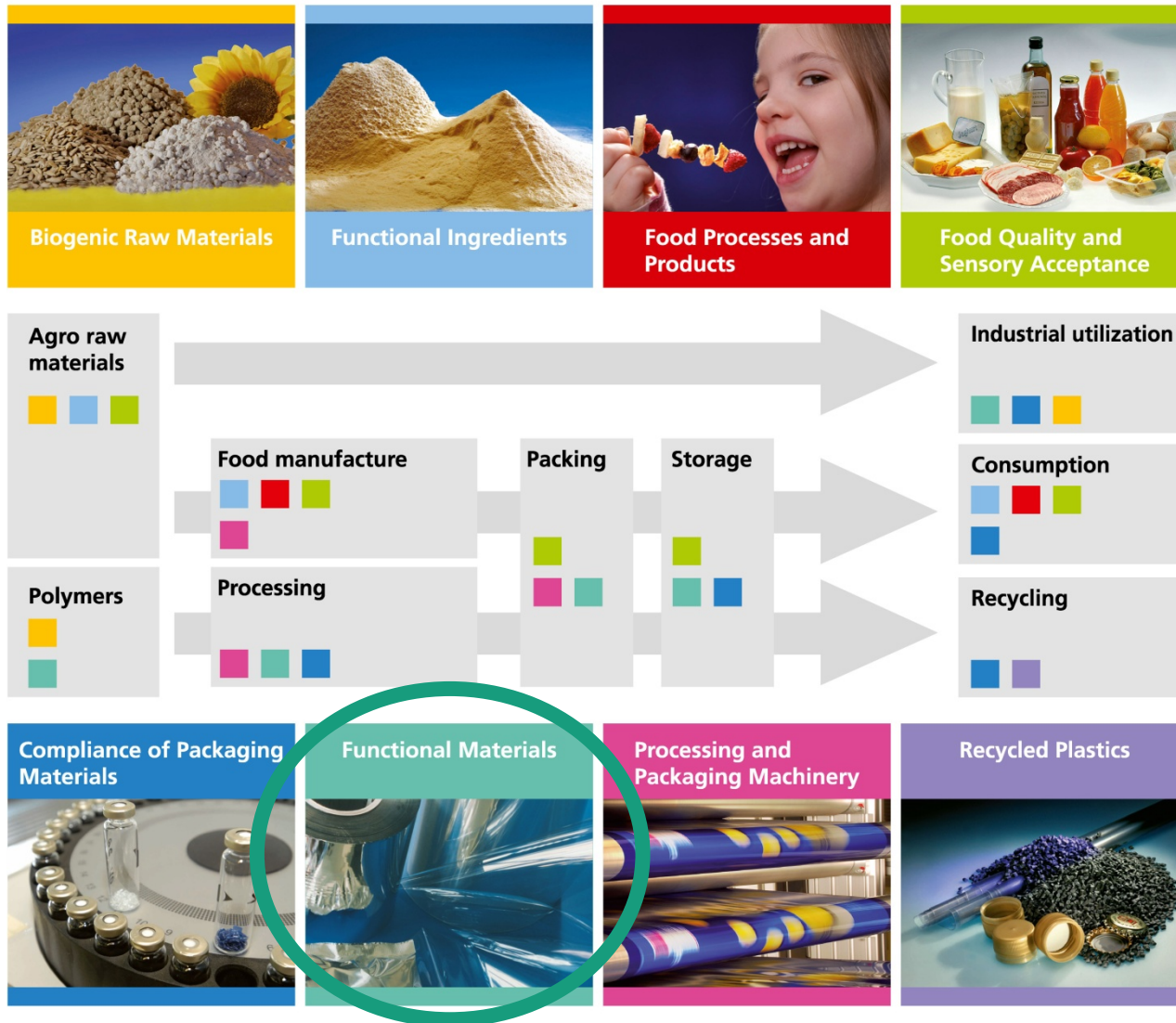

Interpack

Düsseldorf, 2014-05-09

The task of packaging in reducing food waste

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Why do we pack food?



Weck
Orig.-Apparate u. Gläser
ermöglichen jeder
Hausfrau
selbst ihre
Konserven
herzustellen.

„Koch auf Vorrat!“

Viele Nachahmungen
der Weck'schen Einrichtungen sind aber
beste Empfehlung.

Man achte aber auf die Schutzmarke und verlange überall

nur Original Weck!

: Leichte Handhabung! Tadellosen Funktionieren! :
Seit 1909 fast alle Artikel bedeutend,
1910 komplette Einrichtungen nochmals
: zirka 5% im Preise ermässigt! :
: Hervorragende Neuheiten! :
Unvergleichlich sind die Drucksachen

