



# MAP – Packaging materials





Various packaging materials

## Perfect food comes in perfect packaging

Packaging materials are of decisive importance for food quality and shelf-life. Many sophisticated packaging solutions have been developed to prevent rapid deterioration caused by oxygen, light and bacteria or by foreign odour and taste substances that come into contact with the product.

Foodstuff manufacturers have to choose suitable packaging designs and materials while also complying with legal requirements on packaging materials.

For example, they have to examine how to protect the product against quality deterioration from microbial growth, oxidation or dehydration.

Other factors that play a role in the decision include the barrier properties of the packaging against oxygen, light and volatile substances, the water vapour transmission rate, transparency, sealing ability, anti-fogging properties, microwaveability and price.

## Various material properties combined

Packaging materials used with all forms of modified atmospheres (with the exception of fruit and vegetables) should have high barrier characteristics. Polymers used include polyester, polypropylene, polystyrene, polyvinyl chloride, nylon, ethylene vinyl acetate and ethylene vinyl alcohol polymers. These are usually laminated or coextruded with polyethylene, which comes into direct contact with the food and is the heat-sealing medium.

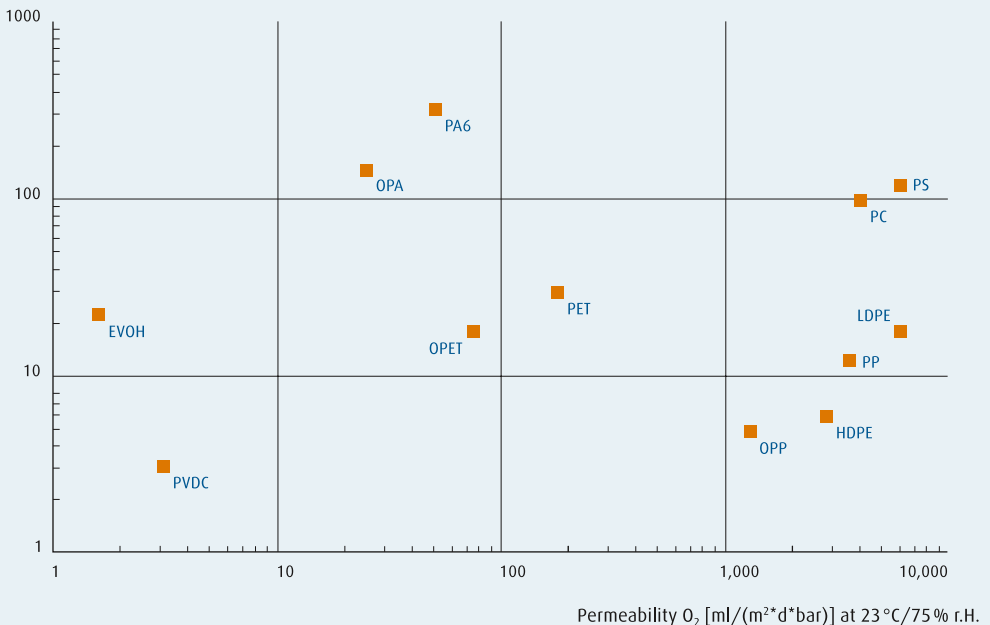
### Permeability ratio

$N_2$	:	$O_2$	:	$CO_2$
1	:	5	:	25

## Permeability of various basic materials

Permeability  $H_2O$   
[g/(m<sup>2</sup>\*d)] at 40 °C/90 % r.H.

Permeability according to film thickness 25 µm



## Primary function of various basic materials

Abbreviation	Basic materials	Primary function
Al	Aluminium	High barrier
APET	Amorphous polyester	Rigidity, gas barrier
CPET	Crystallised polyethylene terephthalate	Rigidity, high temperature resistance, gas barrier
EVA	Ethylene-vinyl acetate	Sealing layers
EVOH	Ethylene-vinyl alcohol	Gas barrier
HDPE	High density polyethylene	Moisture barrier, rigidity, microwave capability, sealing layers
LDPE	Low density polyethylene	Sealing layers
OPA	Oriented polyamide	Gas barrier
OPET	Oriented polyethylene-terephthalate	High temperature resistance, flexibility, puncture resistance
OPP	Oriented polypropylene	Moisture barrier, flexibility, puncture resistance
PA	Polyamide (nylon)	High temperature resistance, flexibility, toughness, partial gas barrier
PAN	Acrylonitrile	Gas barrier
PET	Polyethylene terephthalate (polyester)	Rigidity, partial gas barrier
PP	Polypropylene	Moisture barrier, rigidity, microwave capability
PS	Polystyrene	Rigidity
PVC	Polyvinyl chloride	Rigidity, gas barrier
PvDC	Polyvinylidene chloride	Moisture barrier, gas barrier

Research focuses on developing materials that can be produced and disposed of in an environmentally friendly way, as well as on optimising the packaging material, so that the amount of material is minimised. One development is the use of foamed materials in trays for more attractive presentation. Another development is the use of re-sealable packets for sliced ham, cheese and similar products. The table above shows a list of some typical materials used for product packaging. The exact composition of the film is adapted to the individual product and to the type of package required. To ensure that a modified atmosphere will be retained during the lifetime of the package, several different plastic materials are often combined into a multilayered structure,

each layer having its own function. Different plastic materials can therefore be chosen and combined to achieve:

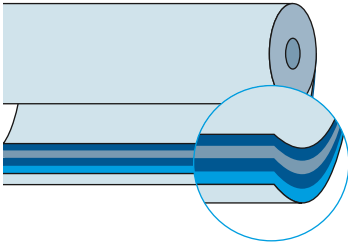
- mechanical strength
- water vapour barriers to prevent weight loss and dehydration
- gas barrier
- gas permeability
- anti-fogging properties (the inside of the material should have a surface that does not allow the formation of water droplets, which reduce transparency)
- sealing properties, i.e. capable of sealing into a tight package while retaining material properties even along the package seal.

## Examples of materials used with certain food products

Food	Material Bottom	Top
Red meat, processed meat, poultry, fresh fish	OPET/PE/EVOH/PE XPP/EVOH/PE EPS/EVOH/PE (XPP and EPS are injection-moulded materials)	OPP/PE/EVOH/PE OPET/PE/EVOH/PE OPA/PE
Sausages	PA/PE	
Pizza, pasta, cheese	OPA/PE	PA/PE
Dry products, coffee, milk powder	Metalised PET/PE	
Chopped lettuce leaves	OPP PS/PE	OPA/PE

### Typical multi-film structure

■ PE    ■ EVOH    ■ OPET



Packaging of salad with flow-pack machine

# Getting ahead through innovation

Our innovative concepts ensure that we play a pioneering role in the global market. As a leading technology company, our task is to constantly raise the bar. Traditionally driven by entrepreneurship, we are focused on developing new, high-quality products and innovative processes

Linde offers more. We create value, clear competitive advantages and greater profitability. Each concept is tailored specifically to meeting our customers' requirements – offering standardised as well as customised solutions. This applies to all industries and all companies regardless of their size.

Linde – Making our world more productive

## Linde Gas

[www.linde-gas.dk](http://www.linde-gas.dk)  
[www.linde-gas.lt](http://www.linde-gas.lt)

[www.linde-gas.ee](http://www.linde-gas.ee)  
[www.linde-gas.lv](http://www.linde-gas.lv)

[www.linde-gas.fi](http://www.linde-gas.fi)  
[www.linde-gas.no](http://www.linde-gas.no)

[www.linde-gas.is](http://www.linde-gas.is)  
[www.linde-gas.se](http://www.linde-gas.se)