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What drives food packaging innovation?

CIBUS TEC_FOOD PACK 2014
Parma, 28th October 2014

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chemicals

chemicals and polymers production,
sales & marketing



5,700
employees



13
plants



335
patents



325
researchers



5.9 €/bln
turnover



3.8 m/ton
production to sales



2.0 €/bln
2014-17 investments



business overview

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Turnover: € 5,9 bln – production: 5,8 m ton
Production to sale: 3,8 m ton

Monomers and Intermediates







Olefins	Aromatics	Derivatives
---------	-----------	-------------

- | | | |
|---|--|---|
| <ul style="list-style-type: none"> Ethylene Propylene Butadiene Raffinate 1 Carbon Black Feedstock | <ul style="list-style-type: none"> Toluene o-m-p-Xylene Pseudocumene DCPD Benzene | <ul style="list-style-type: none"> Phenol Acetone Alphamethylstyrene Cyclohexanone/Ka-Oil EB/Styrene |
|---|--|---|

Polymers

Polyethylene	Styrenics	Elastomers
--------------	-----------	------------

- | | | |
|---|---|---|
| <ul style="list-style-type: none"> LDPE LLDPE VLDPE HDPE EVA | <ul style="list-style-type: none"> GPPS HIPS EPS SAN ABS | <ul style="list-style-type: none"> e-SBR s-SBR BR TPR EP(D)M NBR Latex |
|---|---|---|

sales	€ 2,7 bln			€ 1,4 bln	€ 0,8 bln	€ 0,7 bln
volumes	2290 k/ton	630 K/ton	1040 K/ton	1060 k/ton	460 K/ton	370 K/ton
capacities and market position	Leading player			6 nd in EU	3 rd in EU	2 st in EU
end markets						

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the polyethylene business

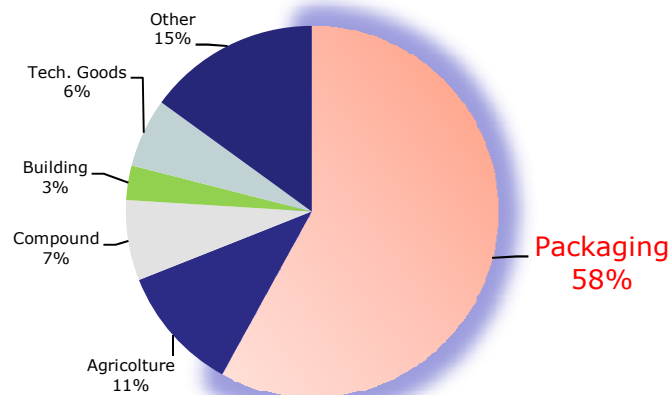
Turnover

€ 1,4 bln

Plants

- Brindisi
- Ferrara
- Ragusa
- Dunkerque (F)
- Oberhausen (D)

Applications



2nd EVA producer in Europe

versalis prides itself for a significant share within the polyethylene market

EVA are high-value niche products

Brands:

Greenflex®

- Ethylene - Vinyl Acetate copolymer (EVA)

Riblene®

- Low Density Polyethylene

Flexirene®

- Linear low density Polyethylene

Clearflex®

- Linear low density Polyethylene

Eraclene®

- High density Polyethylene



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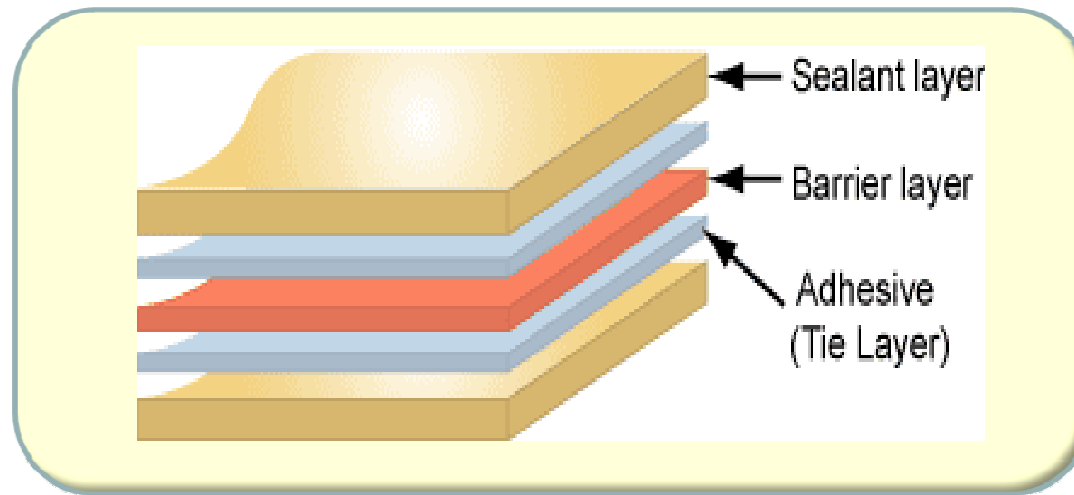


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why choose a multilayer packaging film?



- ❑ Production of a film better suited to the final application
- ❑ Getting the best properties of a given polymer
- ❑ Use of each component in the best way, without compromising the main components properties (synergistic effect)



