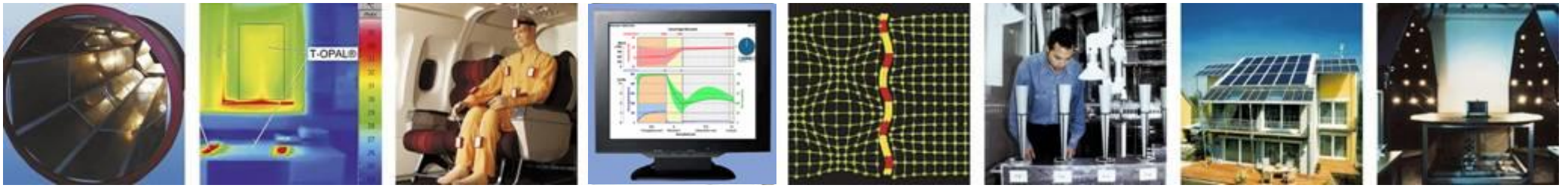


Mold growth prediction with Biohygrothermal Model

Fraunhofer IBP

Contents:

Mold problems in practice

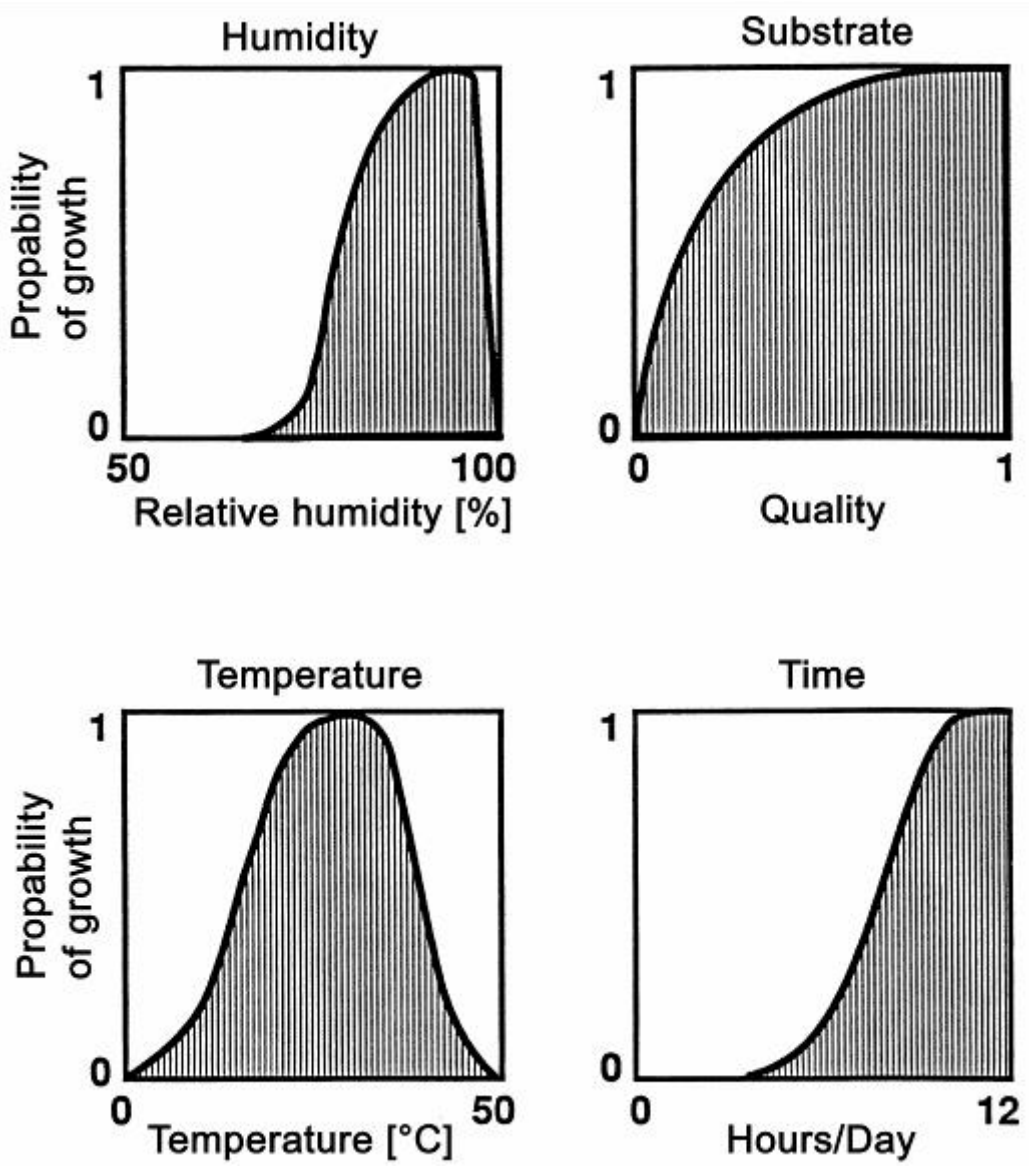
Mold problems in practice

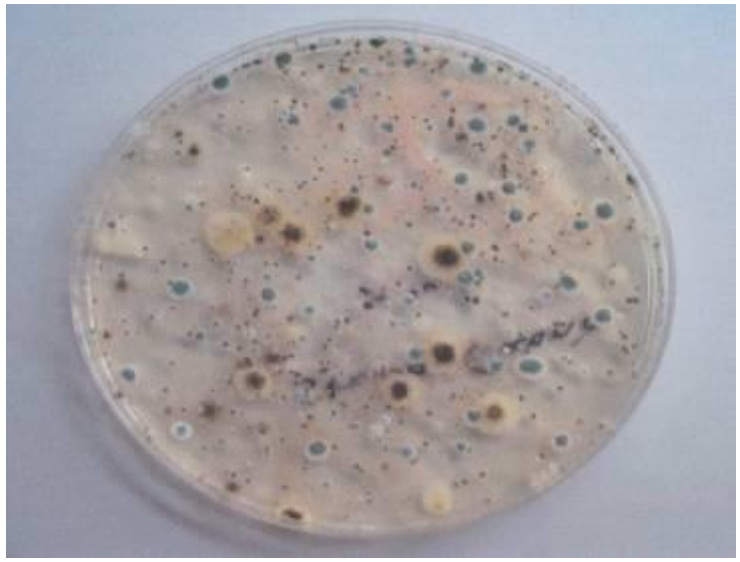
Mould at corners and edges

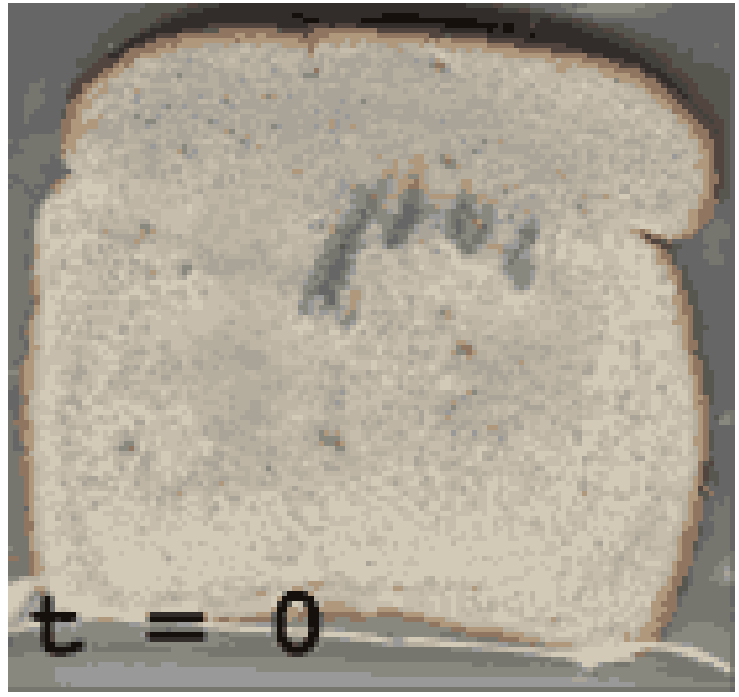
Mold problems in practice

Mould behind interior insulation slabs (EPS)