J. Weck, G. m. b. H., Ötlingen 181
Amt Säckingen in Baden, Deutschland.

Main Task: Avoid Deterioration

Processes of Deterioration

Microbial activity

- Aerobic: oxygen
- Anaerobic: no oxygen

Chemical / biochemical activity

- Lipid oxydation: light and oxygen
- Enzymatic browning: oxygen

Physical processes

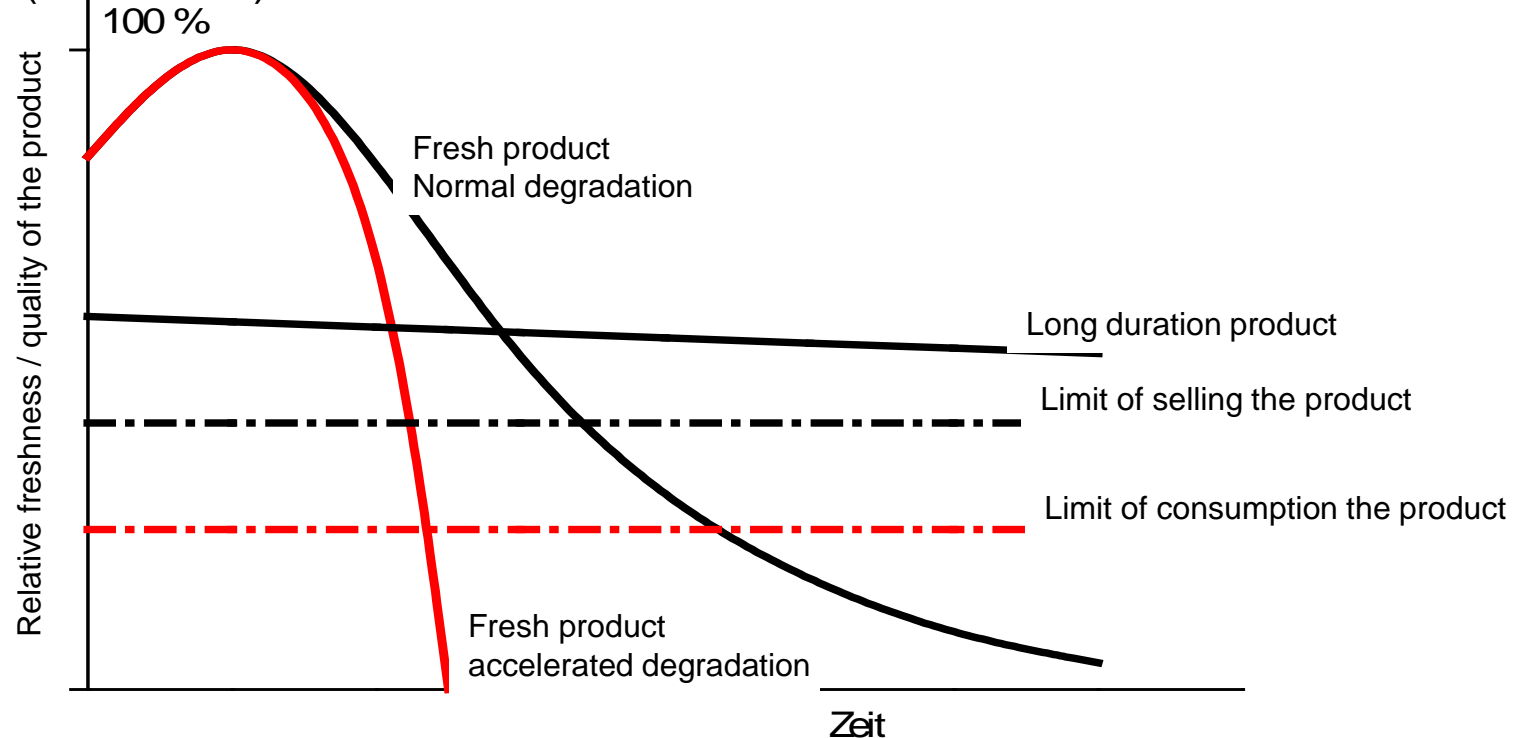
- water: loss or uptake
- Off-flavor
- Loss of aroma



Comparison between fresh and long duration products

Degradation of quality over time, starting with the packaging

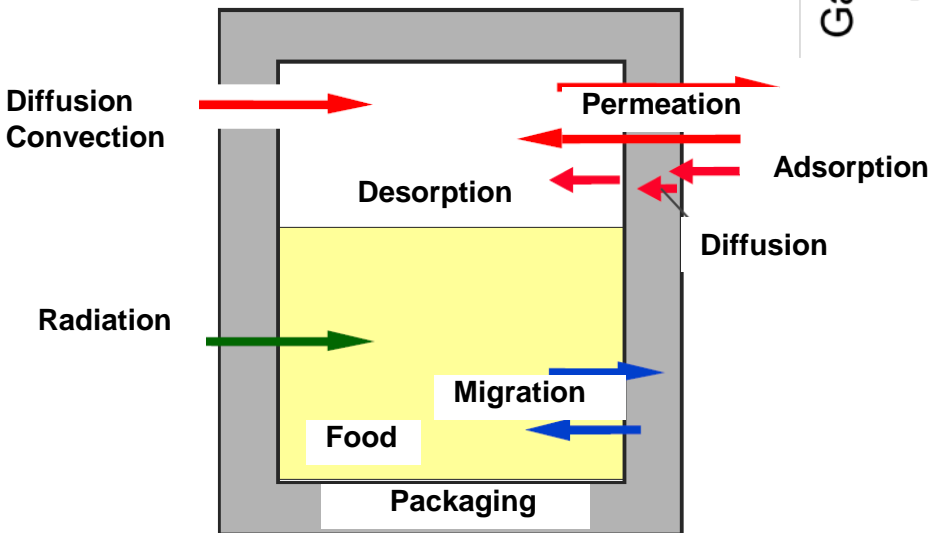
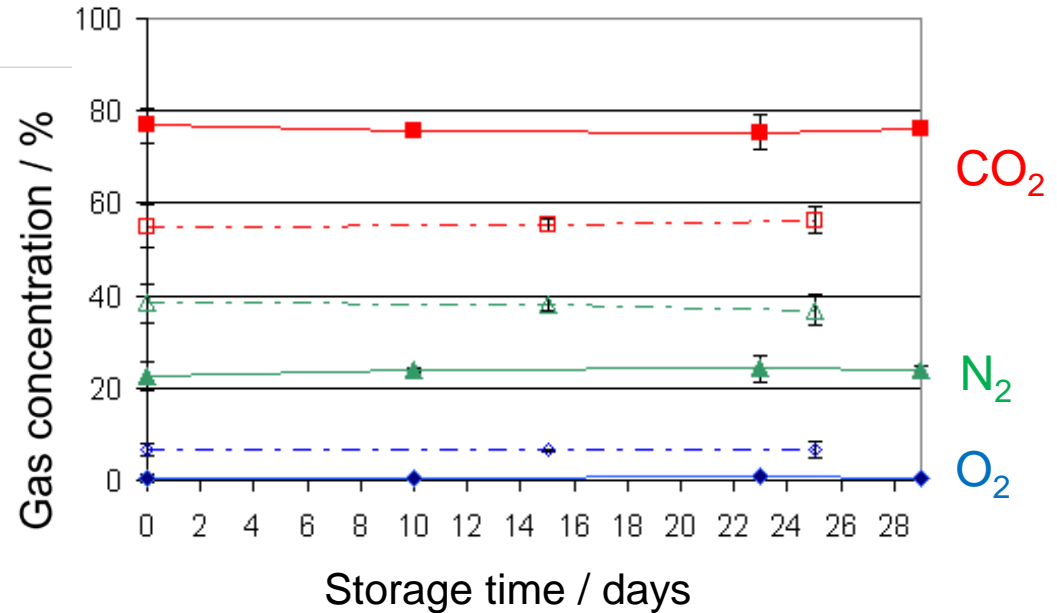
(schematic)