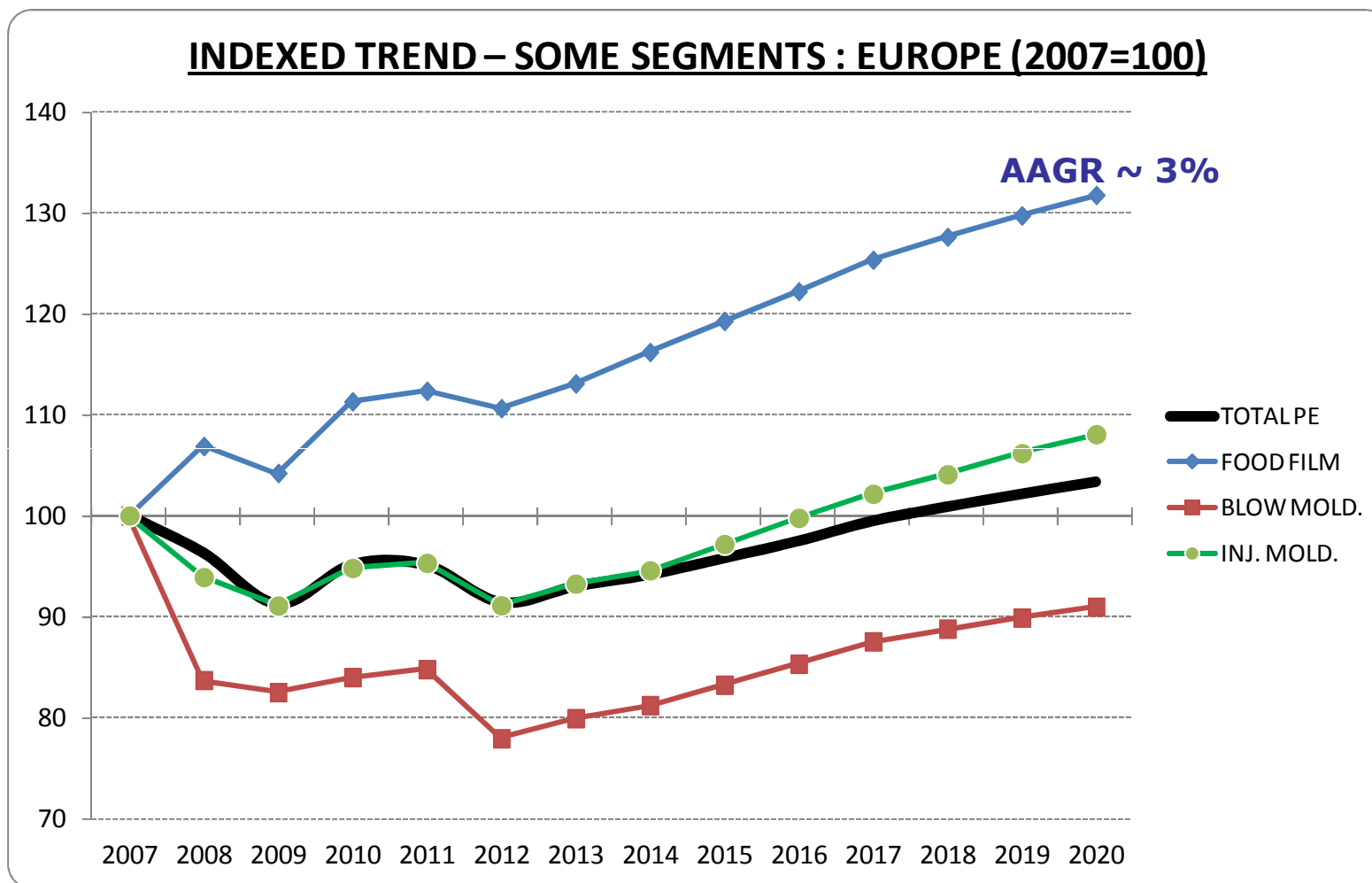
General structure of a multilayer film – courtesy of specialchem



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food packaging film: european market growth



source: internal marketing data

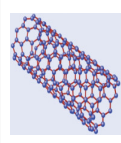


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flexible packaging: our success stories

Adding value in the food supply chain through **the development of partnership** between the **packaging industry** and **the packaging users** seems to be the credo for the new millenium



Advanced polymer **nano-composites**



Smart packaging for consumer goods



Plastomers for sealant layer in flexible packaging



m-LLDPE for flexible packaging

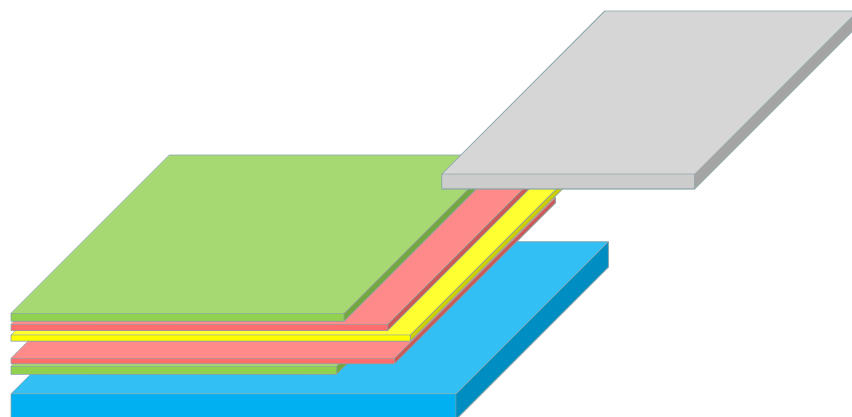
+ innovation + performance + added value →



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food packaging film: sealant layer



— Sealant layer

Key properties

- outstanding **sealability**
- high **mechanical** properties



**Clearflex® FGH B0: an advanced Z-N VLDPE
made by proprietary catalyst and technology**

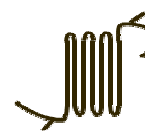
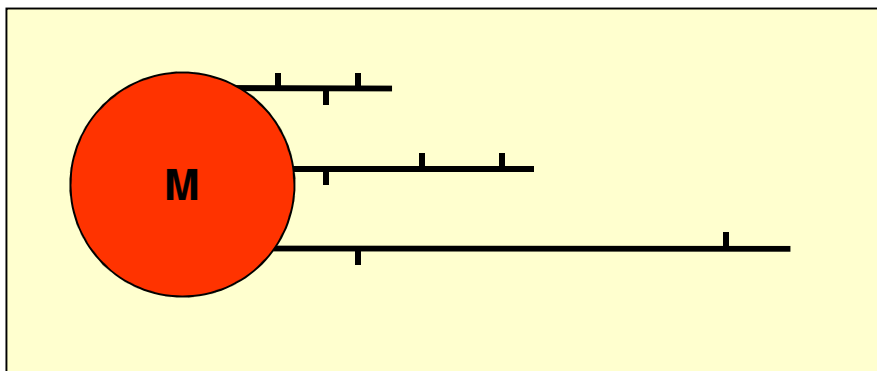