Growth conditions







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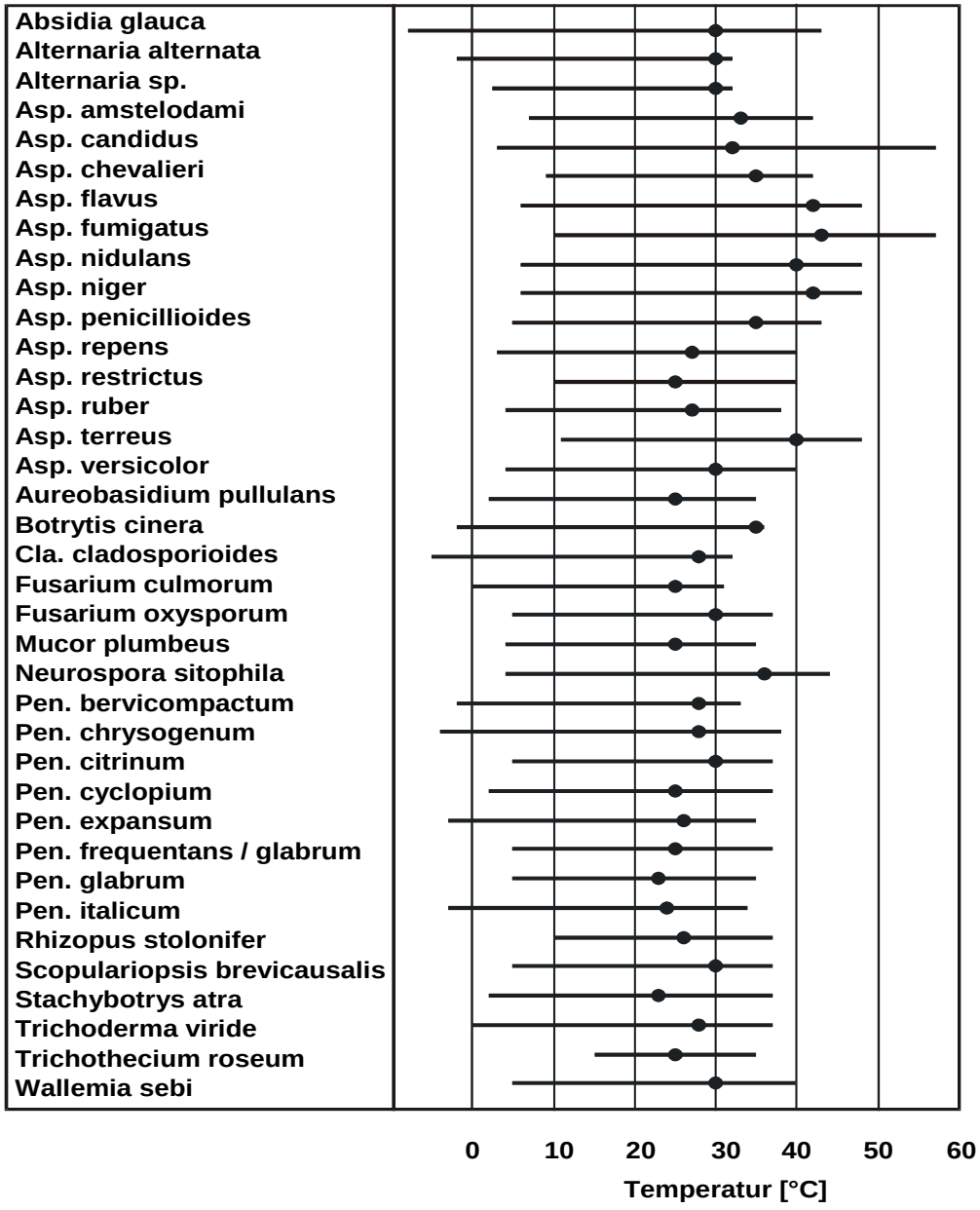
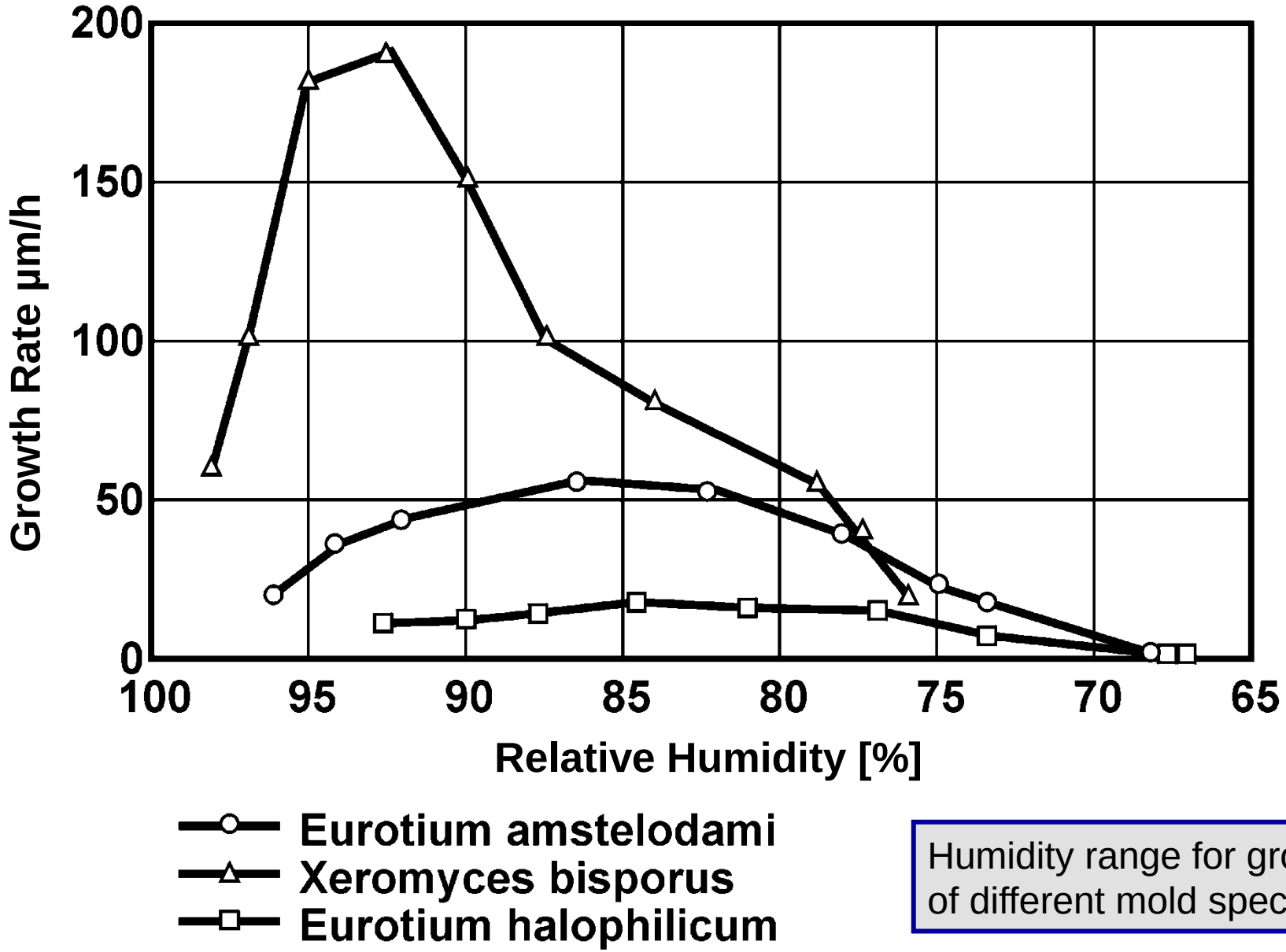
Growth conditions