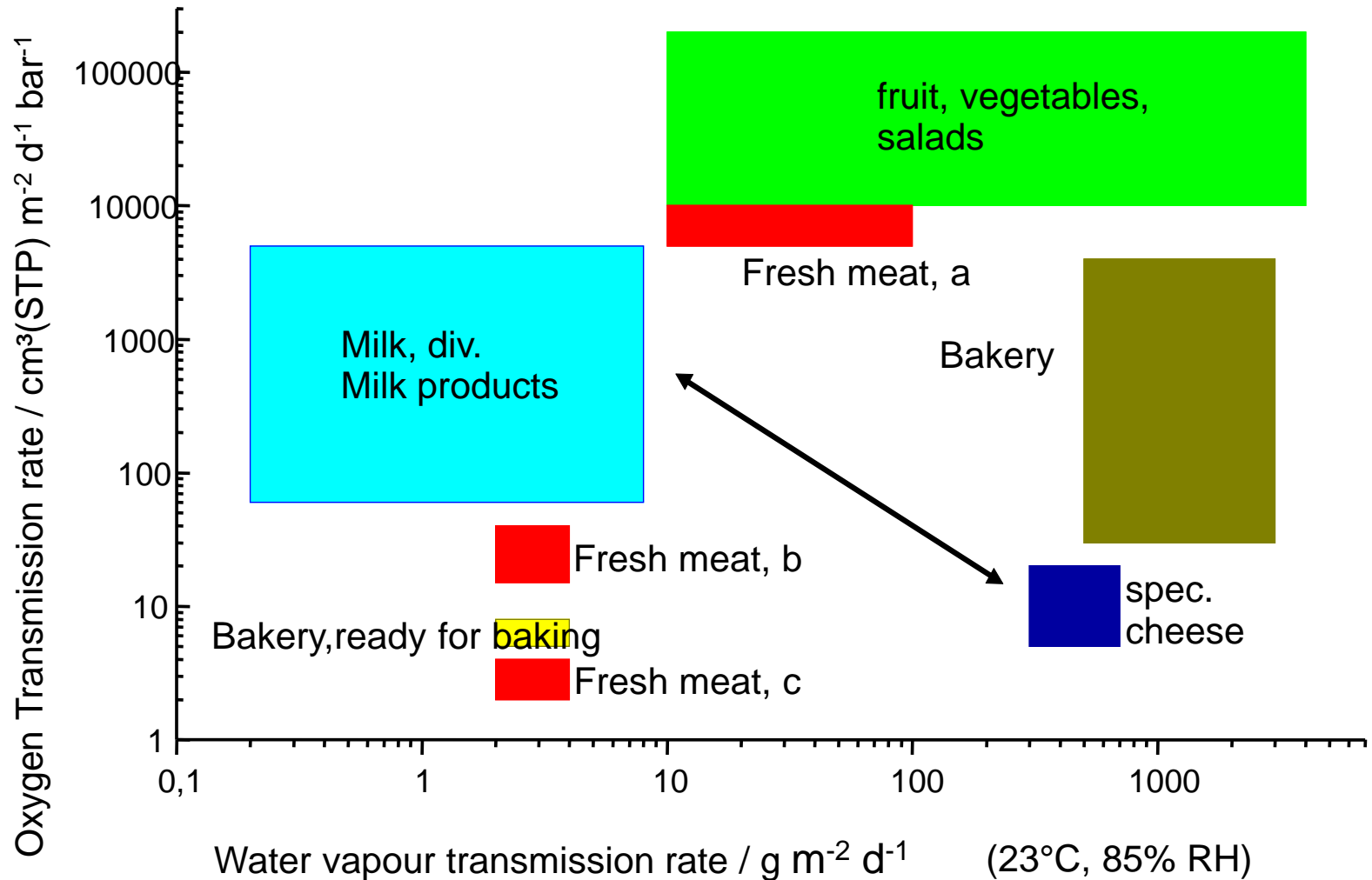
Packaging and mass transport properties

Typical values for bakery products:

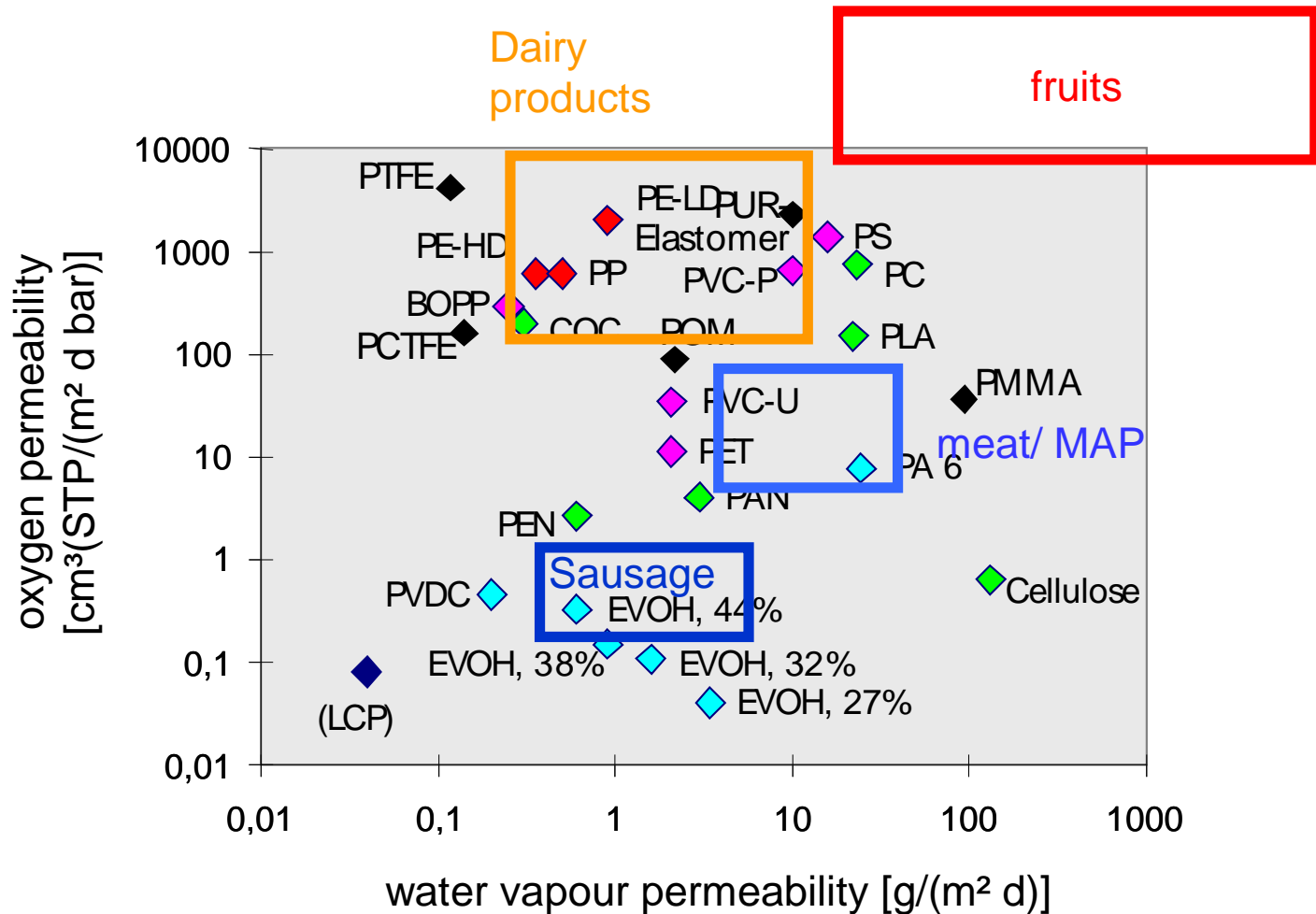
oxygen: < 0.5%
 nitrogen: 30 – 50 %
 Carbon dioxide: 50 - 70 %