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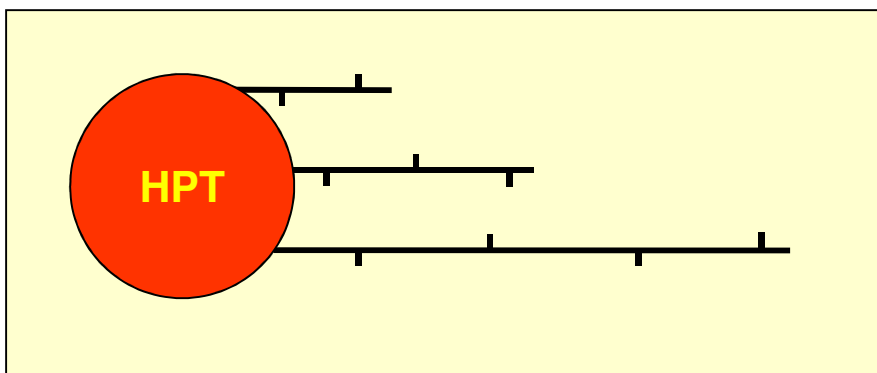
HPT catalyst

Standard
Z-N

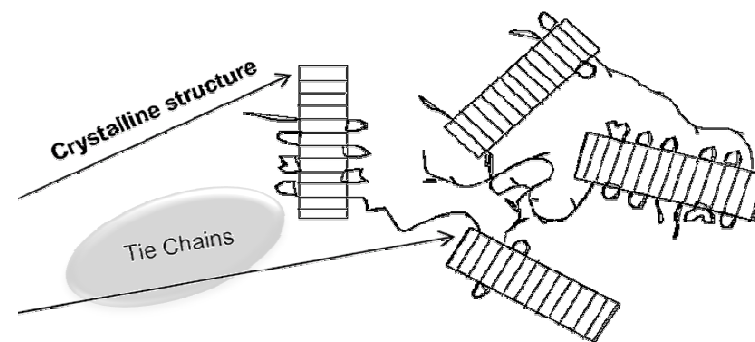


- A. Not homogeneous comonomer distribution**
- B. Not regular size crystals**

New Catalyst
HPT Z-N



- A. Homogeneous comonomer distribution**
- B. Regular size crystals**

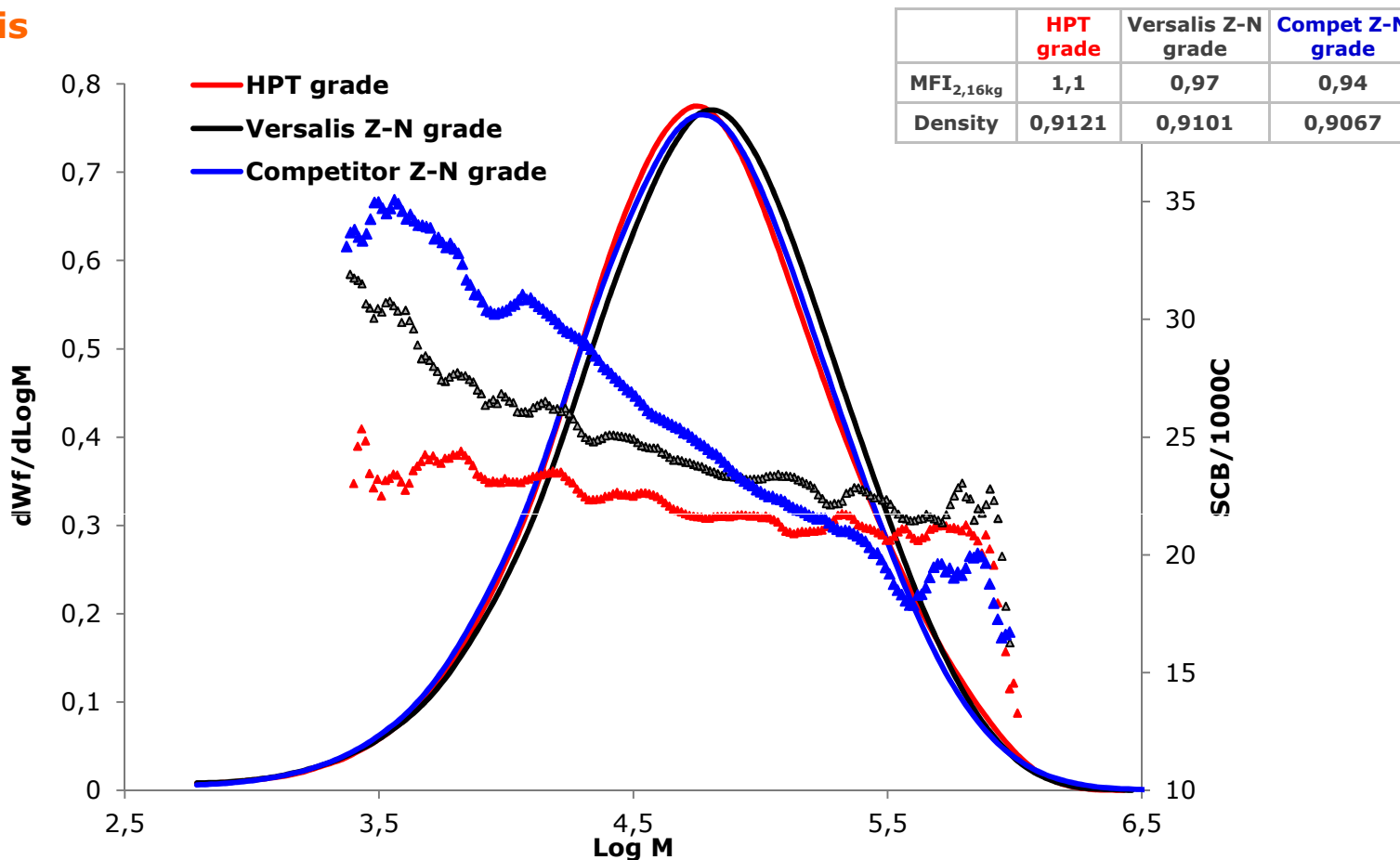


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Clearflex FGH B0 vs std and competitor grades