Temperature range and optimum for mould growth

Fraunhofer IBP

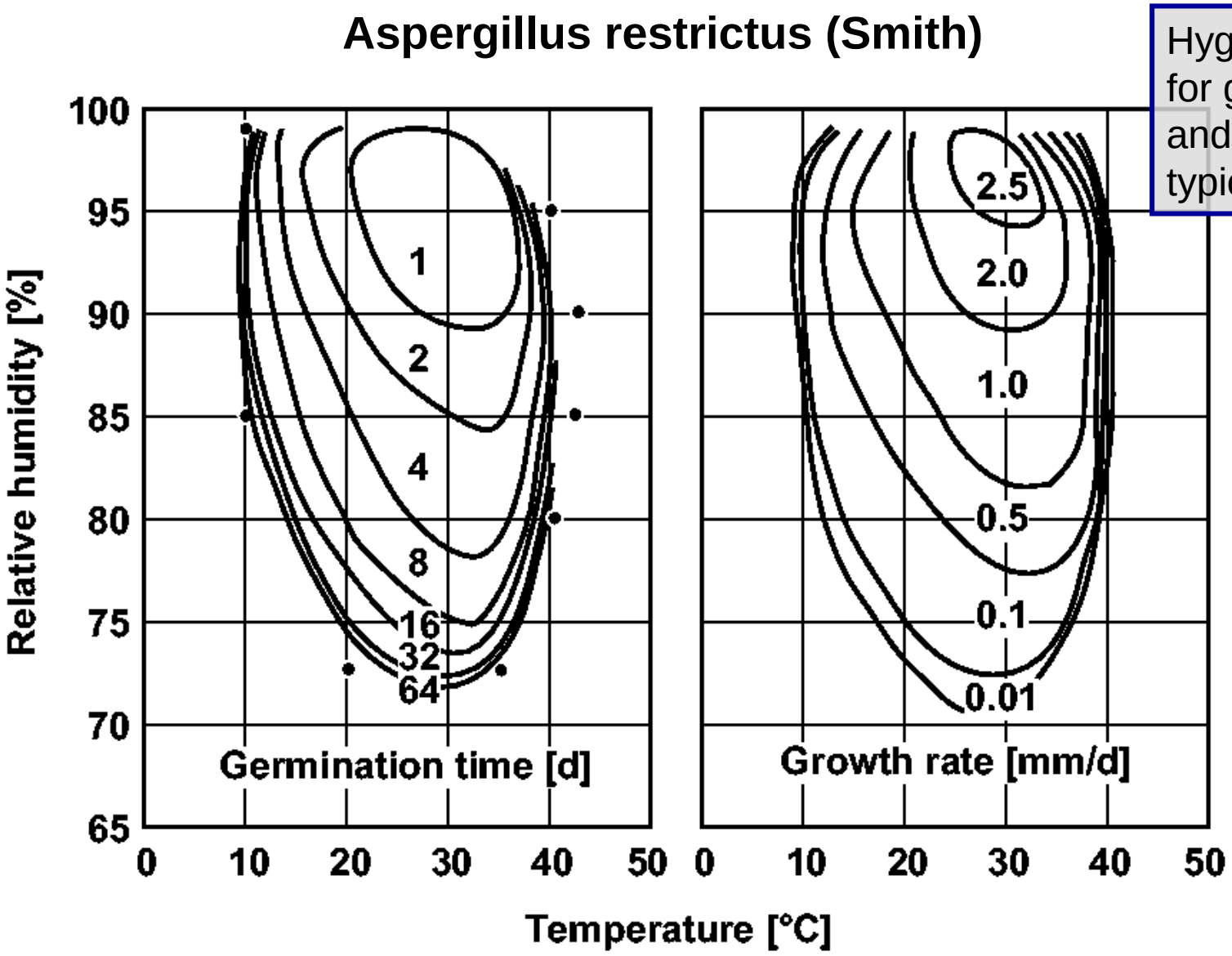
Growth conditions



Humidity range for growth of different mold species

Fraunhofer IBP

Growth conditions

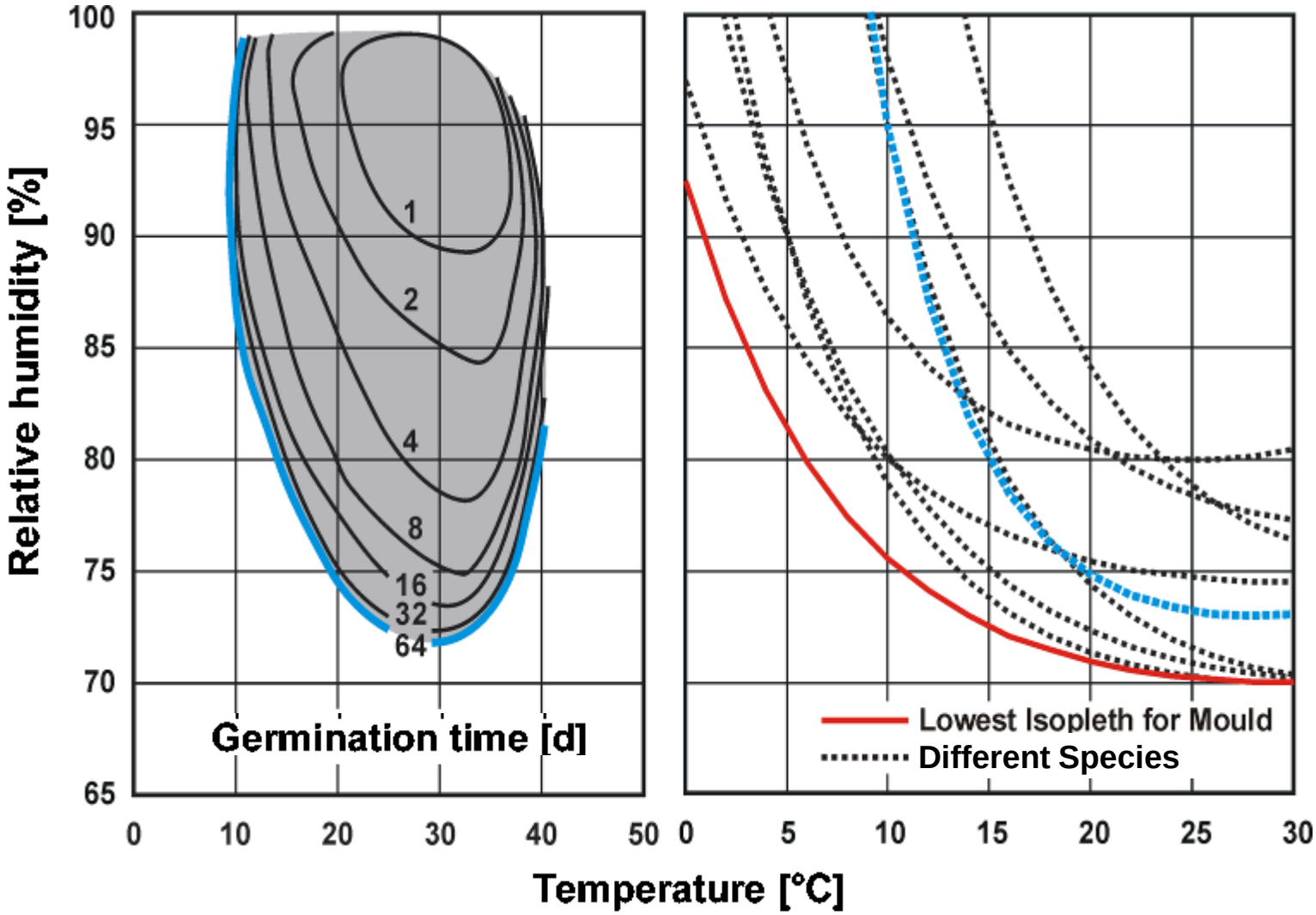


Hygrothermal Iso-lines for germination time and growth rate of a typical mould species