Requirements of fresh products



Requirements of chilled products

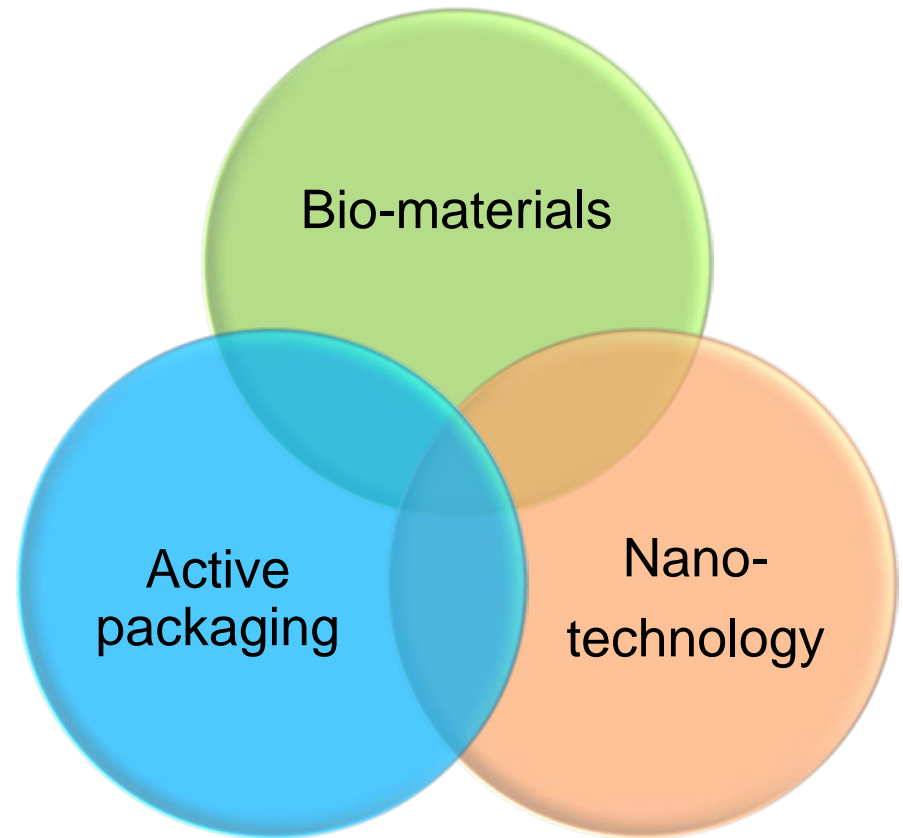


Sustainability in food packaging

❑ Different approaches:

1. Less material
2. Bio polymers
3. Nanotechnology
4. Active packaging
5. Better protection against deterioration

❑ Trends in packaging:



Less Material: Reduced Environmental Impact by Halving the Usage of Materials

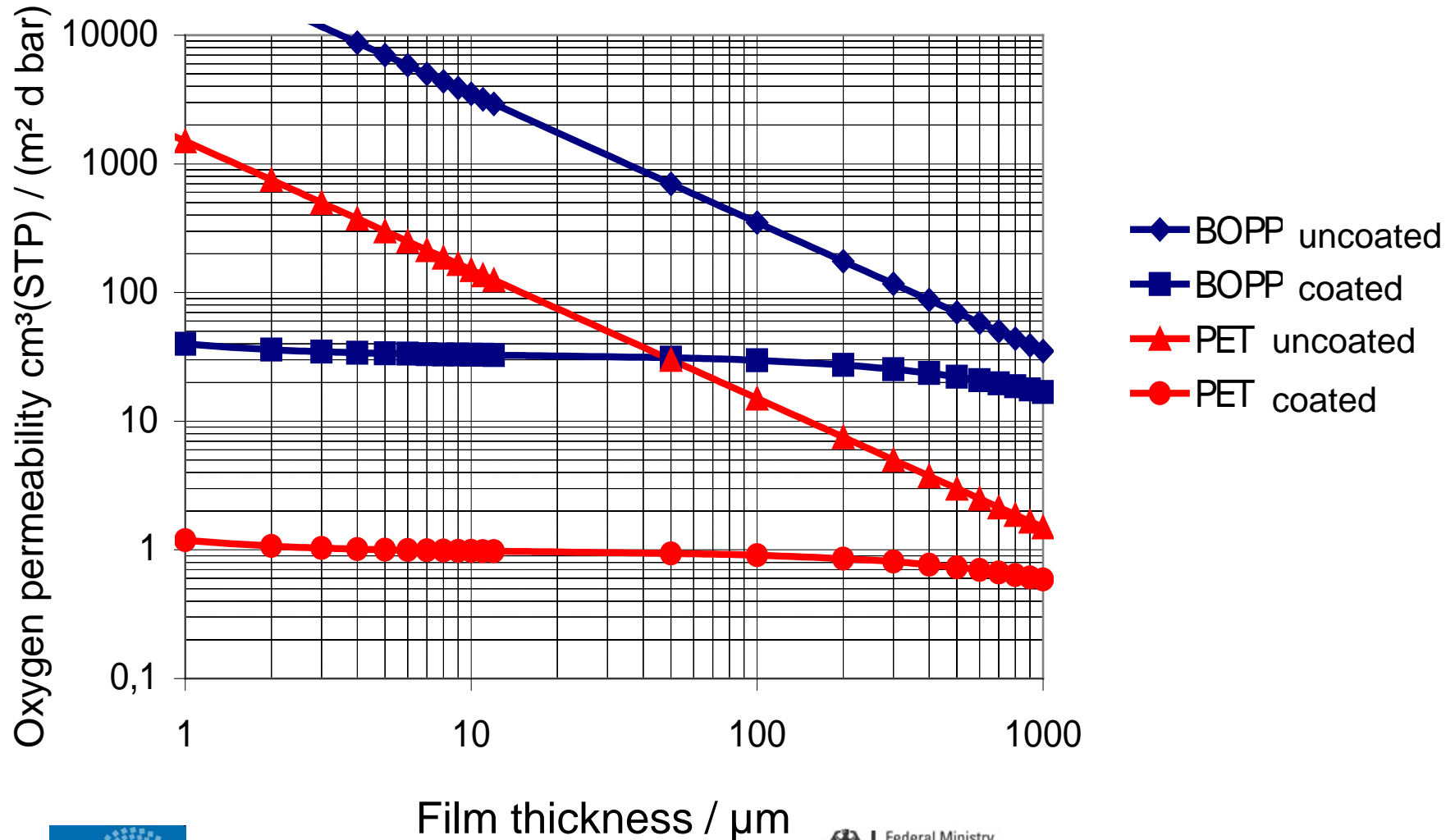
Motivation For a multilayer film structure 70% of the resources are necessary for the production of the base films,