GPC Analysis



	HPT grade	Versalis Z-N grade	Compet Z-N grade
MFI _{2,16kg}	1,1	0,97	0,94
Density	0,9121	0,9101	0,9067

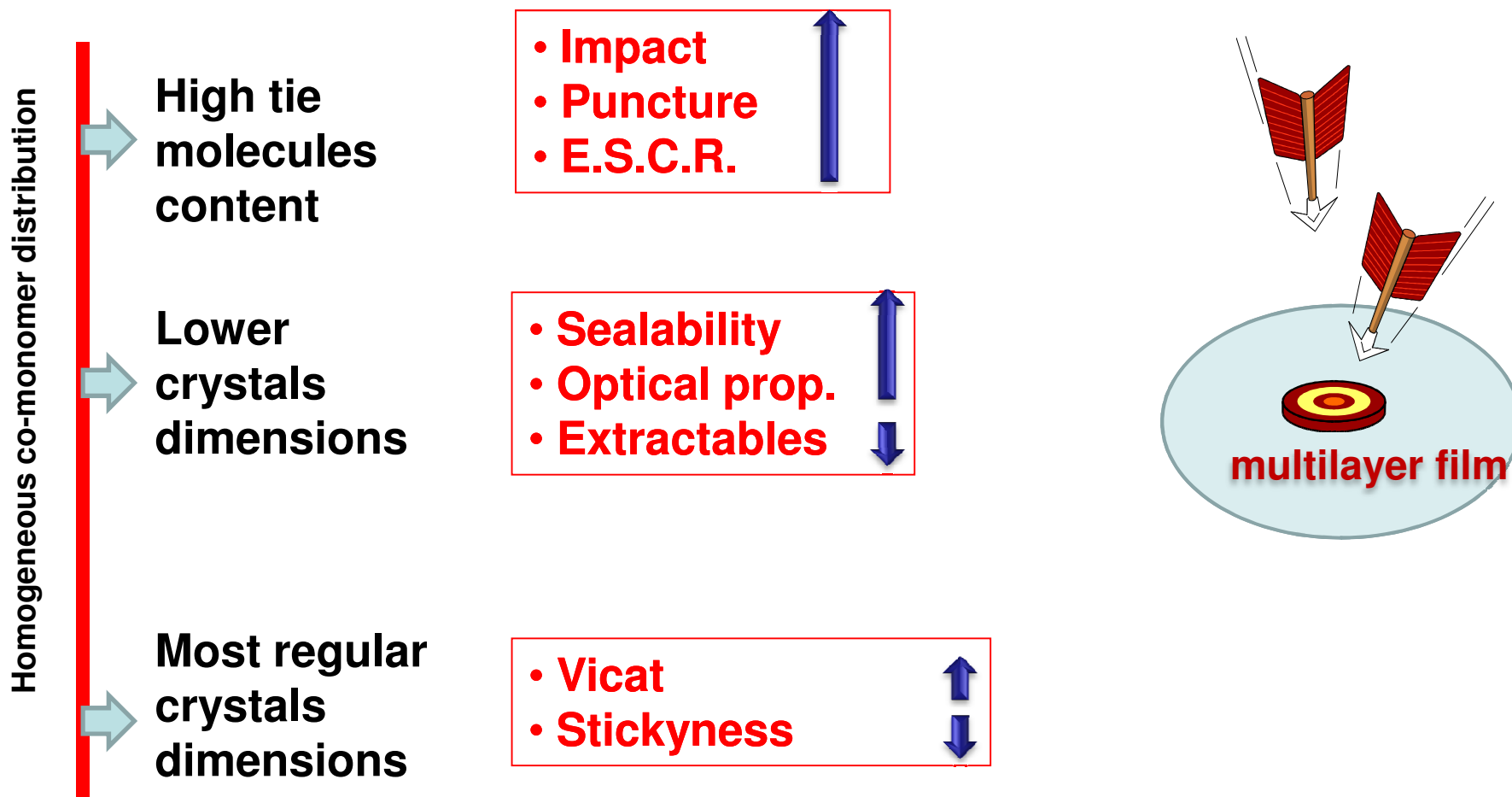
	HPT grade	Versalis Z-N grade	Competitor Z-N grade
Mn	23500	24100	23200
Mw	111600	114300	110100
Mw/Mn	4,7	4,7	4,7
CH3/1000C	23,2	25,4	26,5



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... what does it bring?