Fraunhofer IBP

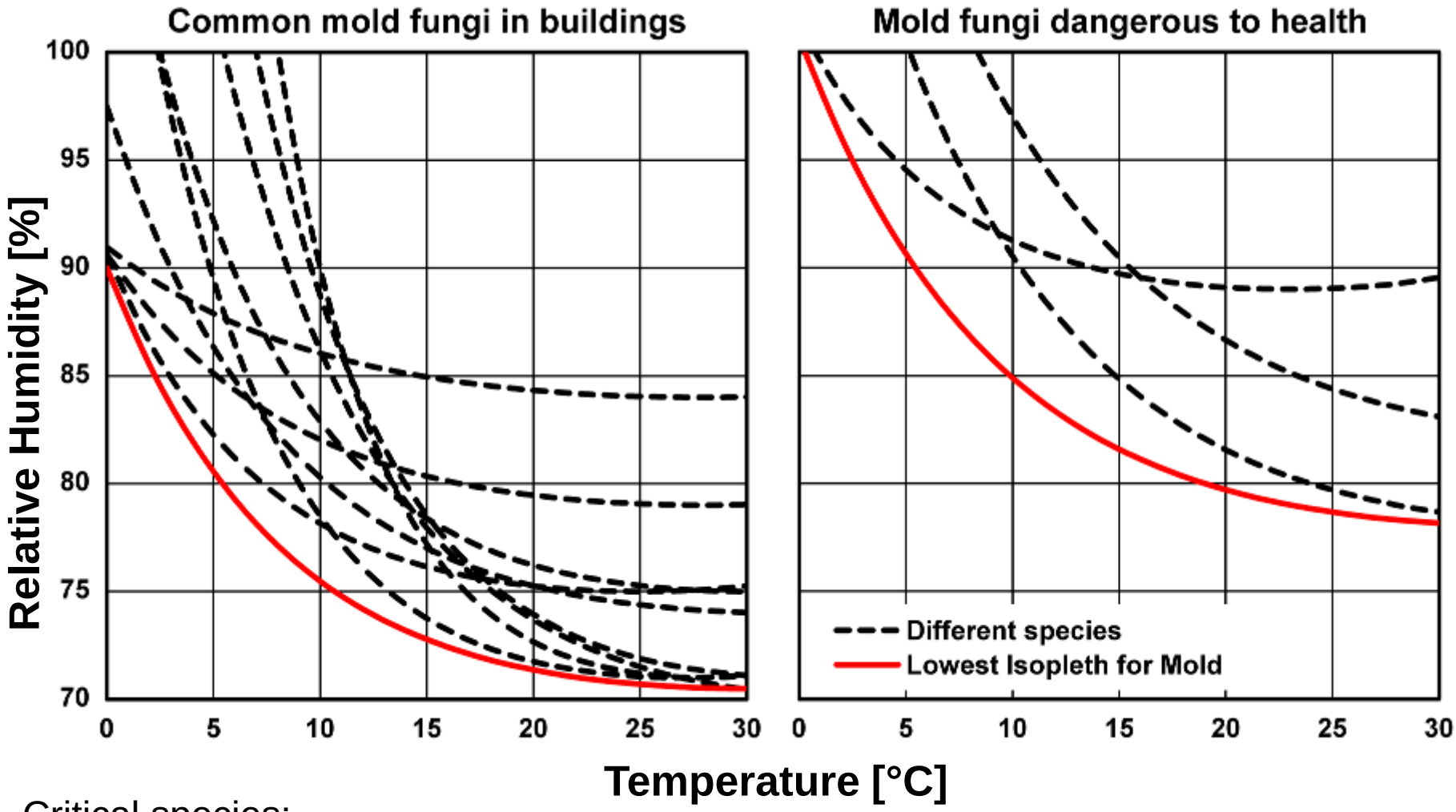
Growth conditions

Aspergillus restrictus and other species



Fraunhofer IBP

Growth conditions



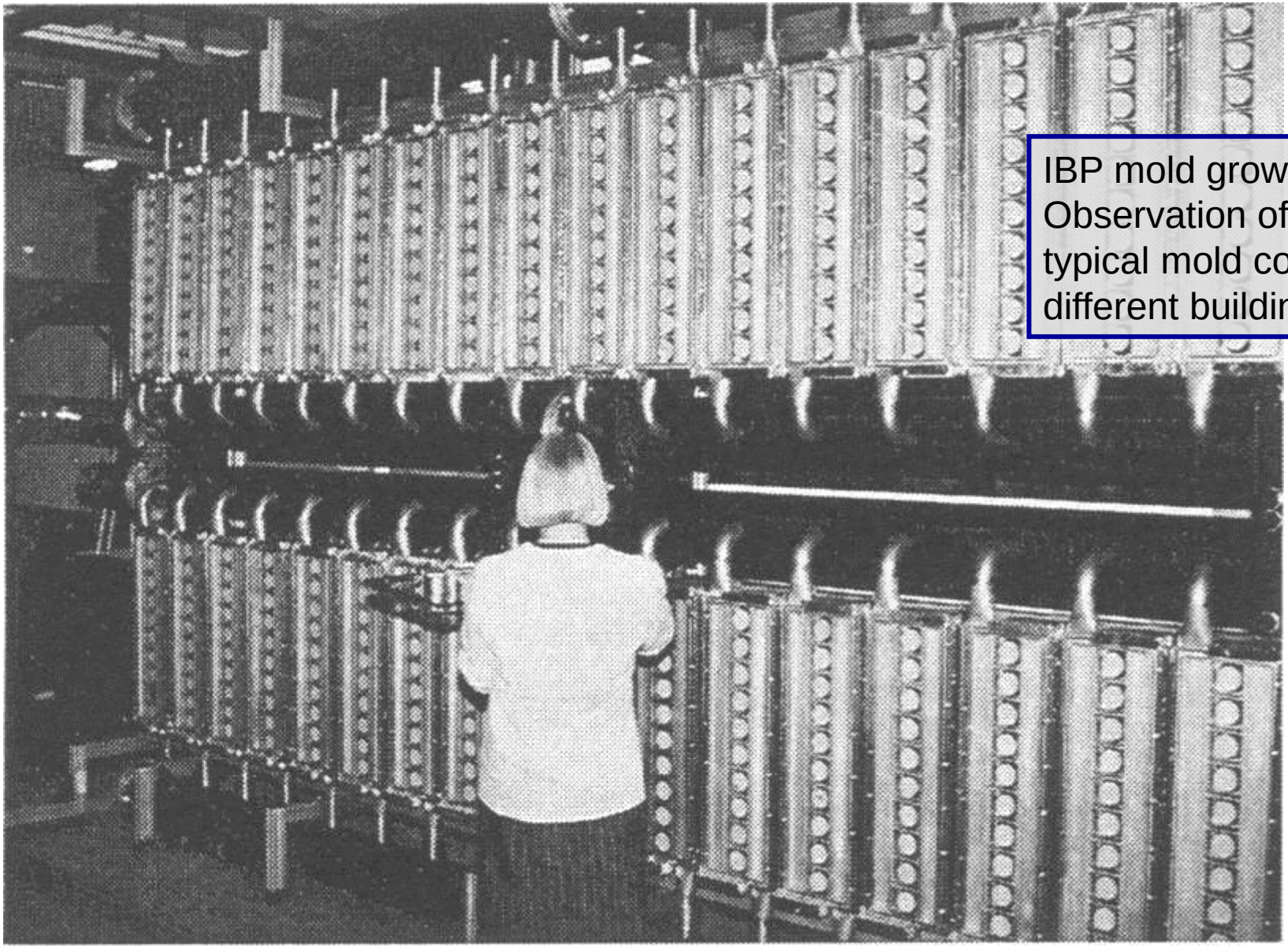
Critical species:

Aspergillus fumigatus
Aspergillus flavus
Stachybotrys chartarum

Potentially hazardous mold species need higher humidity to germinate

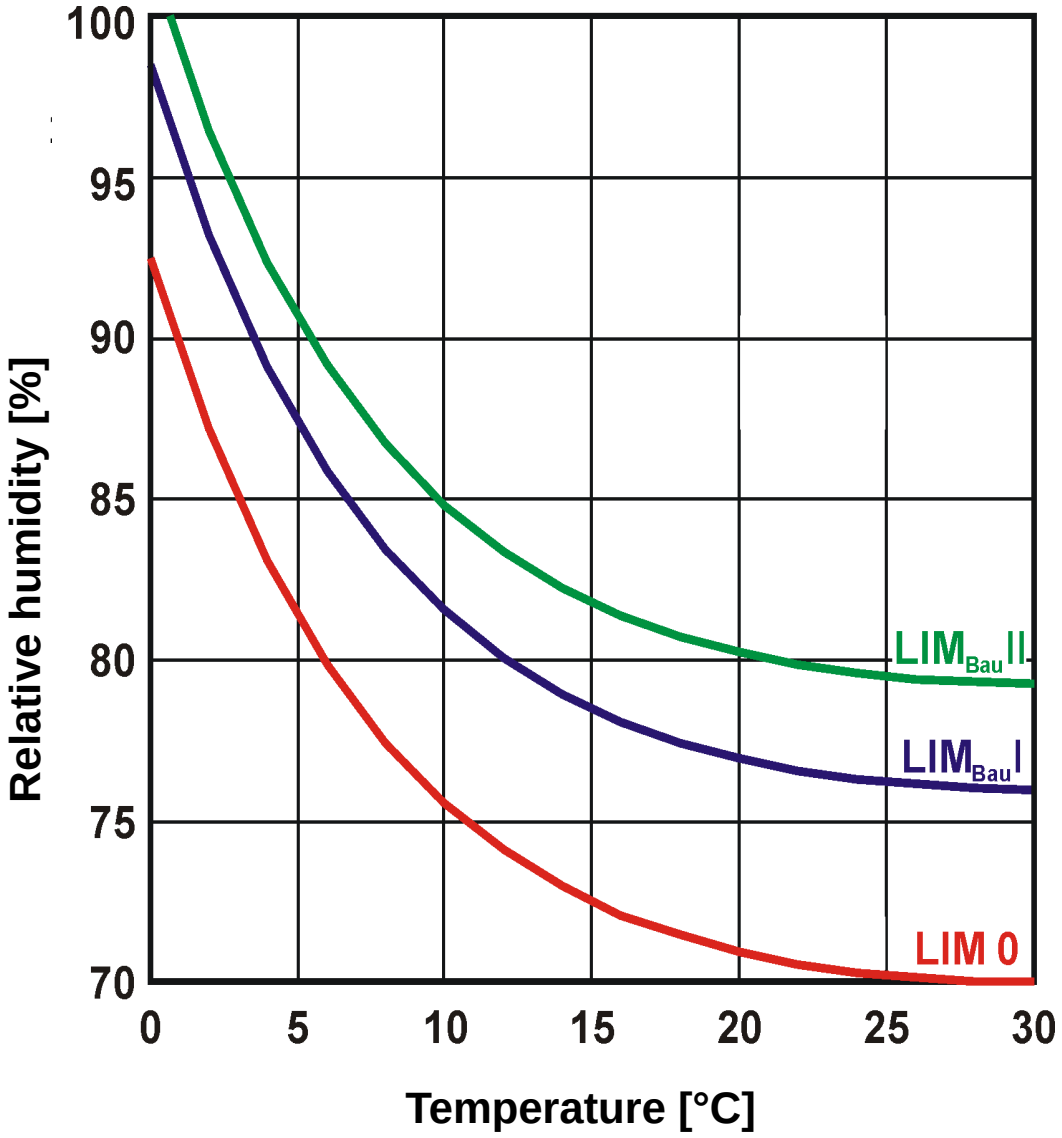
Fraunhofer IBP

Growth conditions



IBP mold growth test set-up: Observation of the growth of a typical mold cocktail on different building materials

