ASBP The Alliance for Sustainable Building Products

An introduction to breathability – Dispelling misconceptions and key factors to consider

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Airtightness, Breathability and Condensation Risk

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Airtightness, Breathability and Condensation Risk in Buildings

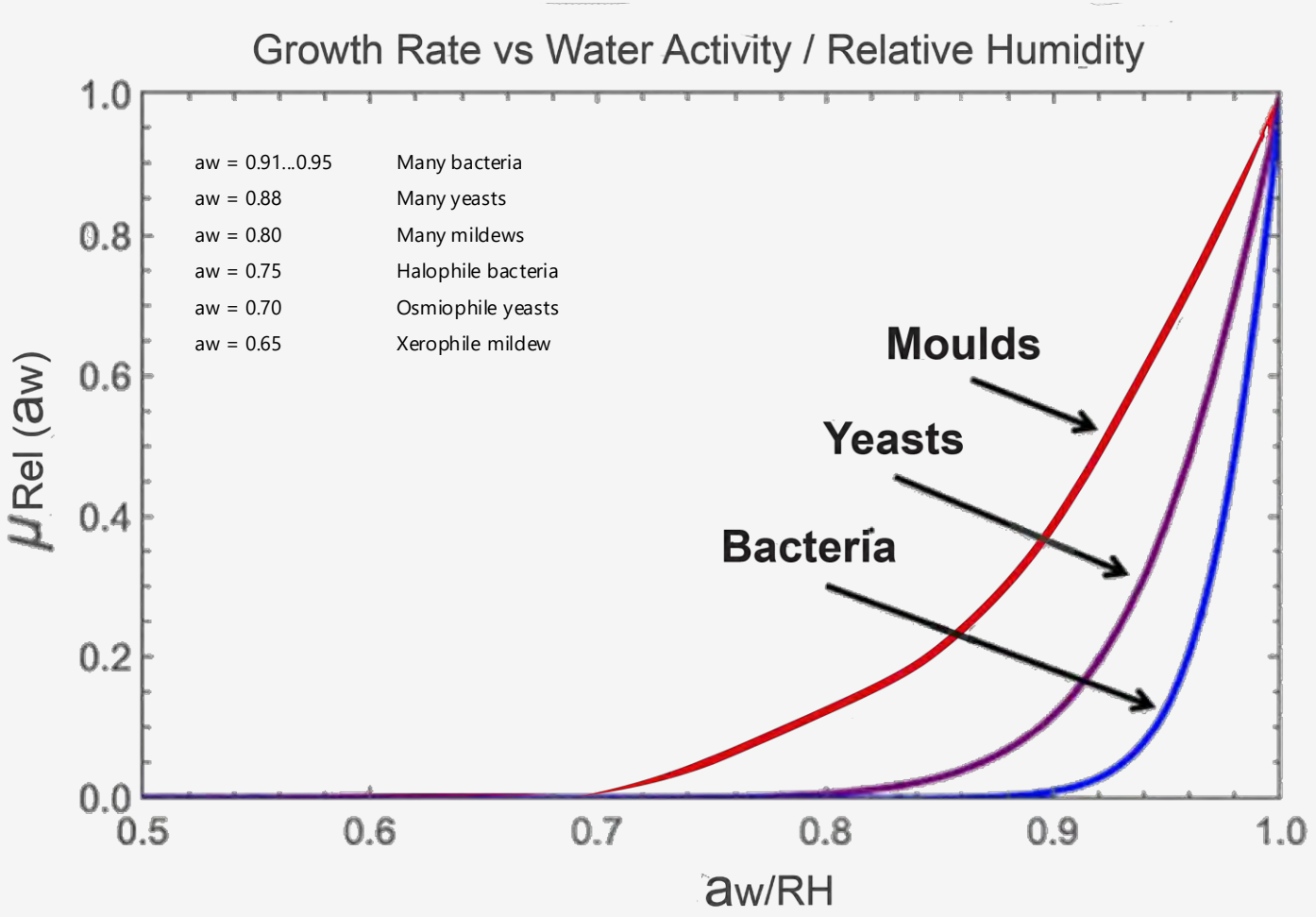
NATURAL FIBRE INSULATION GROUP

Busting the Myths - Mould

Mould cannot grow on hydrophobic materials. wrong!