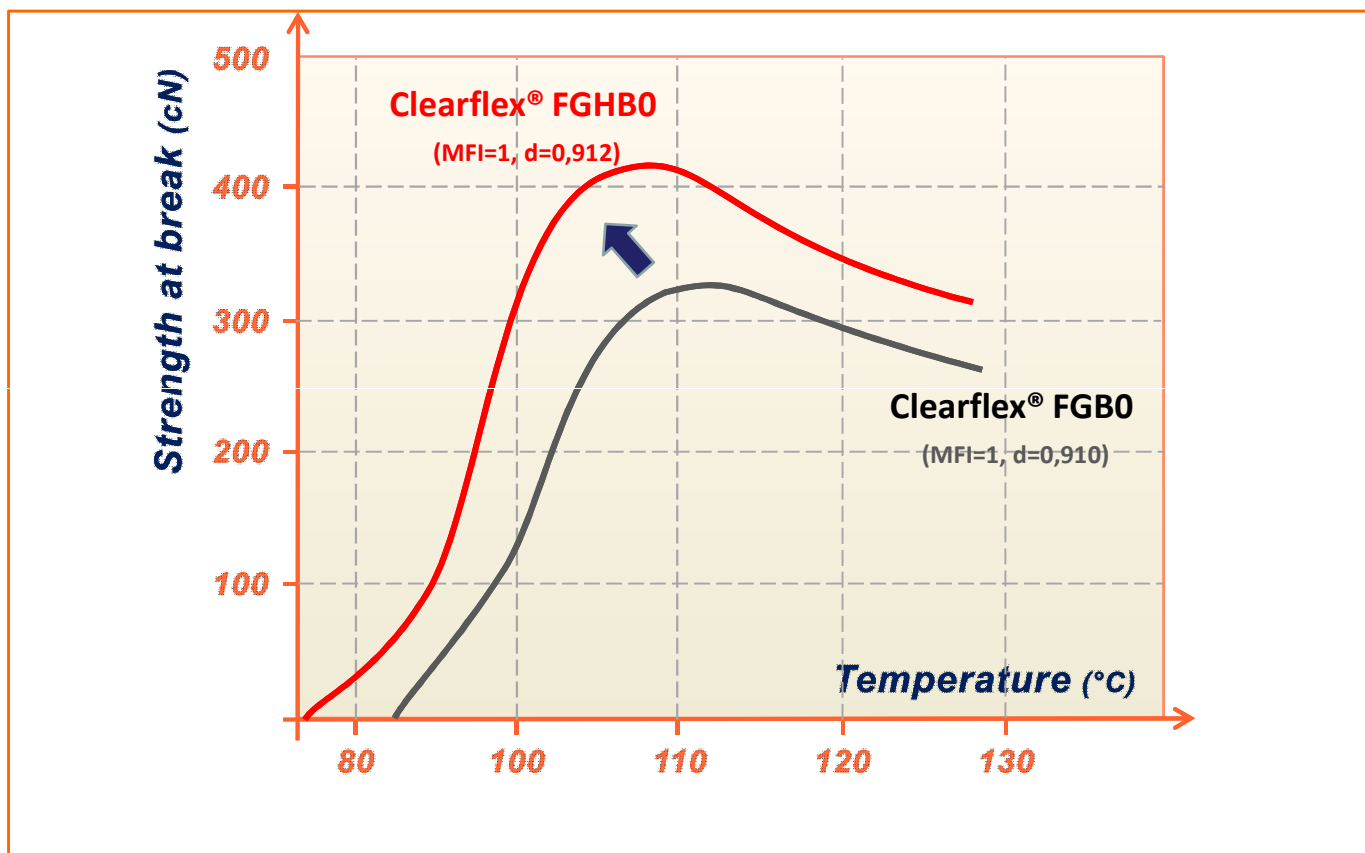


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Clearflex FGH B0 vs std grade

Hot-tack test



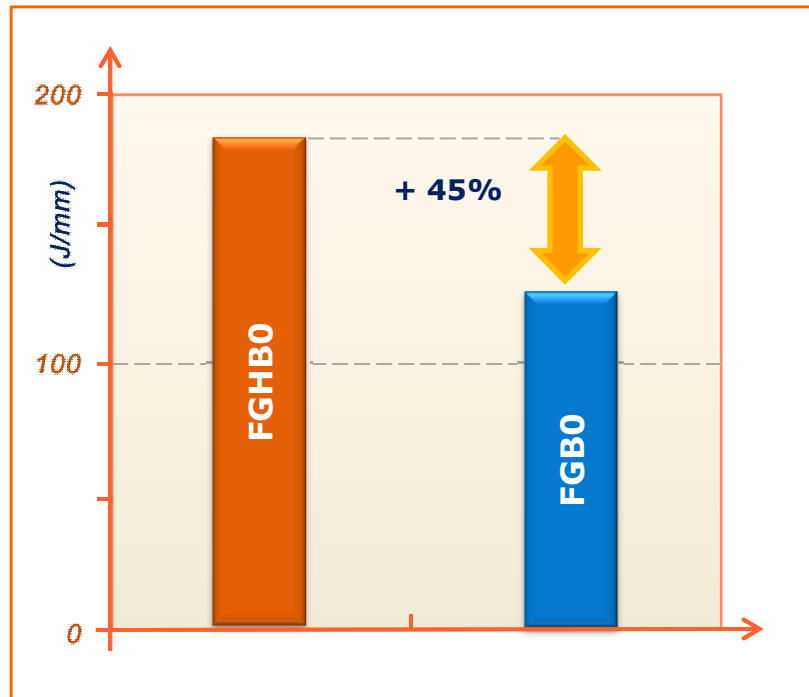
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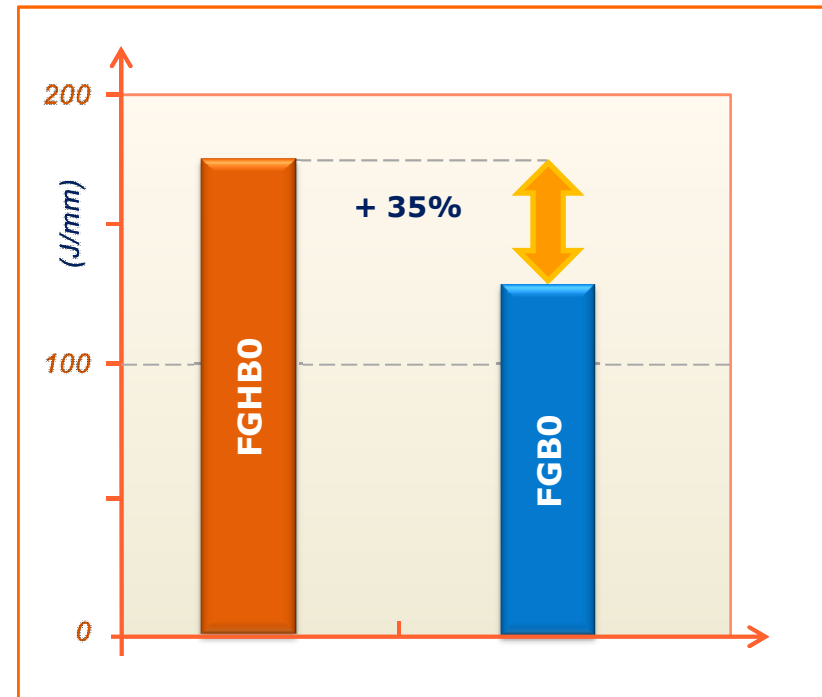
mechanical performances vs std grade