Growth conditions



Substrate Classification

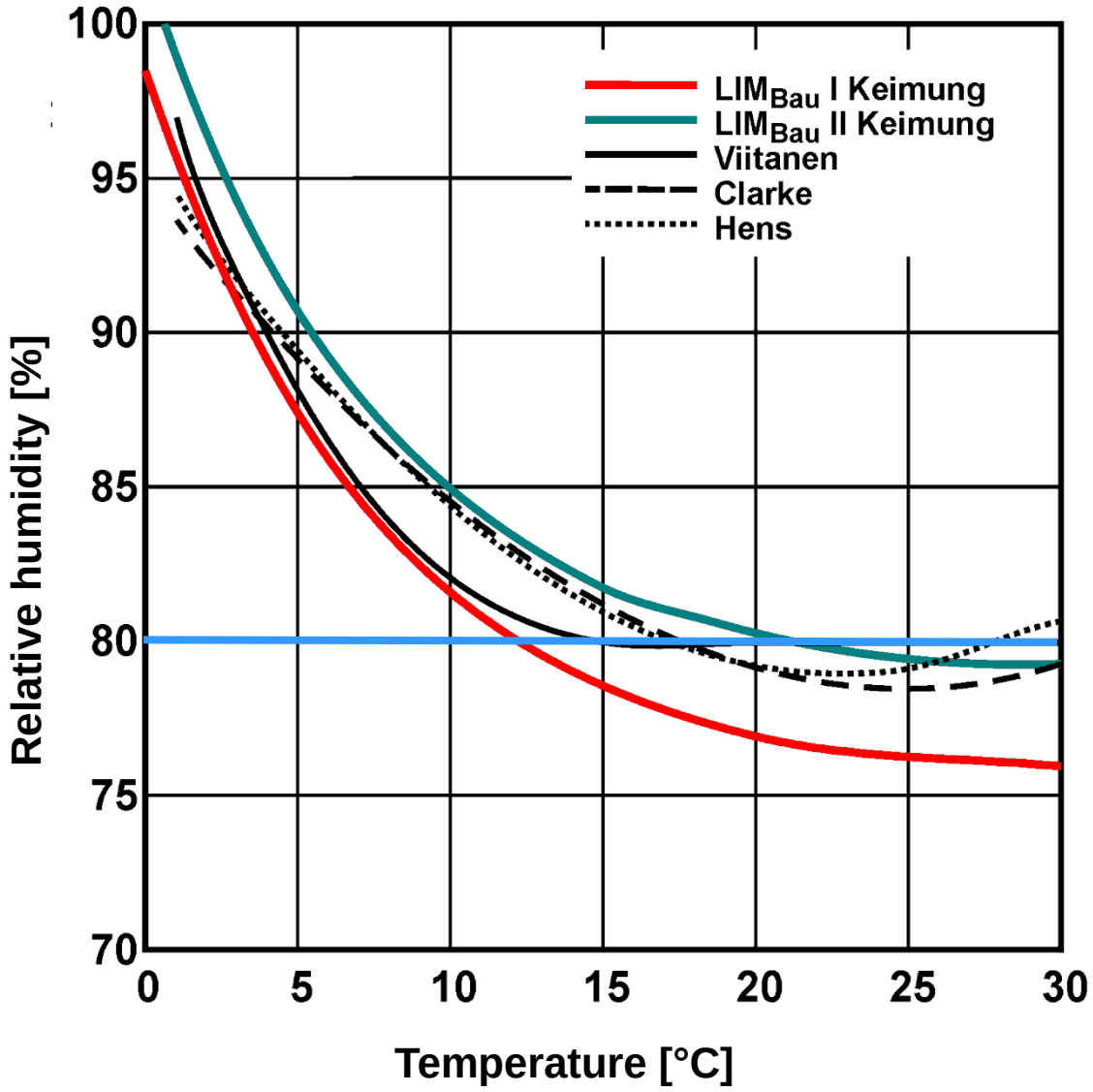
II non biodegradable building materials

I biodegradable building materials

0 optimum substrate

Fraunhofer IBP

Growth conditions



Comparison of LIM with literature data

IEA-Annex 14 & German Standard DIN 4108: 80 %

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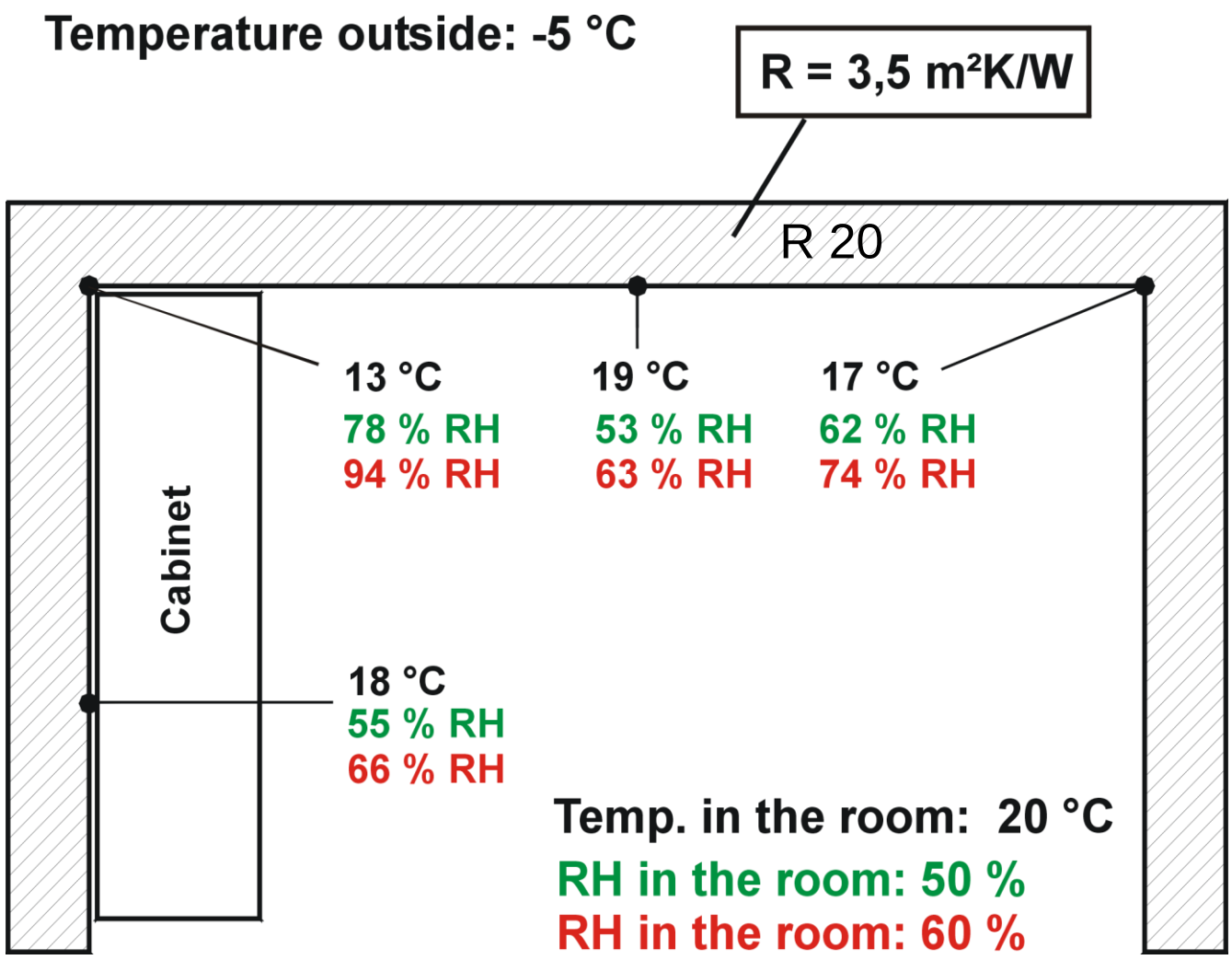
Steady State Model