Almost all surfaces contain enough food for microbes to live off.

Mould, yeasts and bacteria can grow on hydrophilic and hydrophobic surfaces if the humidity and surface water activity is high enough. right!



Busting the Myths - Hygroscopicity

Hygroscopicity is always a good thing. 

Hygroscopicity is always a bad thing. 

Whether hygroscopicity is good or bad depends on the degree of hygroscopicity and how and where a material is used. 

Hygroscopic Classification	Mass gain at 24h @ 25°C & 80% RH
Slightly hygroscopic	<2% and ≥ 0.2%
Hygroscopic	<15% and ≥ 2%
Very hygroscopic	≥ 15%
Deliquescent	Forms a Liquid

Classification doesn't say whether the water is "bound" or "free", i.e. harmless or harmful.

Busting the Myths - Breathability

Breathability is a substitute for ventilation wrong!

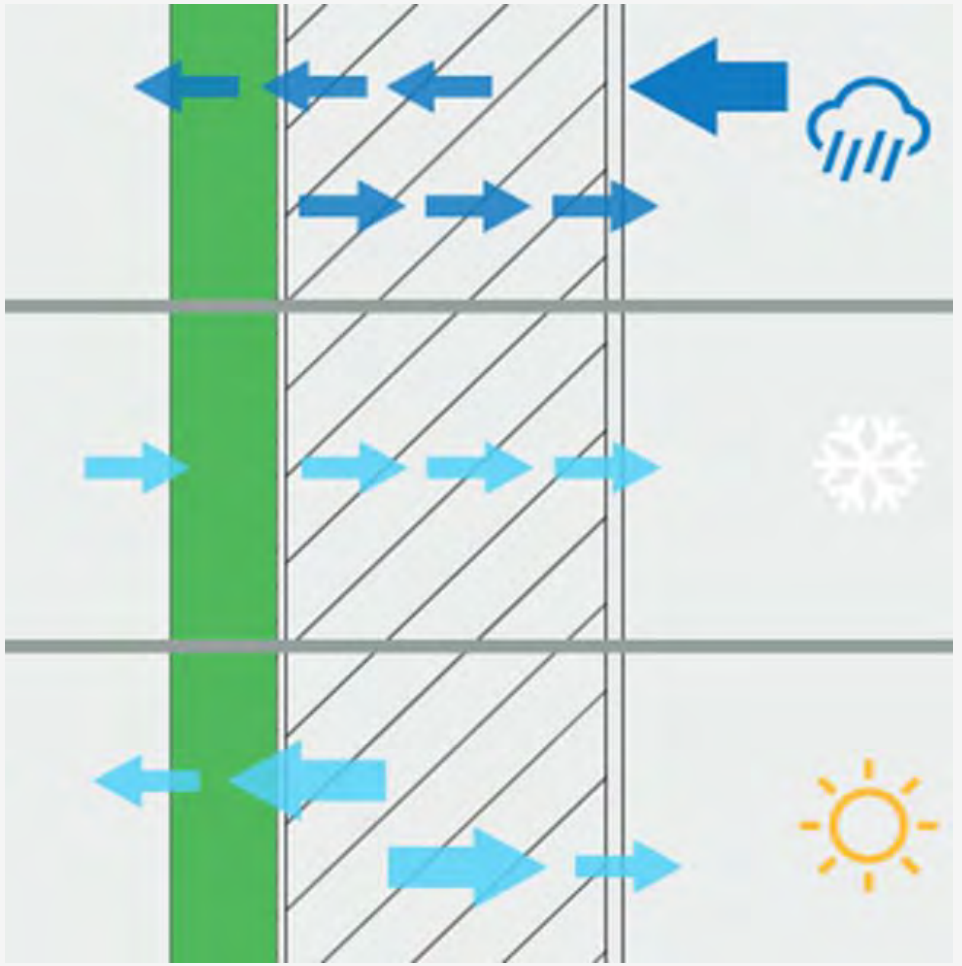
Breathability compliments ventilation to promote moisture balance right!

If something is airtight it can't be breathable wrong!

A material can resist air pressure (air tight) but still be vapour open right!

If something is vapour open it's breathable wrong!

Breathability requires water vapour openness vapour sorption in combination right!