what a better comonomer distribution is able to give

Puncture resistance



Dart resistance

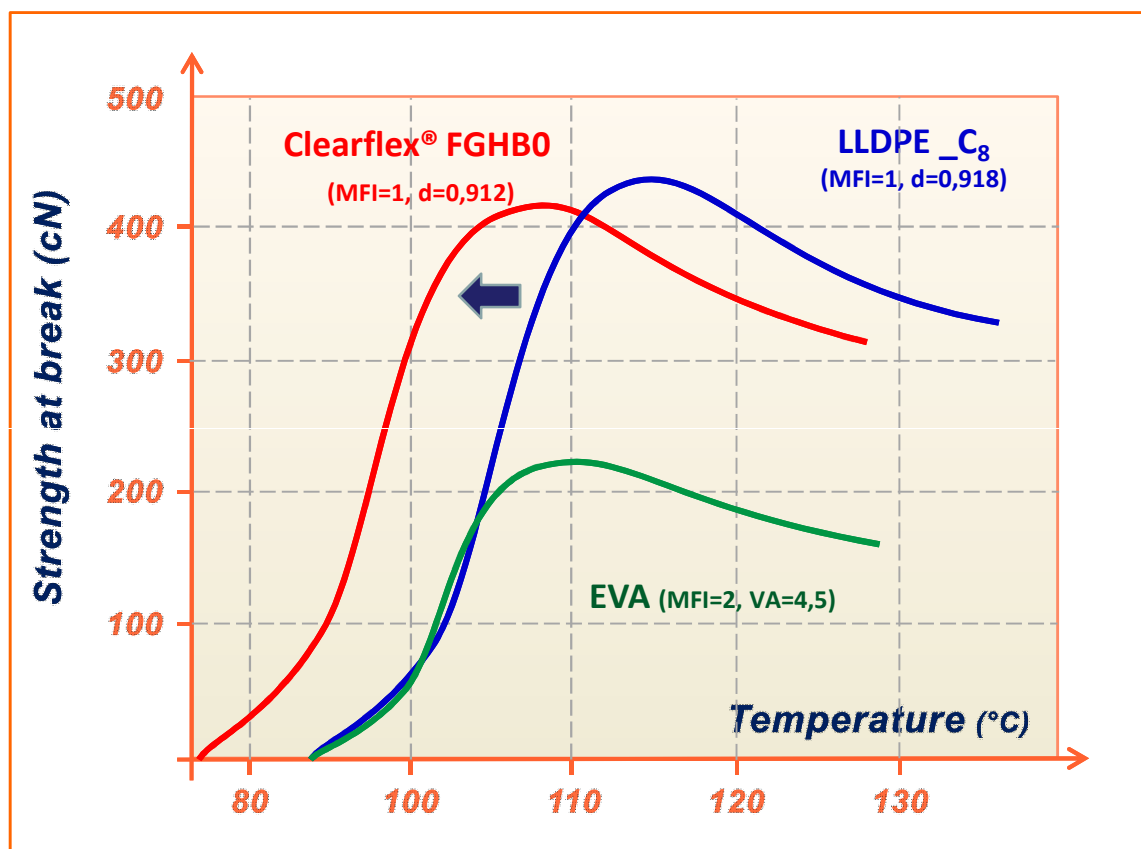


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Clearflex FGH B0 vs competitor grades

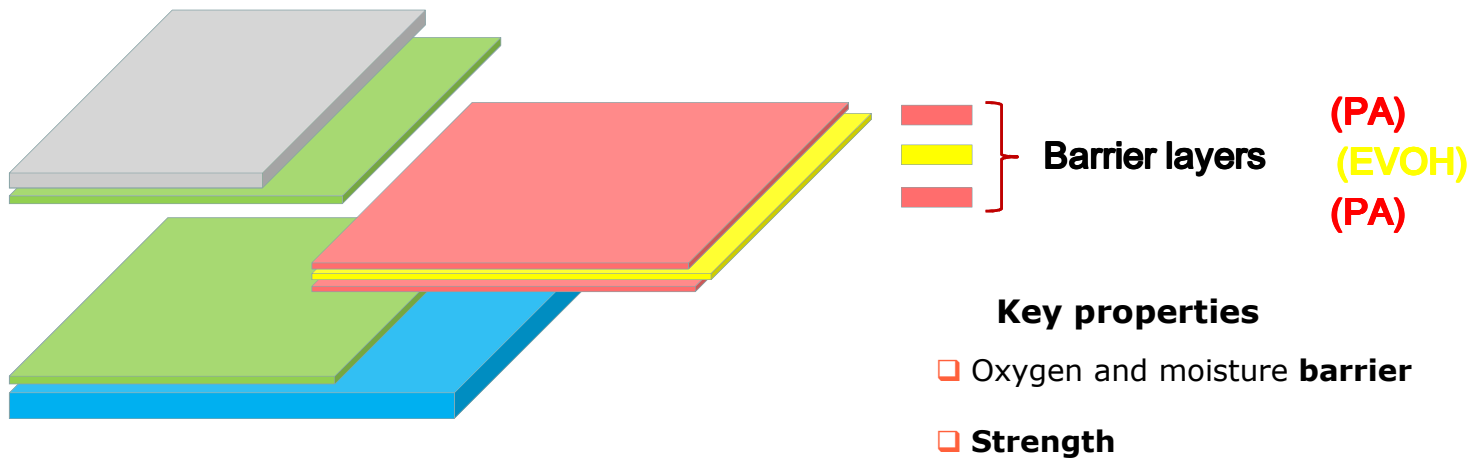
Hot-tack test



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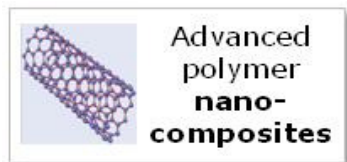
food packaging film: barrier layers