Objectives: The development of thin packaging films which maintain the protective functions development of machine technology for processing the new films

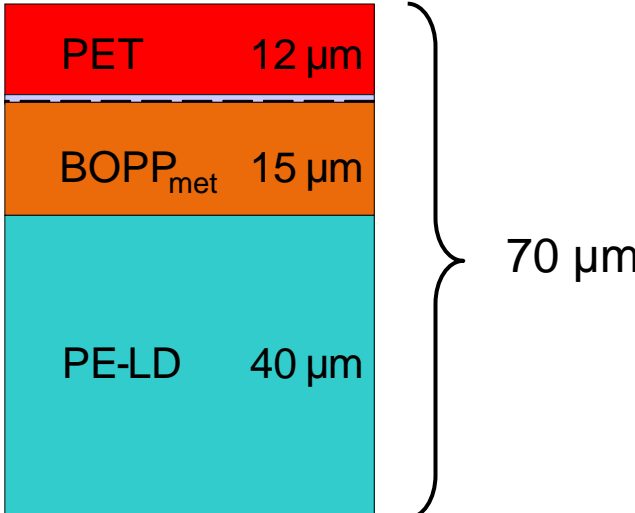
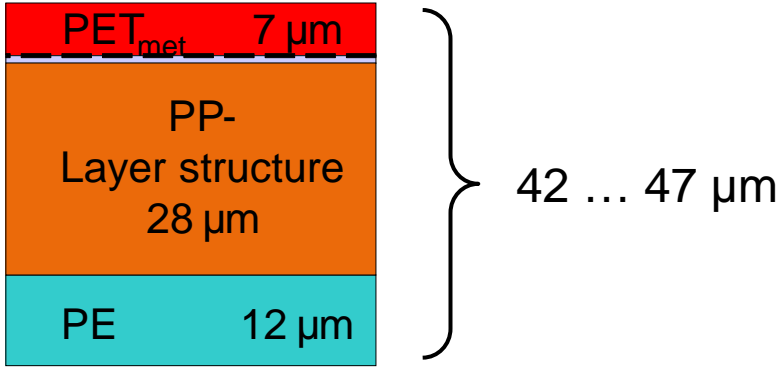
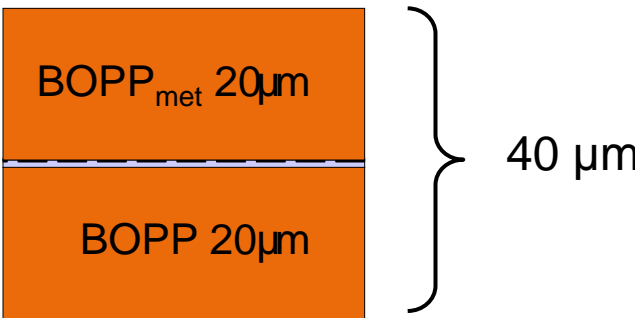
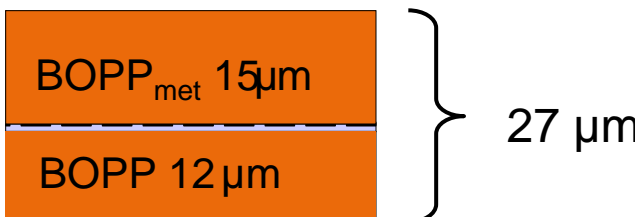
Saving possibility by halving of the thickness:
Up to 35% cumulative energy input

Less Material:

Impact of film thickness regarding barrier improvement



Less Material: Packaging trials with real products

	standard	„thin films“
nuts	 <p>PET 12 μm</p> <p>BOPP_{met} 15 μm</p> <p>PE-LD 40 μm</p> <p>70 μm</p>	 <p>PET_{met} 7 μm</p> <p>PP-Layer structure 28 μm</p> <p>PE 12 μm</p> <p>42 ... 47 μm</p>
chips	 <p>BOPP_{met} 20 μm</p> <p>BOPP 20 μm</p> <p>40 μm</p>	 <p>BOPP_{met} 15 μm</p> <p>BOPP 12 μm</p> <p>27 μm</p>