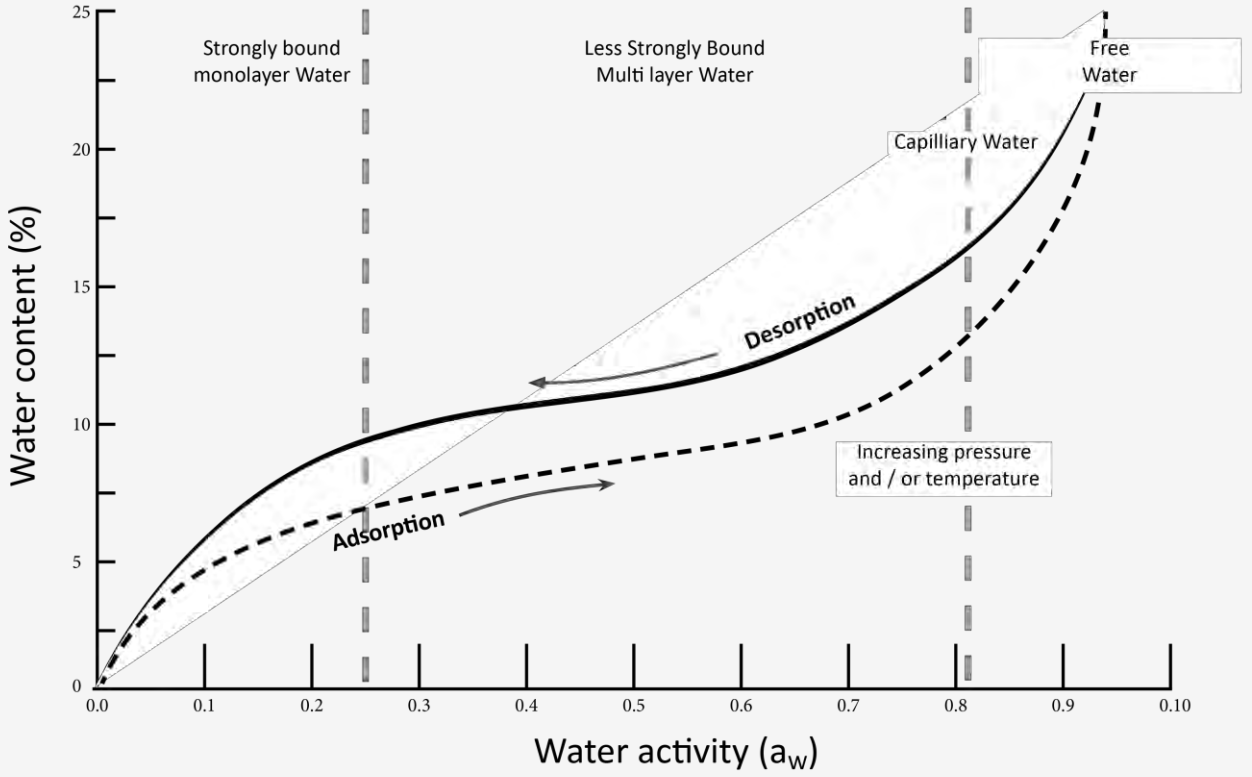
Water Soprtion

Water sorptive materials bind and release water to balance their water content with the relative humidity of the surrounding air.

Influenced by **Porosity** & **Polarity** of a material.

Porous materials are generally more water sorptive.

Polar molecules are more sorptive.