Work in progress



- **Smart packaging** obtained by functional additives in PE



- **Nanocomposites** obtained by dispersion of nanoparticles in PE



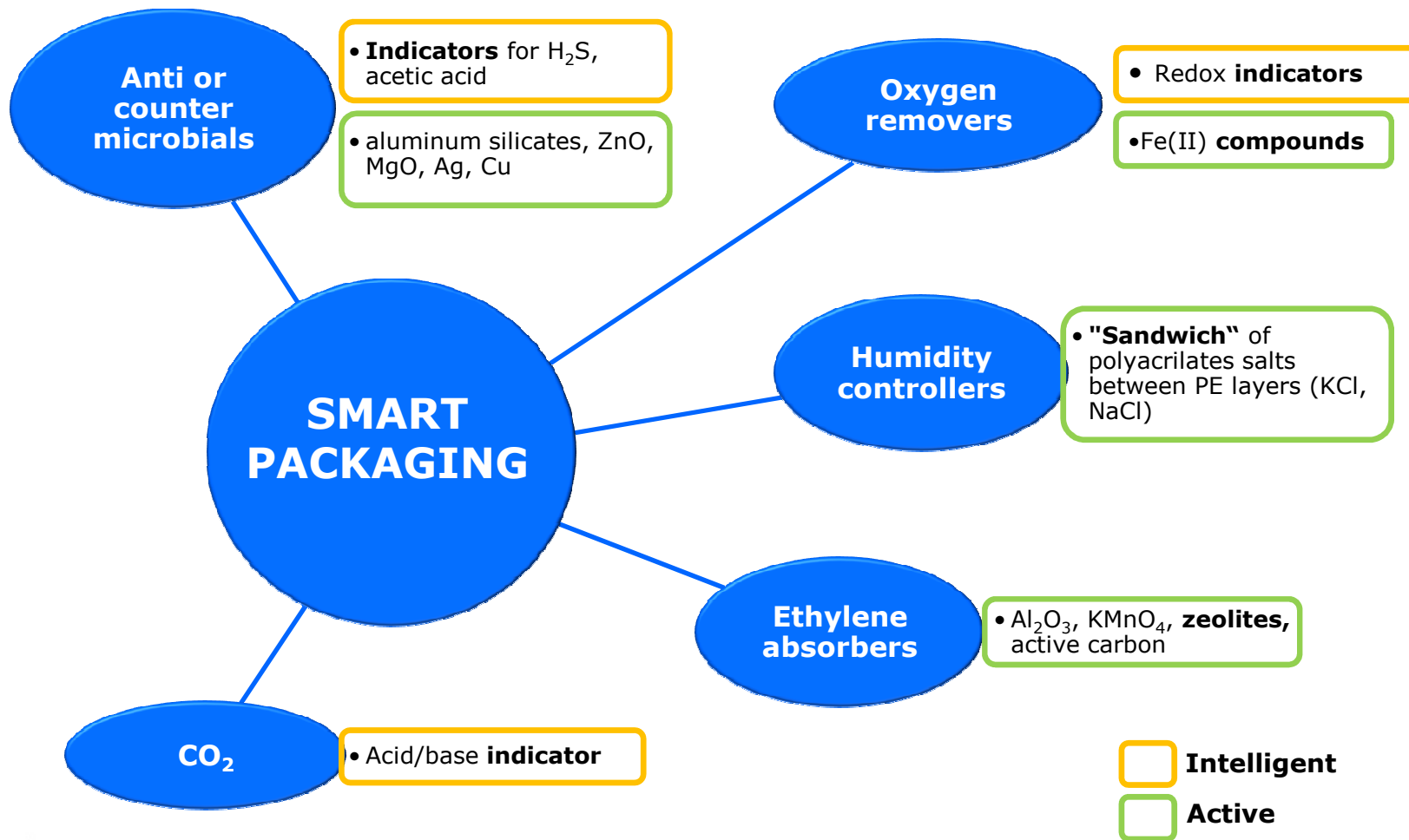
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food packaging film: smart packaging



SMART PACKAGING ADDITIVES

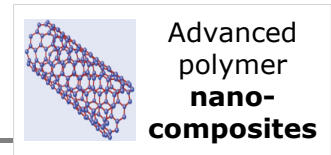


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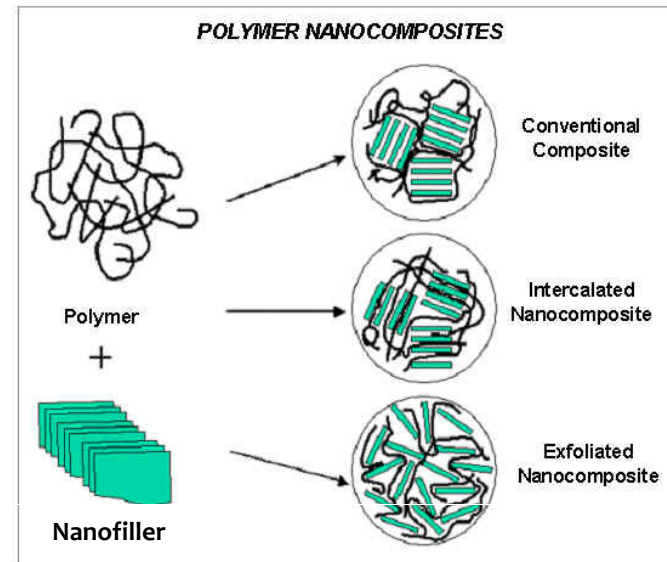
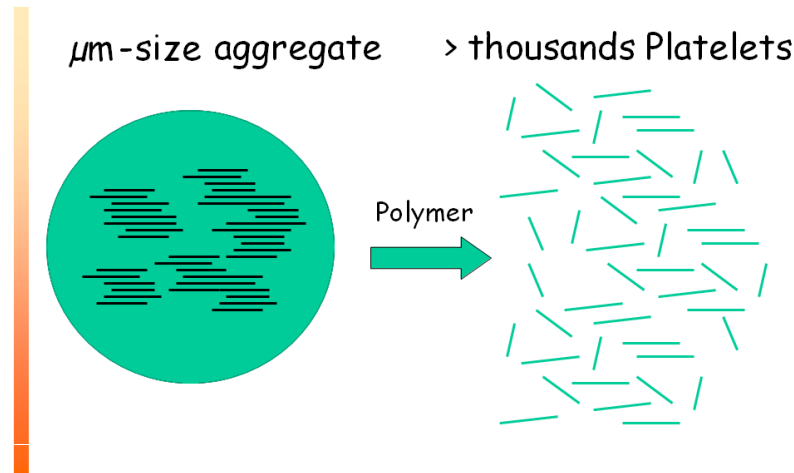
Intelligent
Active

