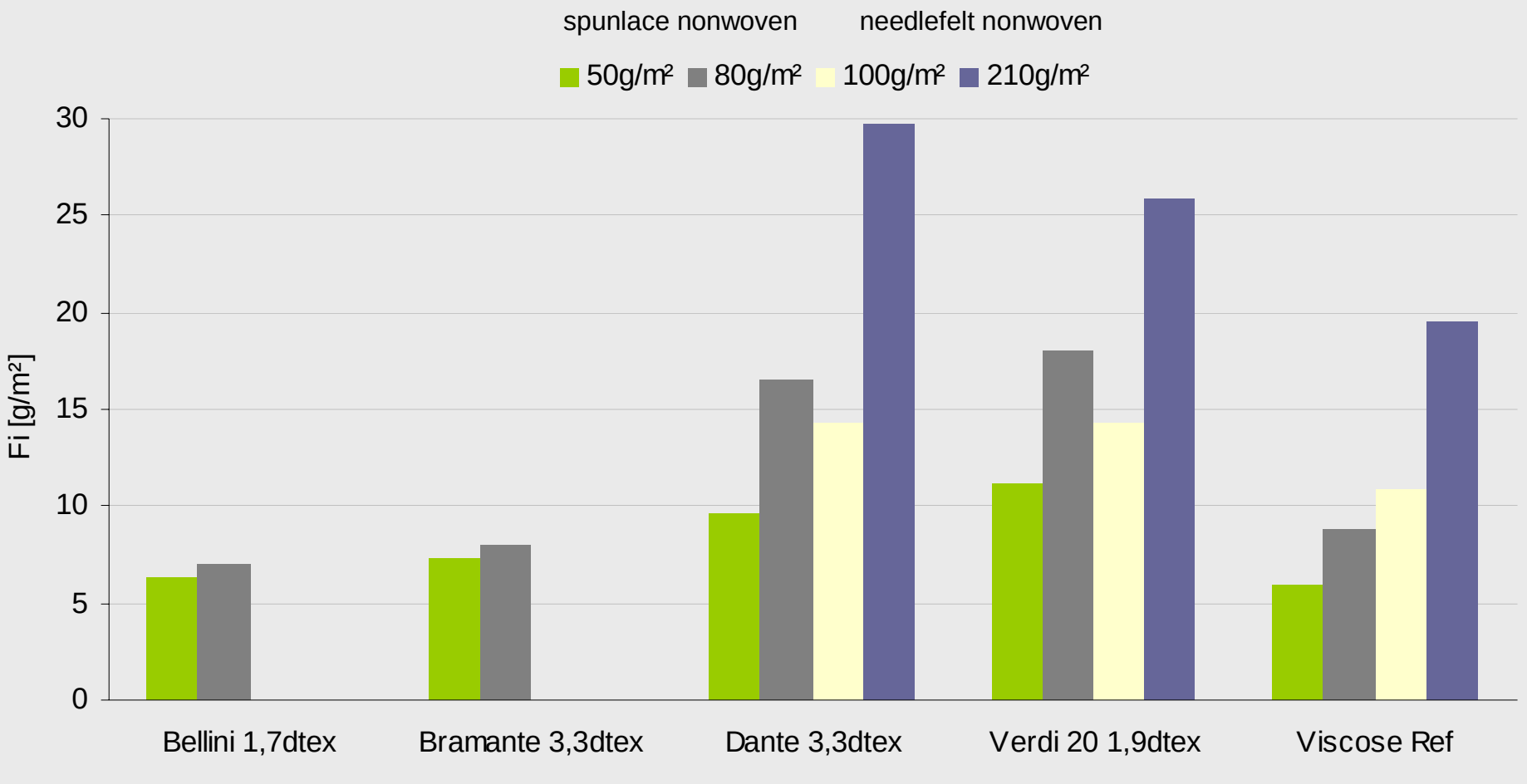
Short time water vapour absorbency (F_i)



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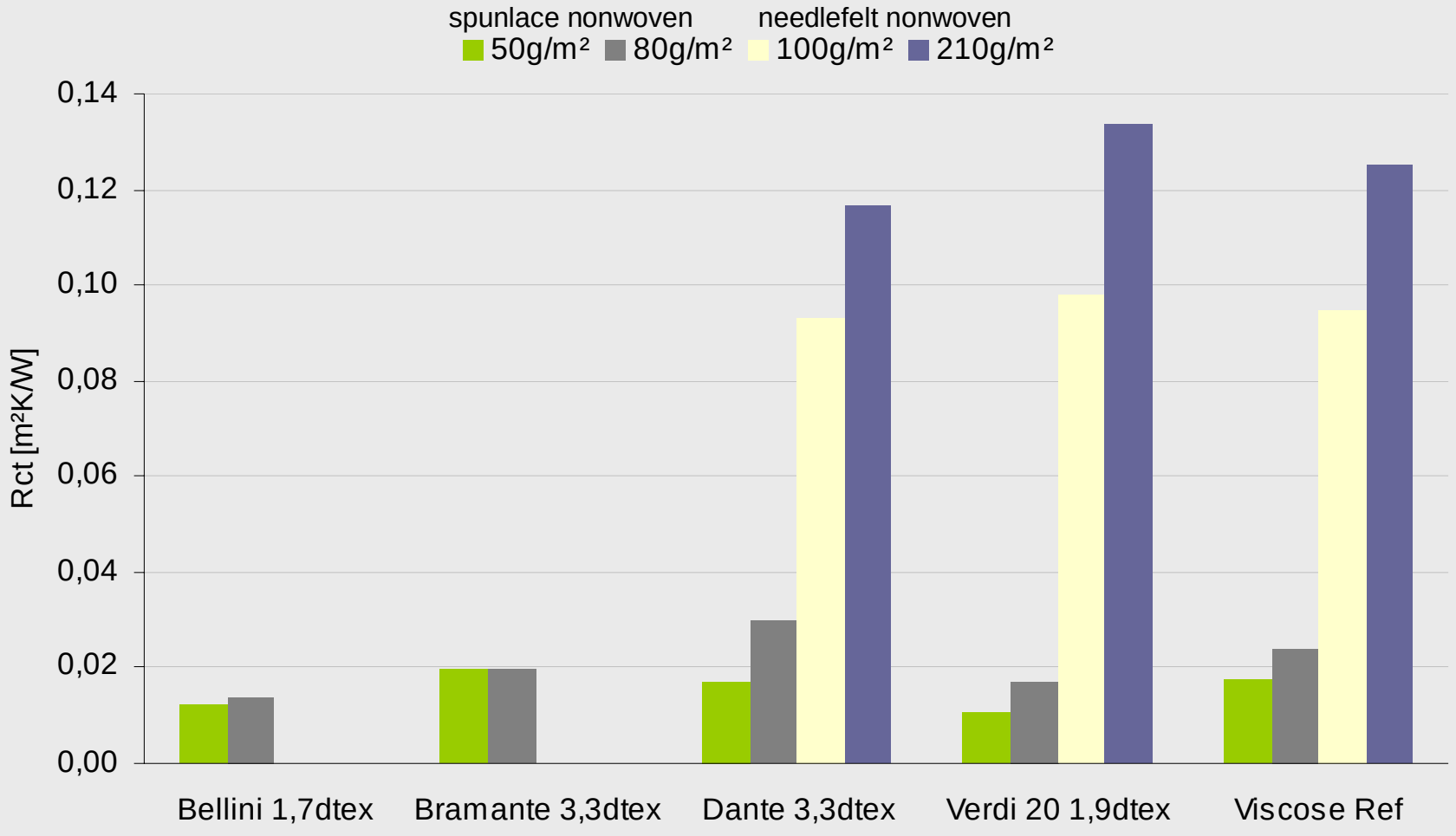
Thermal resistance or thermal insulation (R_{ct})