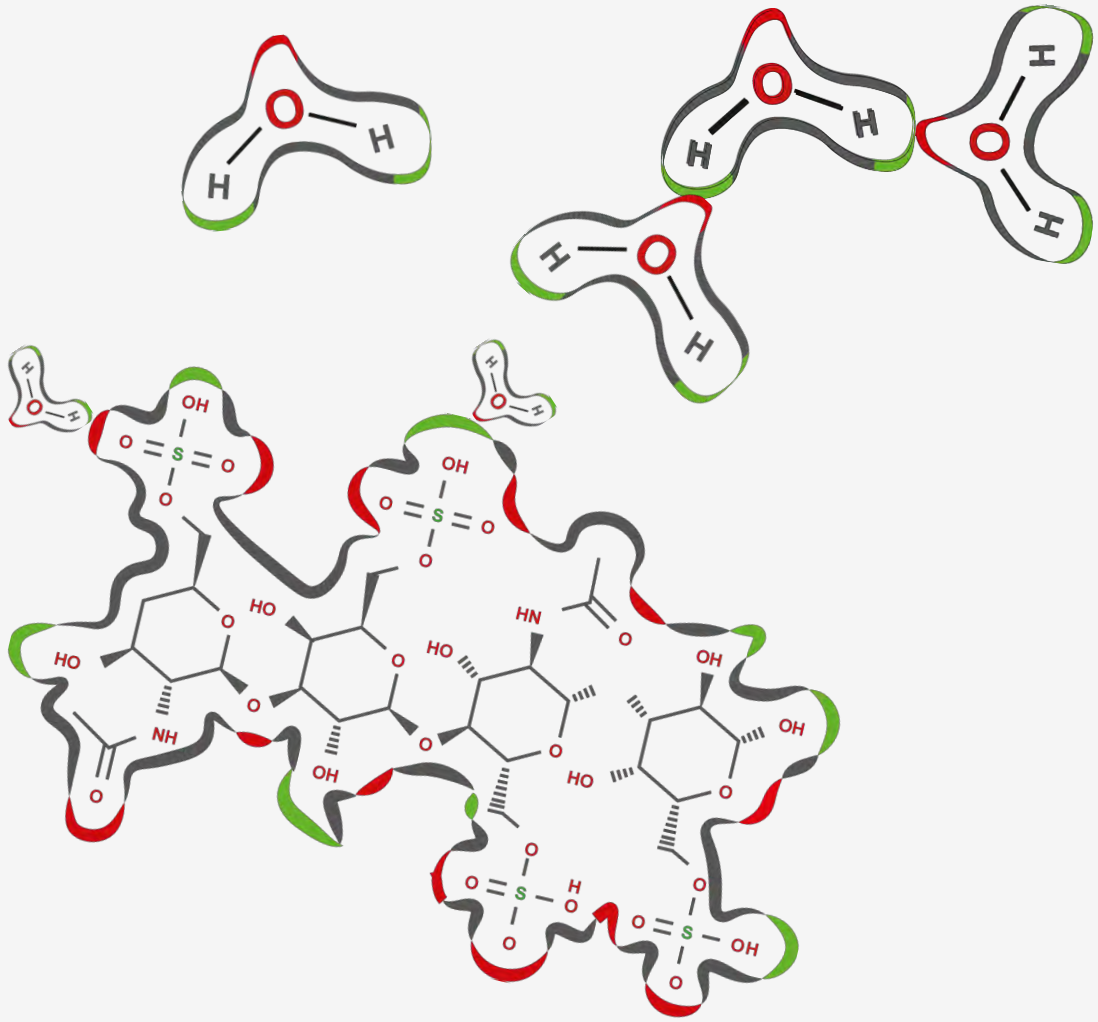
The Wonders of Water

Water molecules have an uneven electrical charge which creates poles like a magnet on each water molecule.

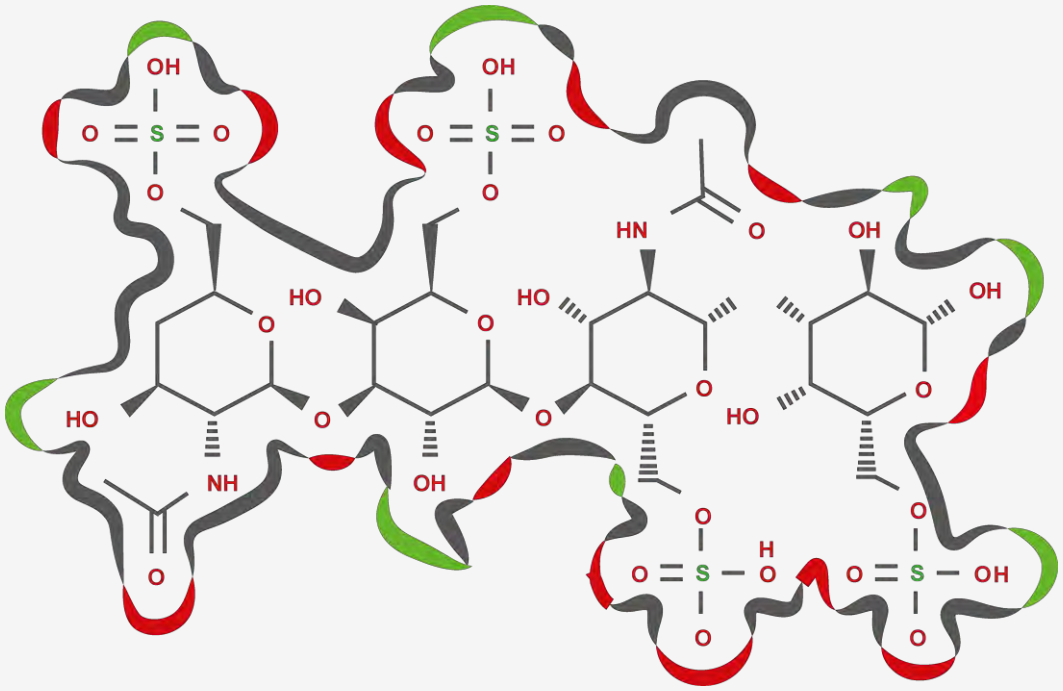
Like magnets, poles like to stick to opposite poles.