Biopolymers

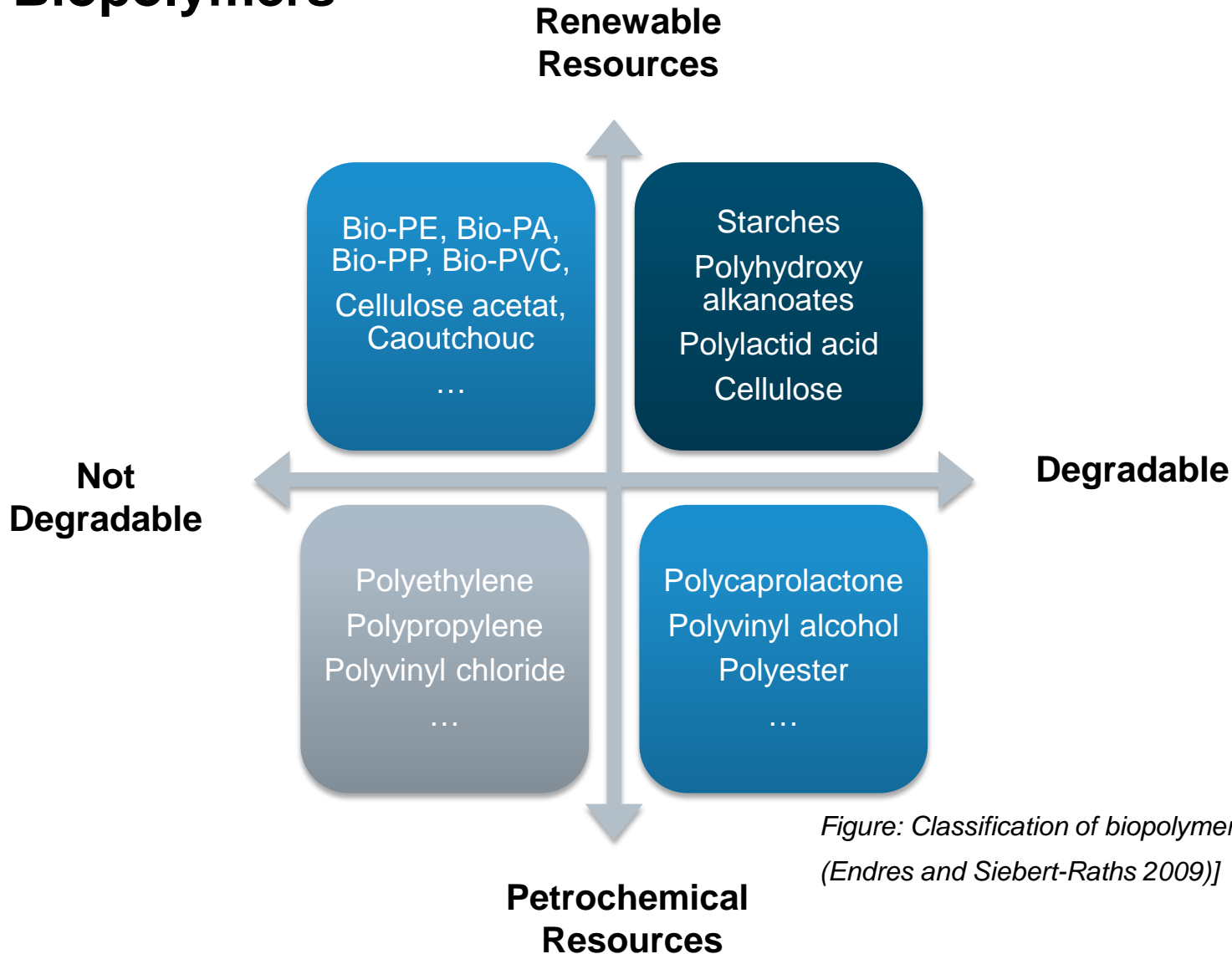


Figure: Classification of biopolymers [according to (Endres and Siebert-Raths 2009)]

Nanotechnology

Inorganic barrier layers on films (here: PET)

- Barrier improvement up to factor 100, longer shelflife
- No direct contact of thin inorganic layers to packed food
- In use since decades

**Industrial
production: Some
 10^{10} m² per year**

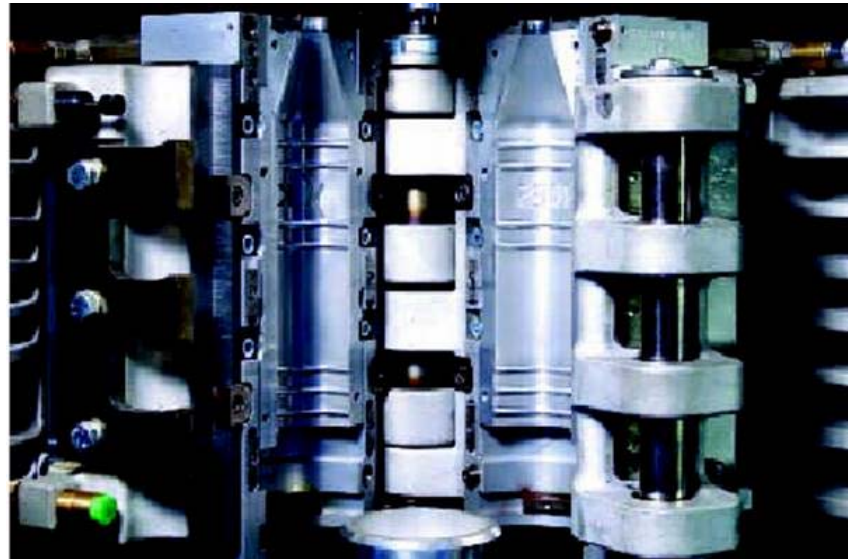
----- 300 nm

Al layer, ca. 50 nm

SiO_x layer, ca. 60 nm

Nanotechnology

Titanium nitride (TiN) nanoparticles in PET for container applications



Mould for stretch blowing

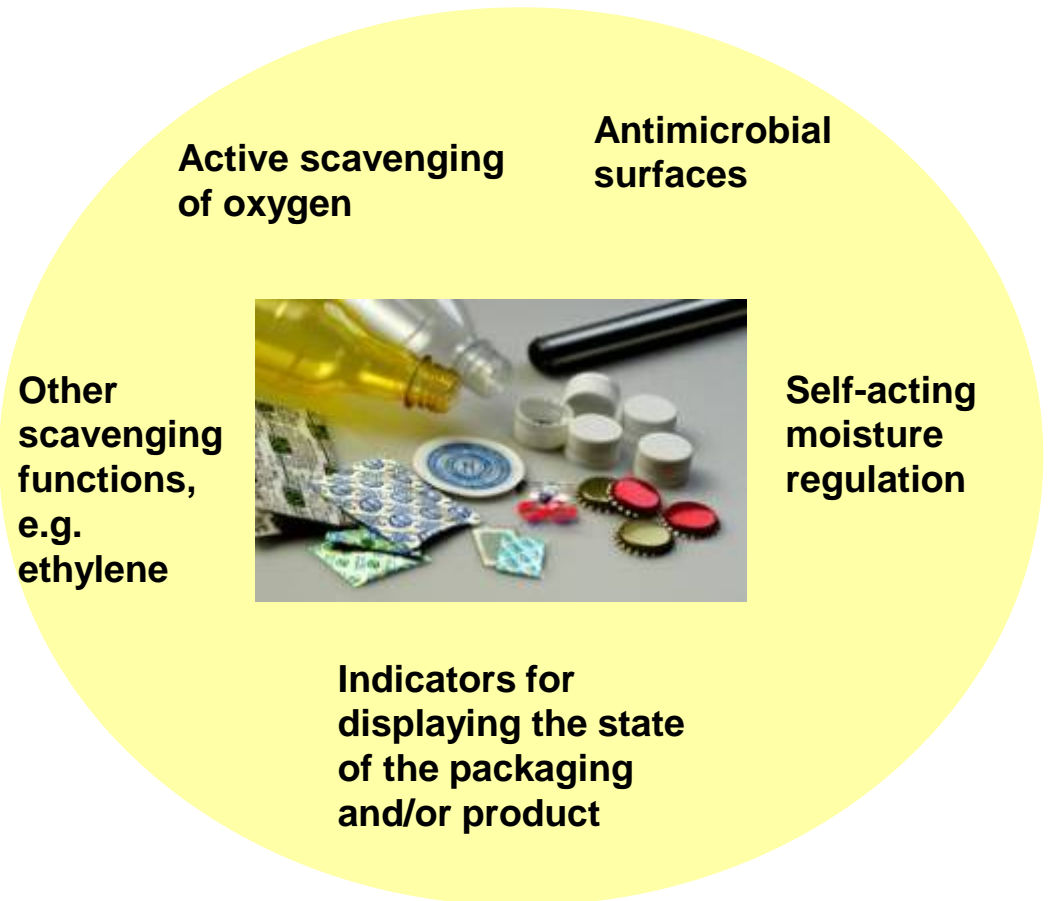
Pre-form and container

Source: Krones AG, Neutraubling

Active and Intelligent Packaging

Benefits:

- Improved protection for the contents
- Transparency for consumers
- More intense competitiveness of food and packaging manufacturers



Types of Application for Oxygen Scavengers



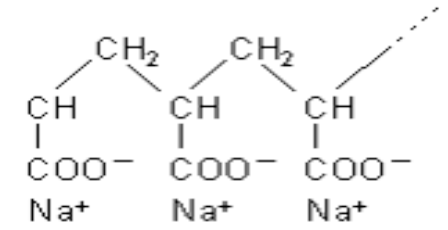
Packaging Containing Moisture Absorber



Absorbent pad



Super Absorbent (SAP)



Quelle: Prof. R. Blume, Universität Bielefeld

Structure of SAP



Devided meat tray



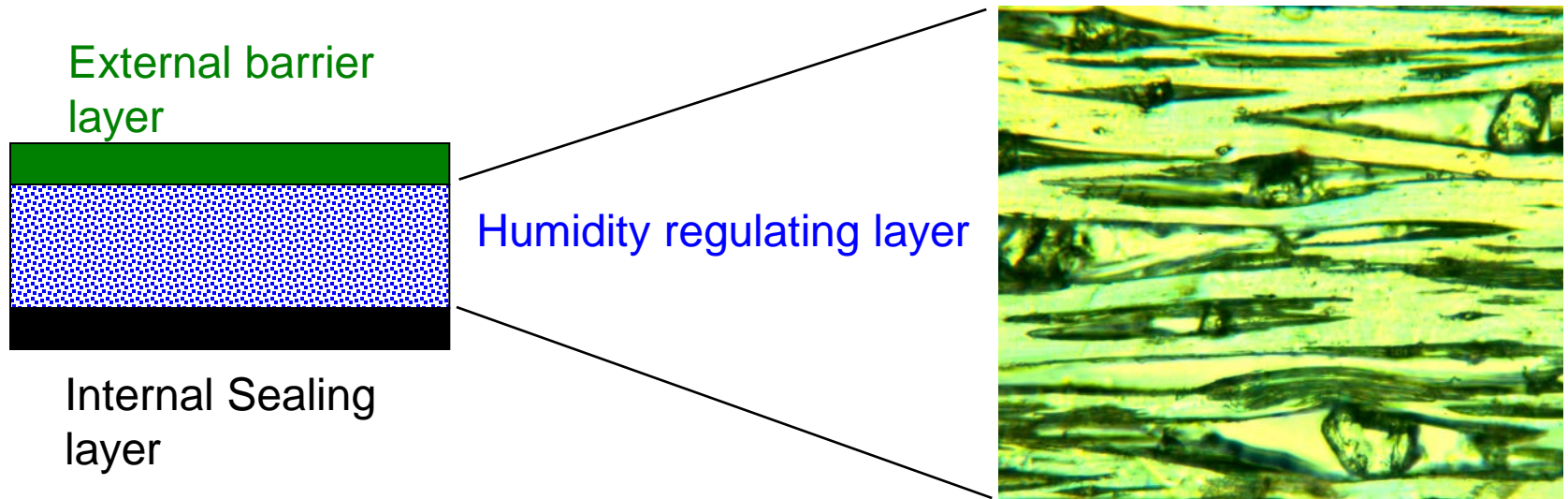
Perforation



Absorber pads, devided trays and SAP bond liquid water, 100% rel. H.
MAP not possible with perforation

➔ **No system available to regulate relative humidity**

Humidity regulating film



Active layer with cavities for salt particles and water

Humidity Regulation

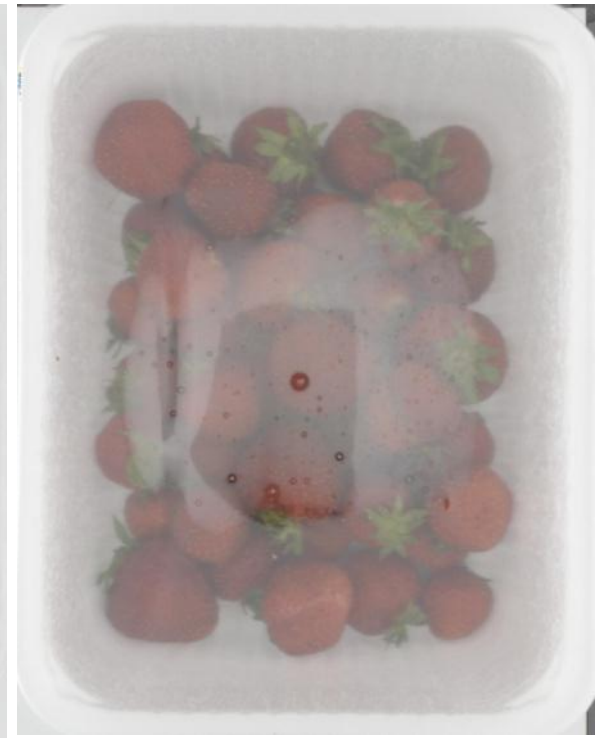
goal: reduction of condensation



Standard tray 5 cm

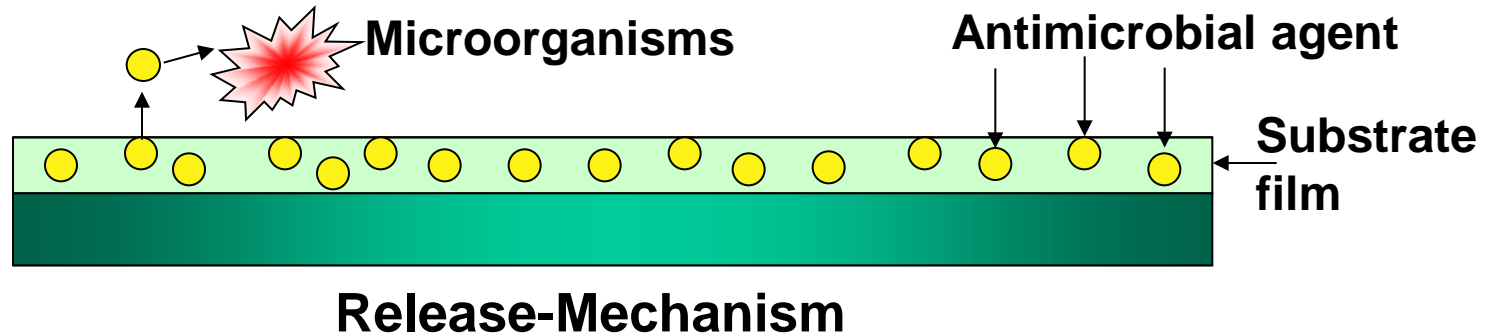


Humidity regulating
tray 5 cm



Humidity regulating tray
9 cm

Antimicrobial Packaging and Surfaces



Objectives:

- Laquer with preserving agents as active ingredients, e.g. benzoic or sorbic acid
- Reduction of preserving content in the food
- Preventing the growth of microorganisms on the surface
- Application for solid and pasty products

Improved Emptying Behaviour of Packaging

survey of products from the German food market showed **residue amounts of up to 20 percent** of the nominal filling volume

main problem: **highly viscous products**, e.g. foods, cosmetics, ...

potential savings per year (Germany)

- 900 mio. €
- 1 mio. GJ primary energy



Example of an „empty“ mustard packaging

Source: F. Loibl, TUM, Nanofair 2008

Improved Emptying Behaviour of Packaging

Limitation:

filling material sticks to surface of packaging materials

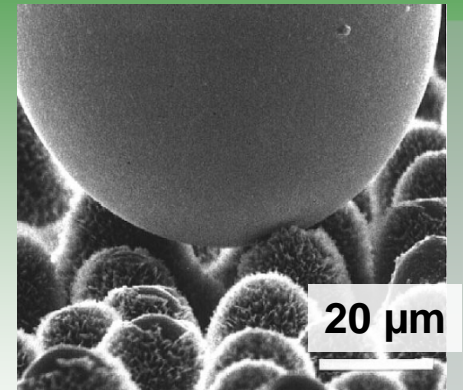
Objectives:

Improvement of emptying behaviour of packaging by coating the surface with plasma-polymerized nano scale layers

Applications:

highly viscous products, e.g. foods, cosmetics, ...

Lotus-Effekt:



W.Barthlott, C.Neinhuis *Planta*
202 (1997) 1-8.

Improved Emptying Behaviour of Packaging

Conclusions

- best emptying performance was observed on surfaces with low polarity and low total surface energy
- differences between hydrophilic and hydrophobic filled goods



Comparison of flow properties without surface coating (left) and with a surface coating (right)

Sustainability aspects of food packaging

Survey for UK, 1995

Indicator: total energy used
per consumer for food
consumption

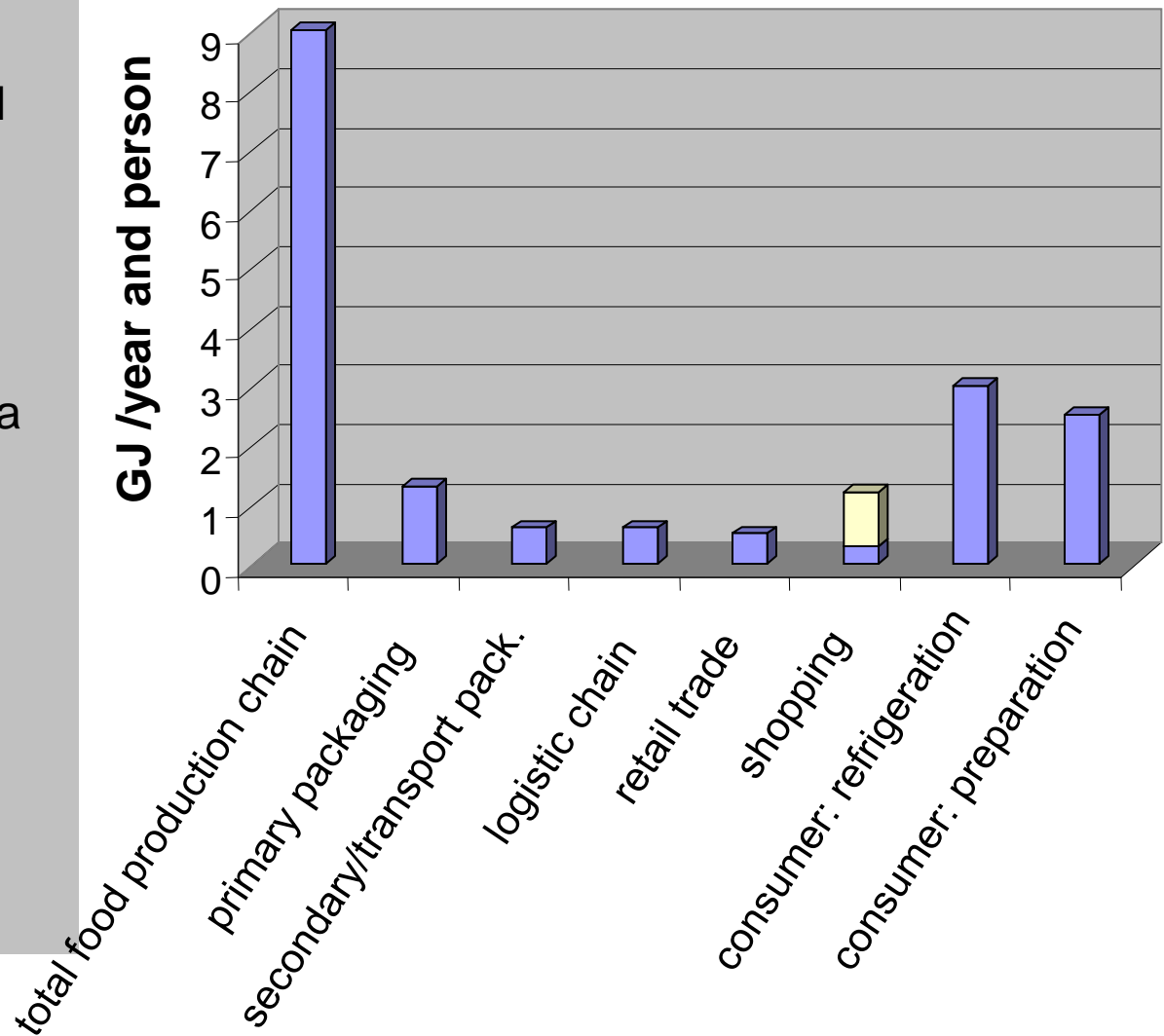
(Source: Kooijman 1996)

Energy equivalent to drive a
typical smaller car over
10000 km:

about 20 GJ

Food losses at the
consumer:

3 ... 40 per cent



Conclusion

The task of packaging in reducing (food) waste

- Less material
- Bio polymers
- Nanotechnology
- Active packaging

and most of all

- **Better protection against deterioration**

Thank You!

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