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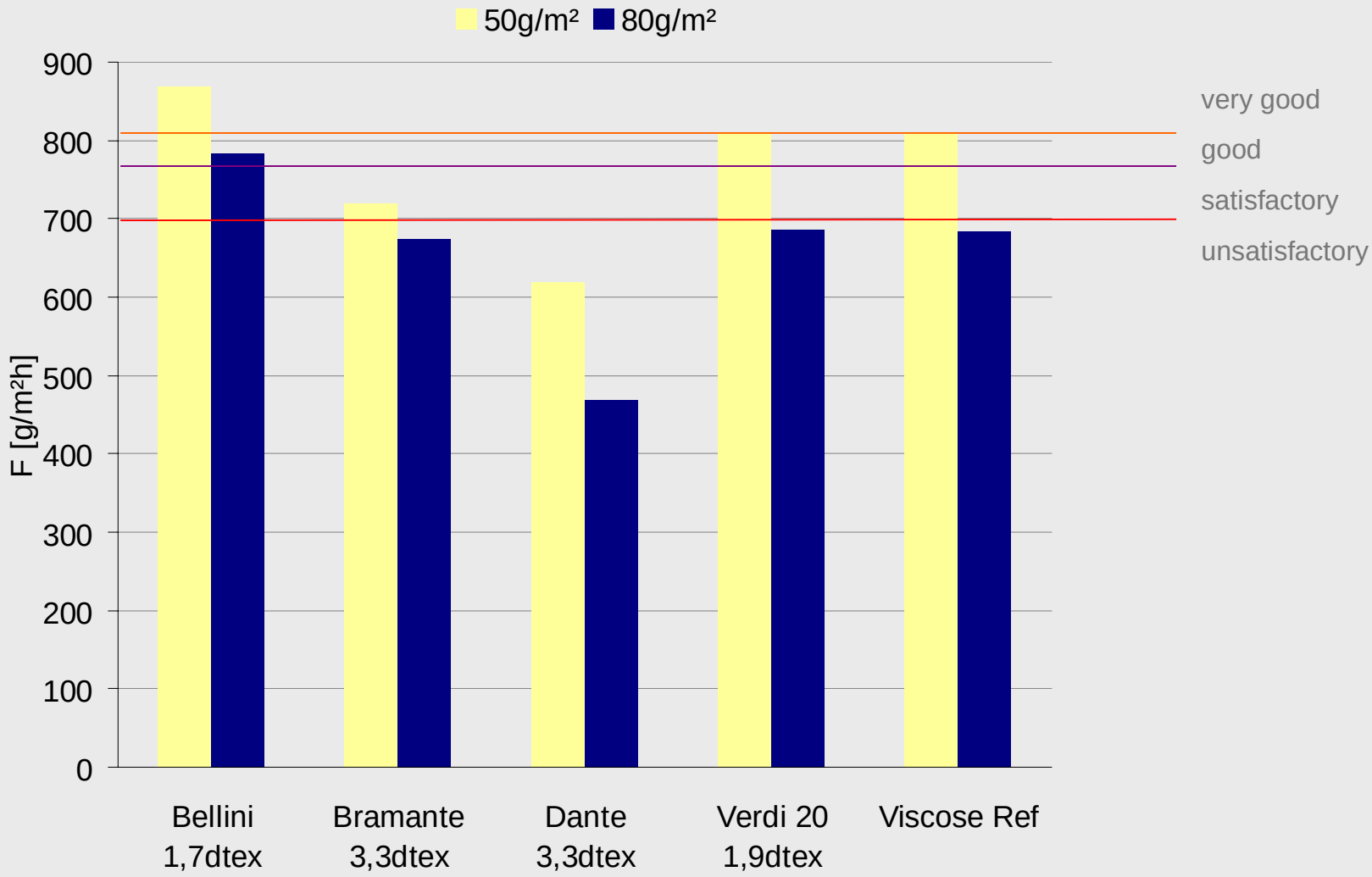
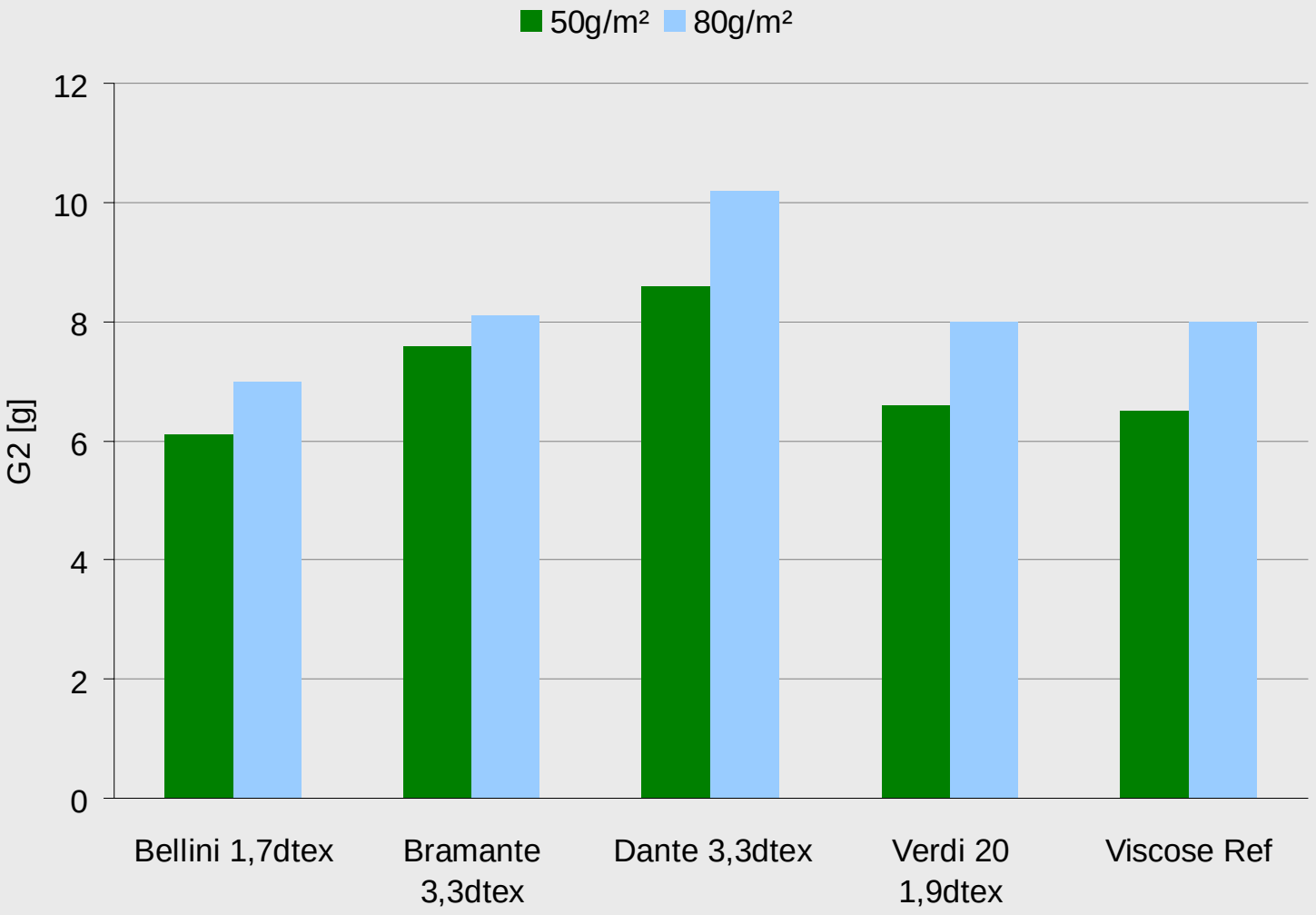
Buffering capacity of liquid sweat
liquid sweat transport (F)