Water molecules can stick to themselves (cohesion) or they can stick to other molecules with uneven electrical charges (adhesion).

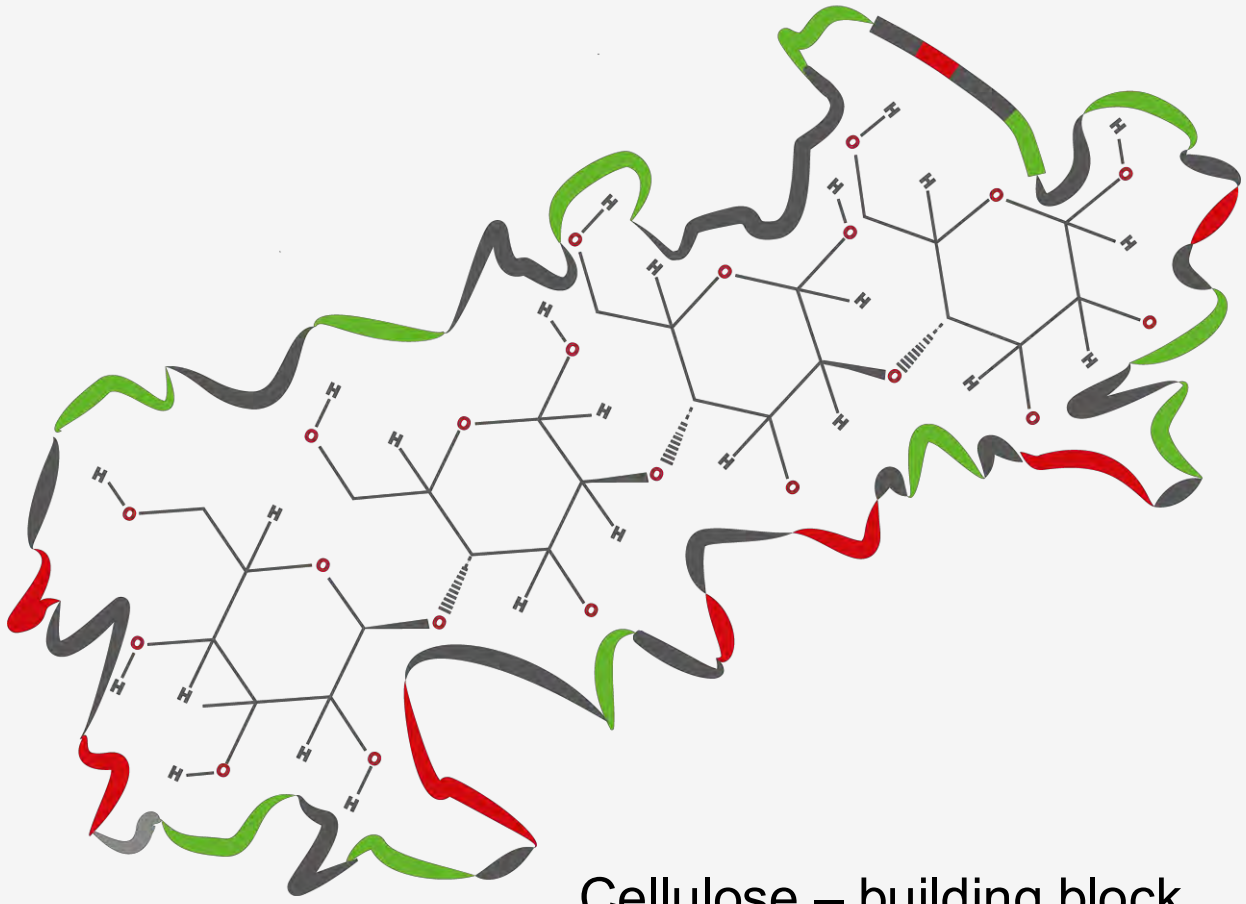
Increasing porosity provides more pathways for water to bind to the molecular building blocks of a material.