Steady-state conditions



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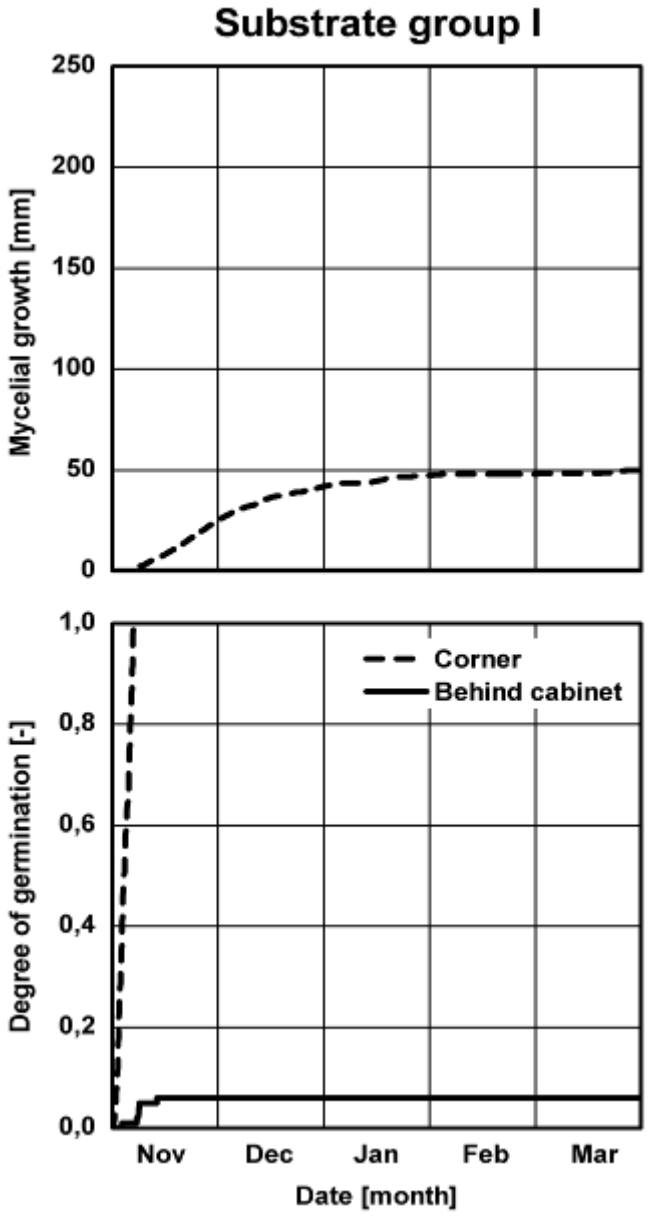
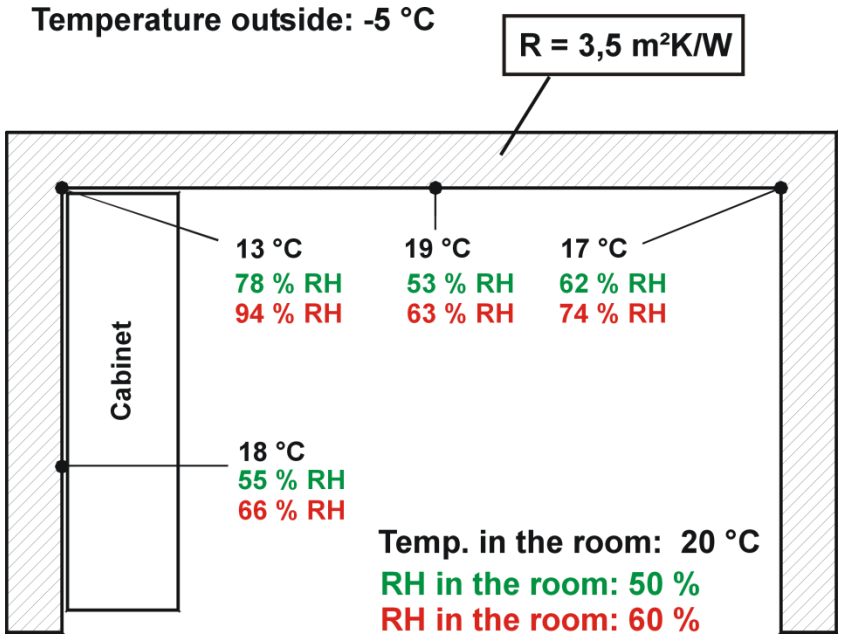
Steady State Model



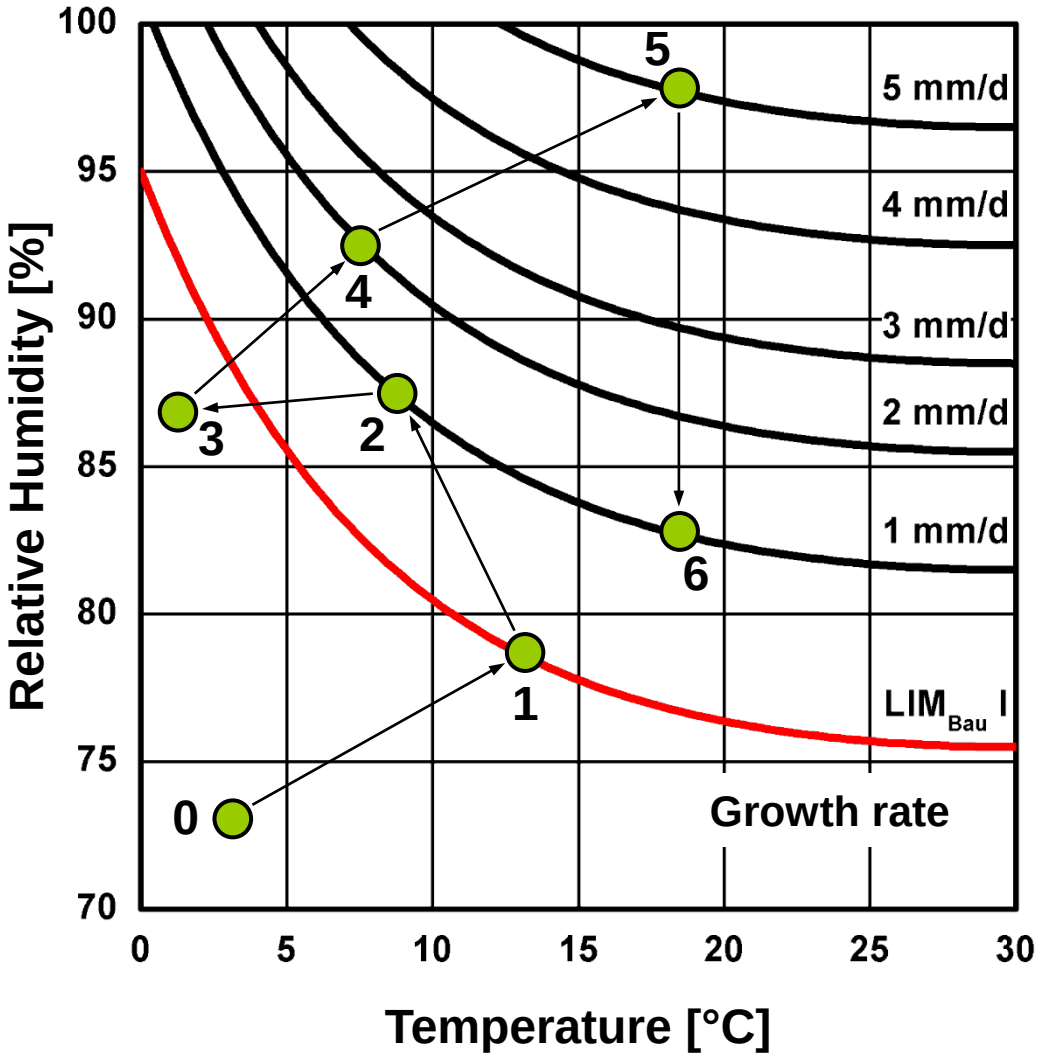


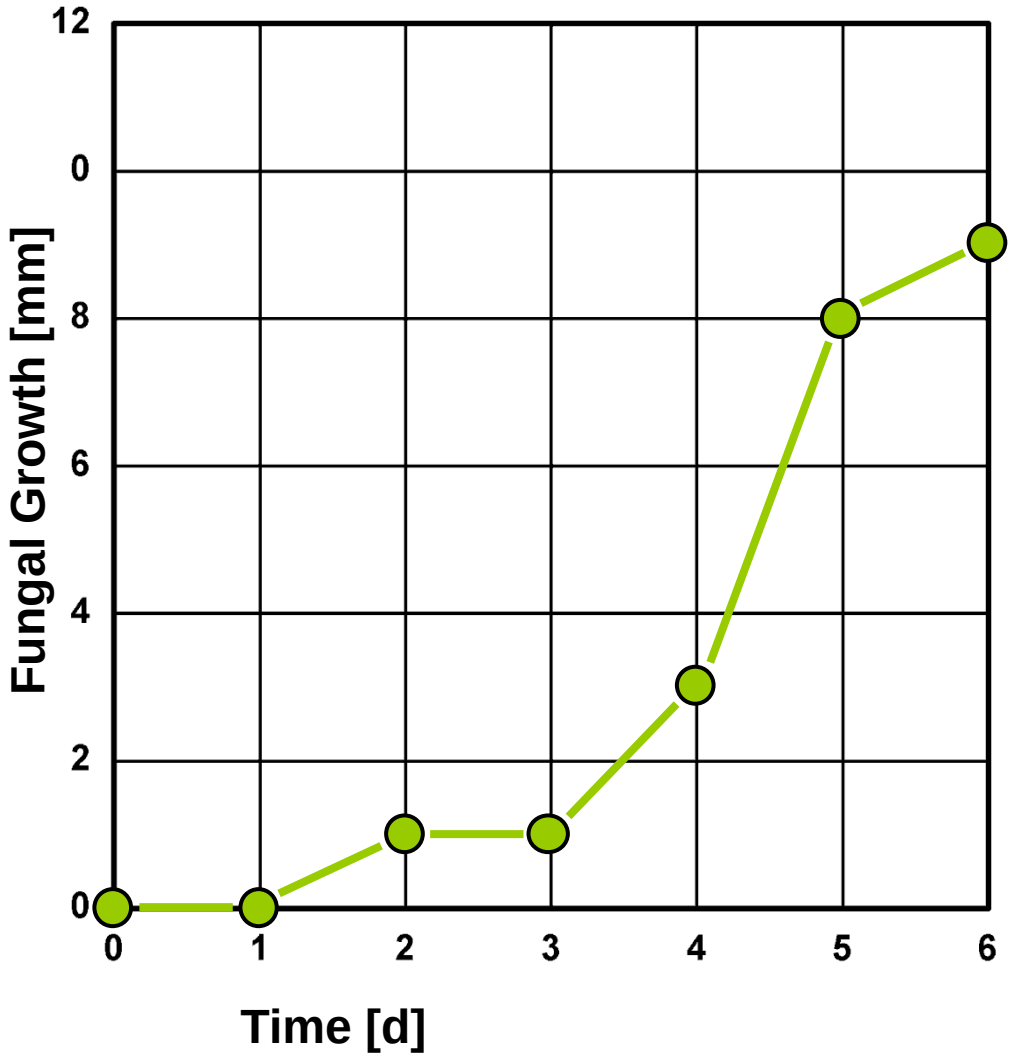
Fraunhofer IBP

Steady State Model

Transient conditions

Steady state model for transient conditions ?!