Buffering capacity of liquid sweat
sweat uptake (G_2)



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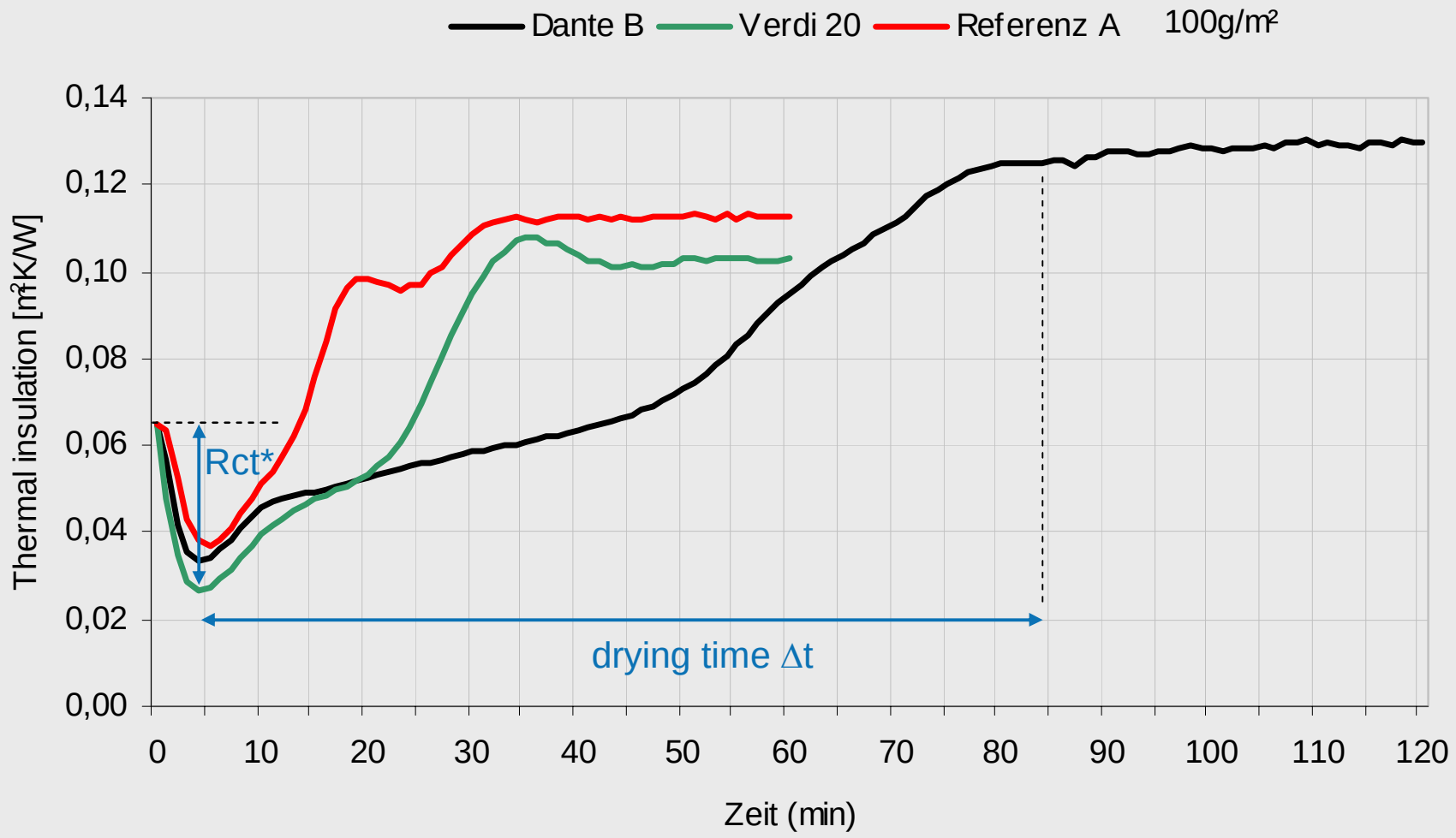
Thermal resistance of the moist fabric (R_{ct*})