Natural Fibre Building Blocks



Keratin – building block of wool



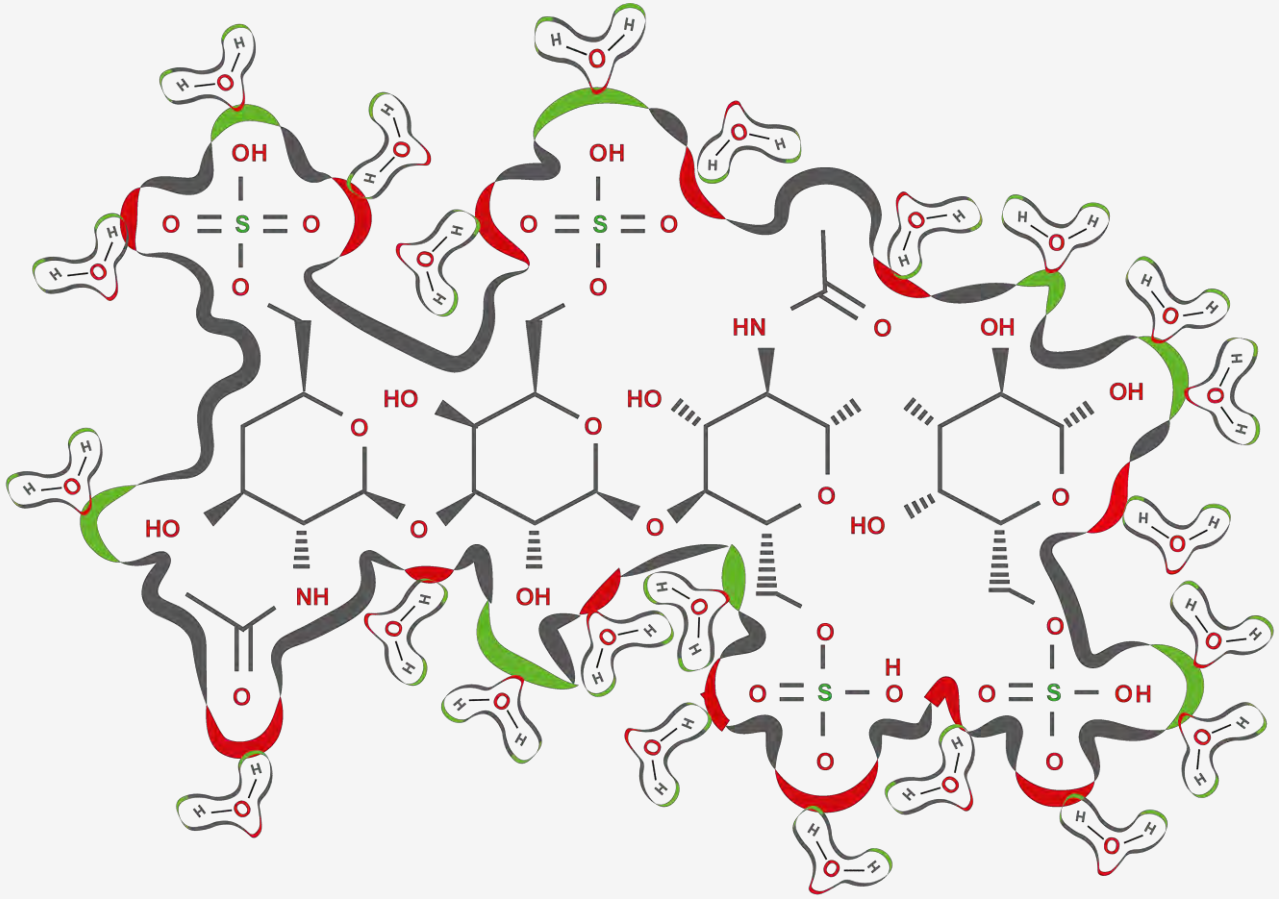
Cellulose – building block of wood and plant fibres