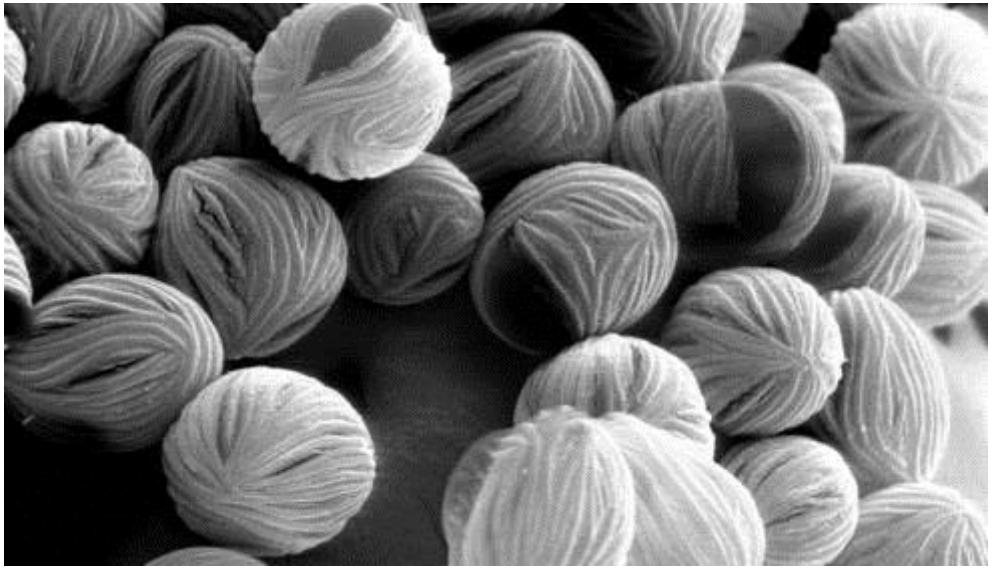


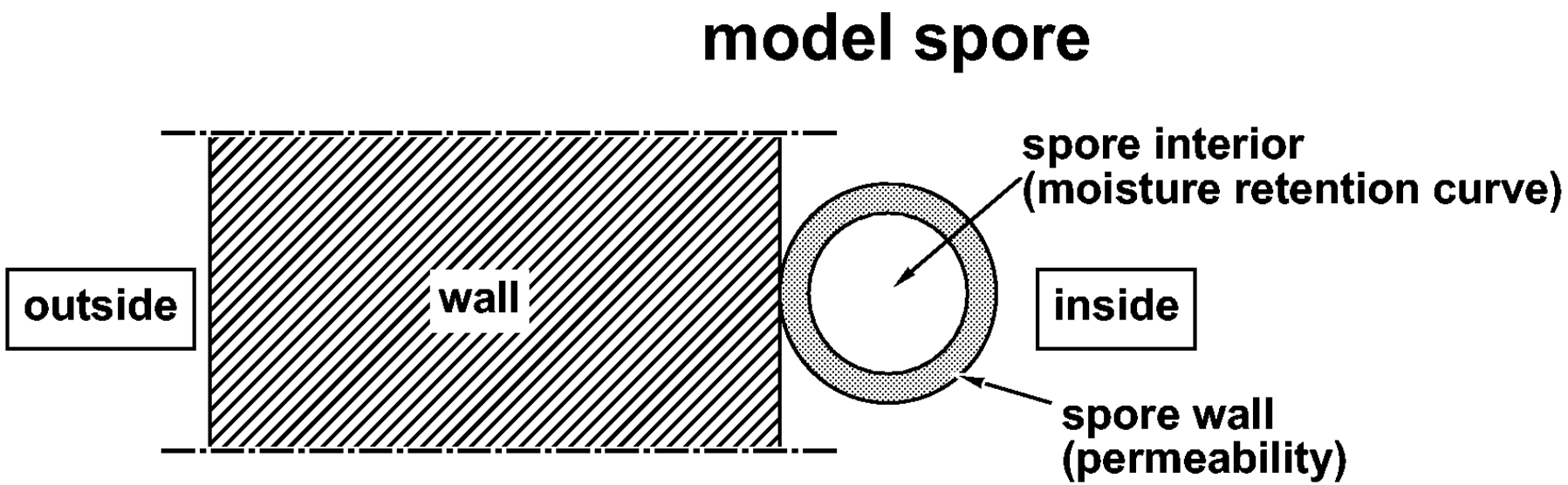


Fraunhofer IBP

Dynamic Model

Dynamic model for transient conditions

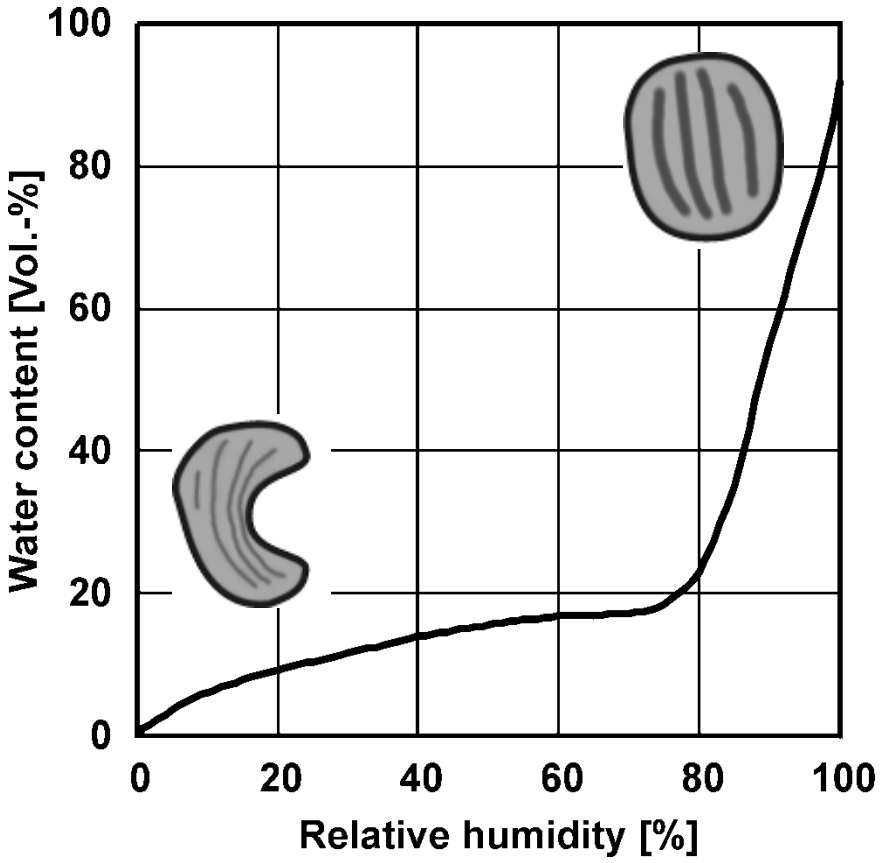




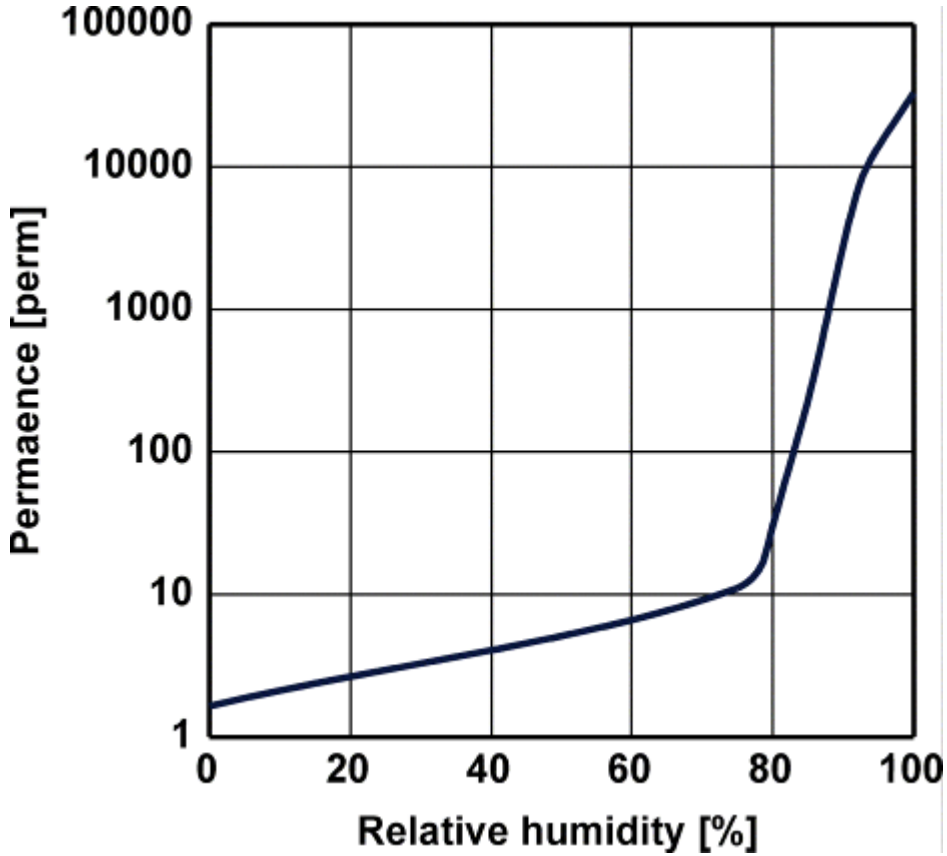
Dynamic Model

Model spore

Water retention curve



Spore wall permeance



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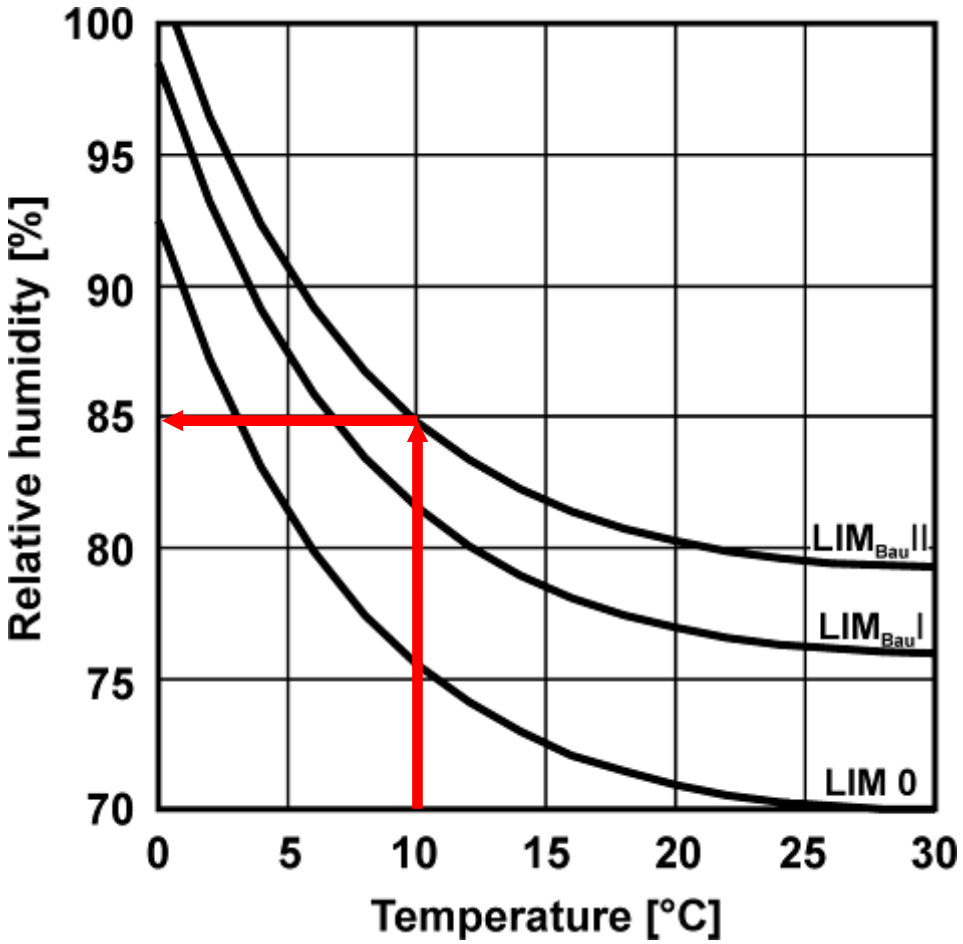
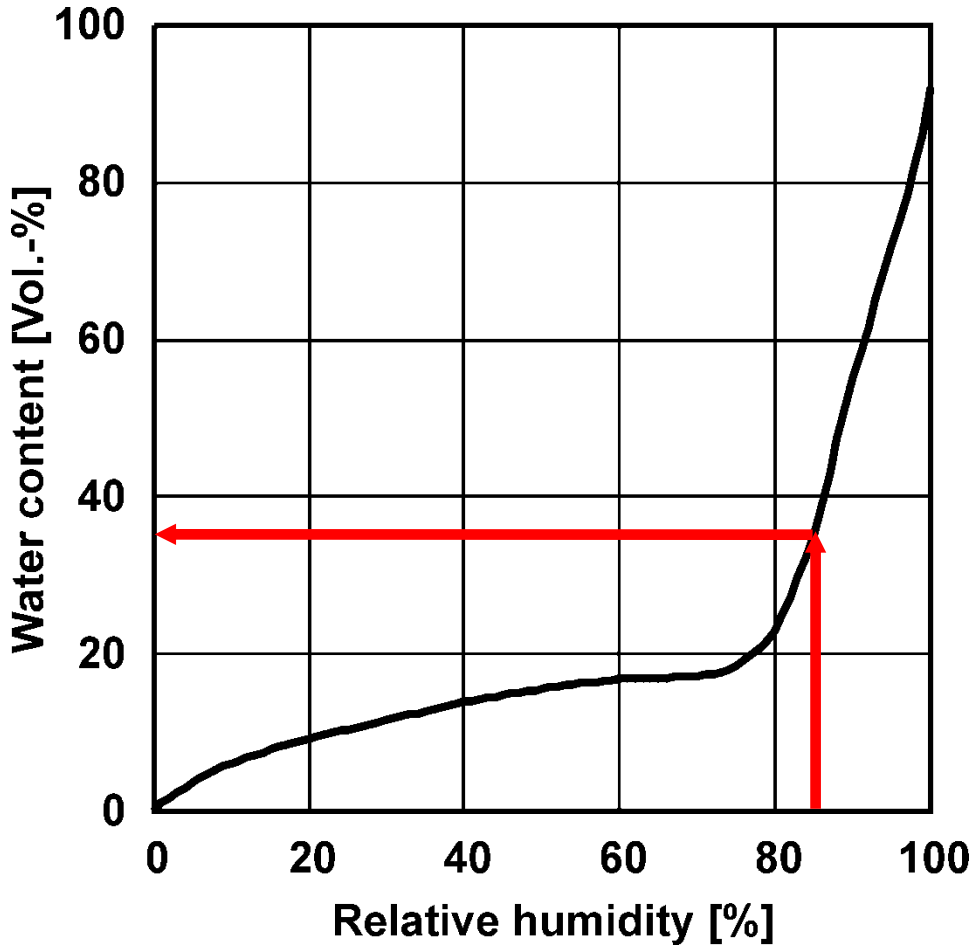
Dynamic Model

Definition of critical spore water content for germination



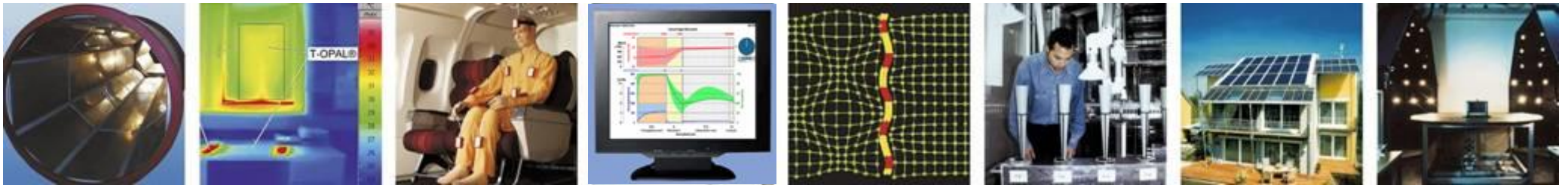


Fraunhofer IBP

Dynamic Model

Model assumptions of WUFI-Bio

Factor	Real life	WUFI-Bio
Humidity & Temperature	determining factors	critical water content = f (φ,θ)
Time	strong influence	germination, growth rate = f(t)
Substrate	availability of nutrients, (concentration of growth inhibiting chemicals)	LIM 0, LIM 1, LIM 2 material specific isopleths
pH-Value	high pH is toxic	not accounted for
Spore dissemination	spores are ubiquitous in air	spores are assumed to be present
Lethal conditions	high and low temp. or low RH may be lethal	decline not yet accounted for >> evaluation should be confined to 12 month starting anytime within the simulated period



Mold growth prediction with Biohygrothermal Model

Fraunhofer IBP