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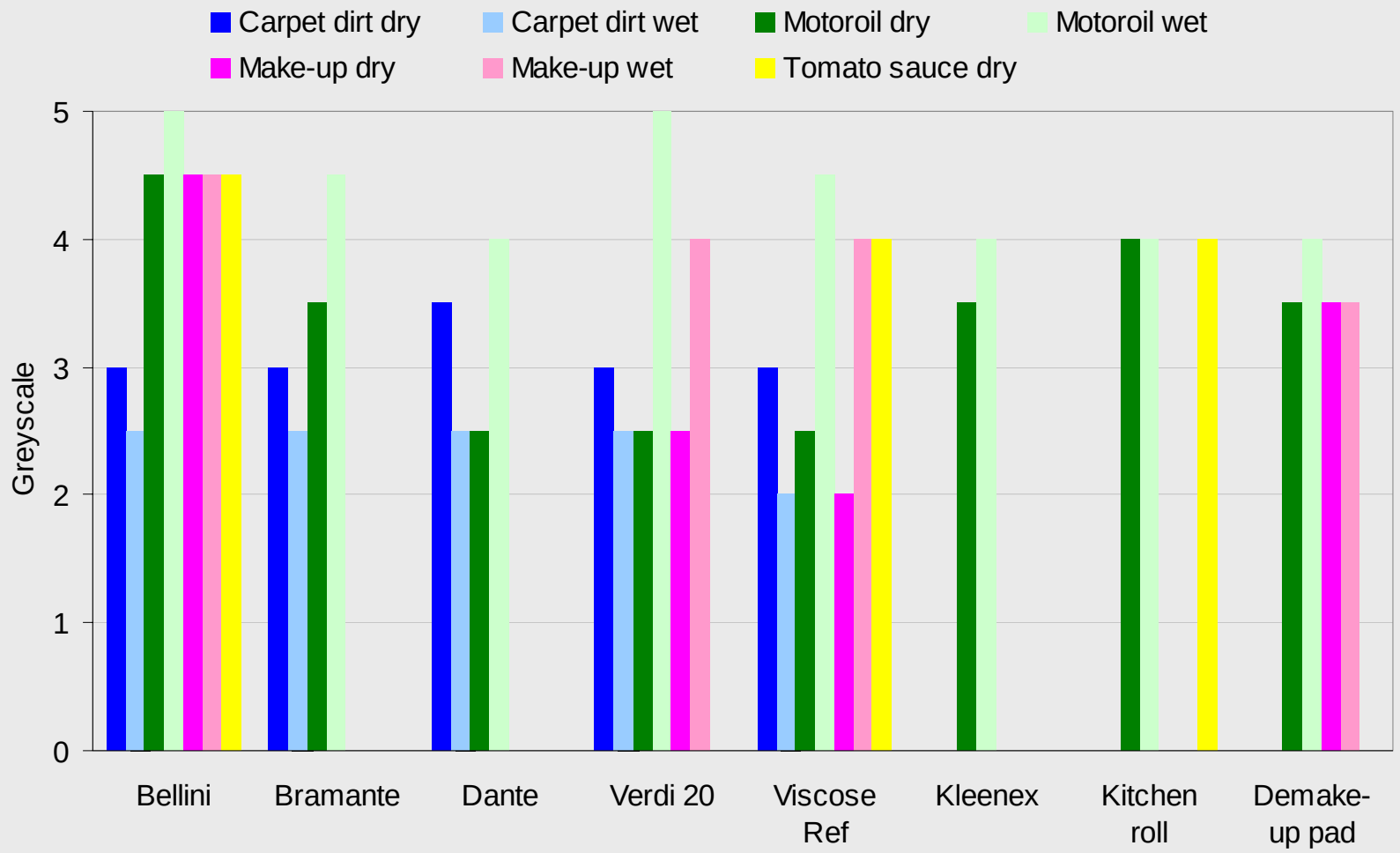
Summary Protective Clothing against Cold

- Short time water vapour absorbency (Fi) is better
- Thermal insulation (R_{ct}) is comparable despite a higher Fi