Bound Water – Mono-layer

Mono-layer water

Very tightly bound

Typical RH<25%



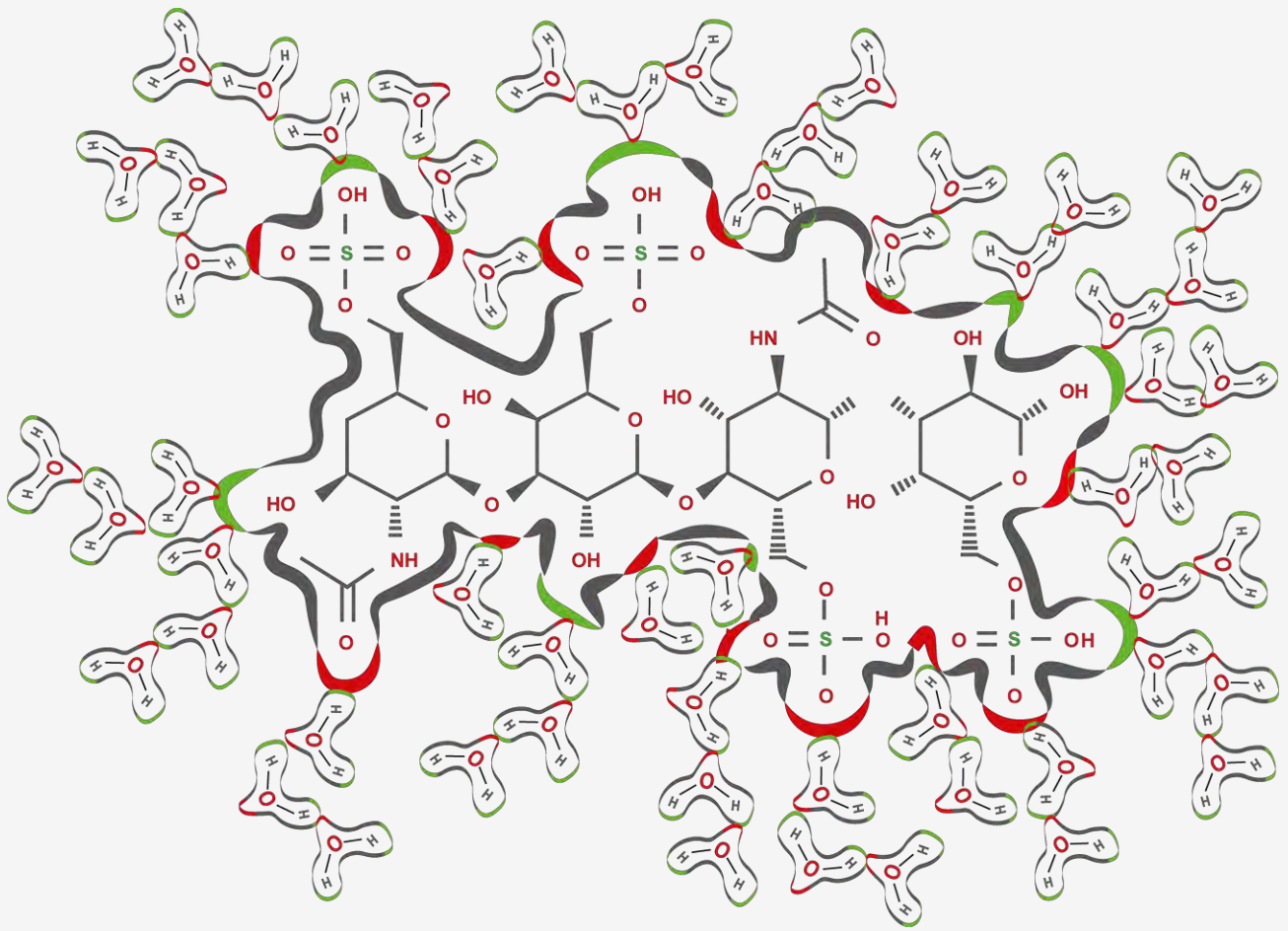
Bound Water - Multilayer

Multi-layer water

Less tightly bound

Bonds weaken with distance

Typical RH<25%



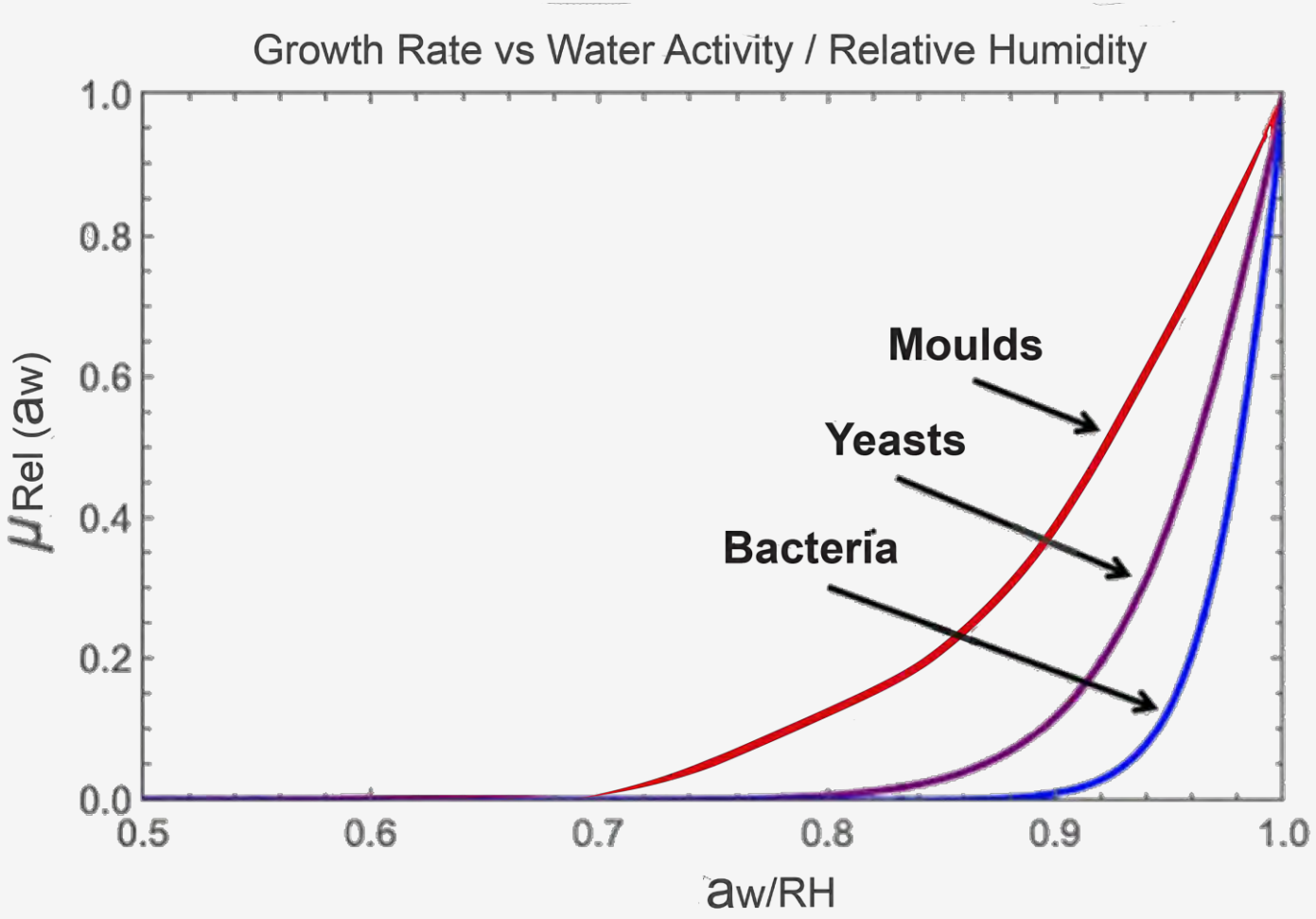
Water Sorption Isotherm

Shows water content at a given relative humidity

Shows water activity at a given water content, i.e the degree to which the water is “bound” or “free”

Isotherm for natural fibres is characteristic of highly porous material

Enables accurate hygrothermal modelling



Thank you

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