- Buffering capacity of liquid sweat transport (F) is comparable but with a higher sweat uptake (G_2)
- Thermal insulation (Rct*) and drying time (Δt) of the moist fabric is comparable – except Dante fibers

The Verdi fiber has clear advantage in PPE for cold protection

The Dante fiber is most suitable for long-lasting cooling effects

Application as Wipes – Modified “Martindale”



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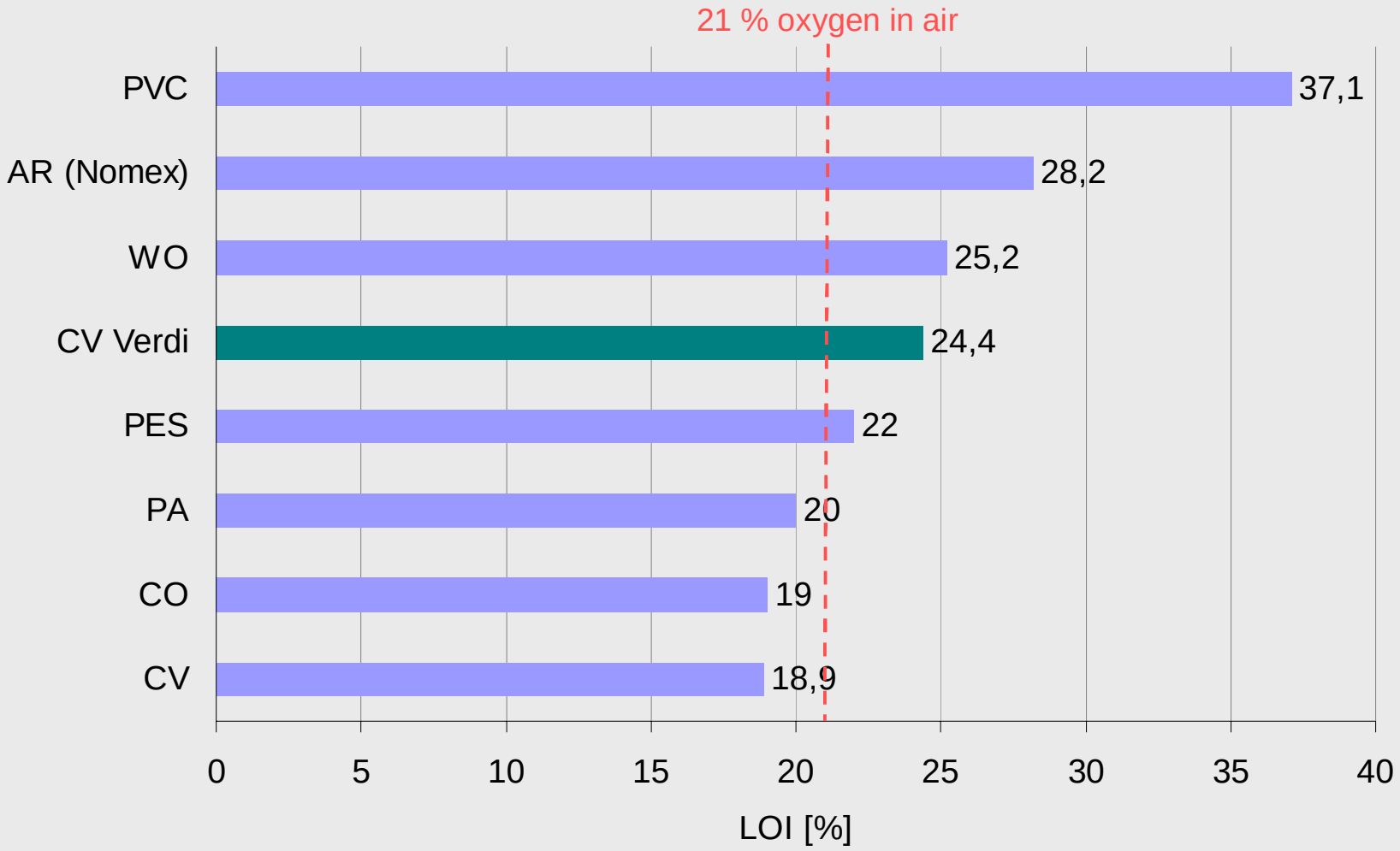
Reduced flammability – LOI Index



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Thank you for your kind attention

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