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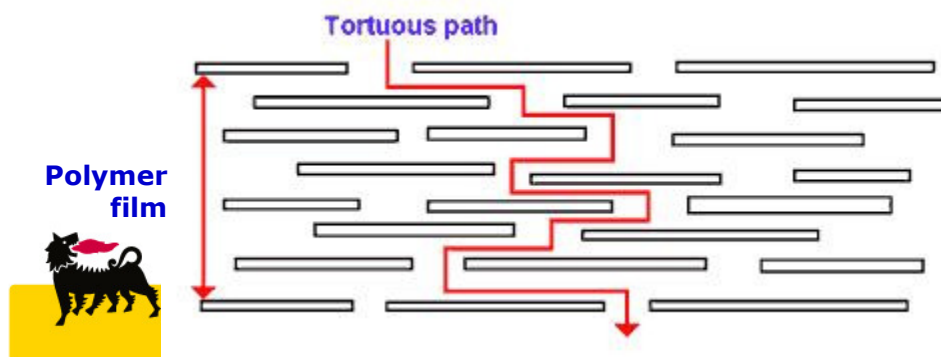
food packaging film: nanocomposites



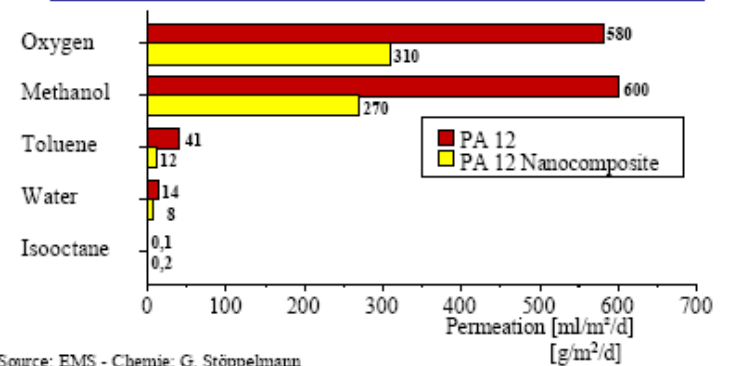
NANOCOMPOSITES



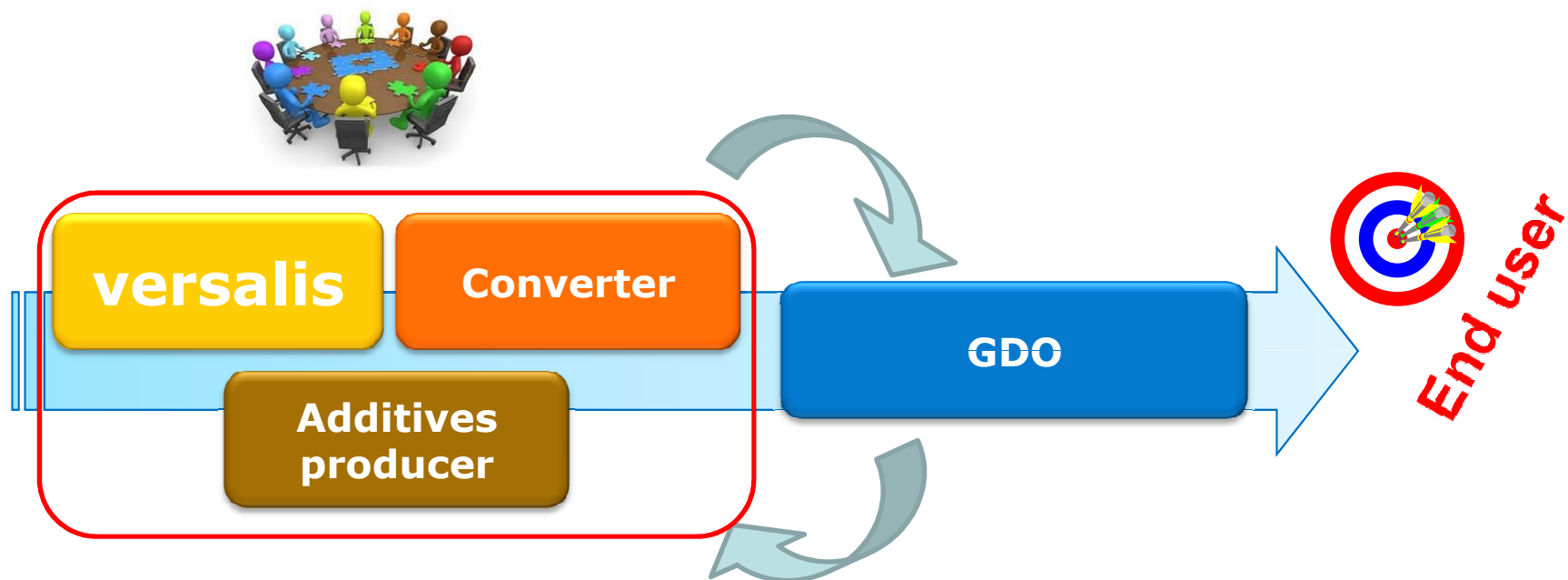
The **KEY POINT** is to additivate polyethylene with nanoparticles to improve barrier properties enhancing also mechanical, optical, thermal or electrical properties



Permeation of different gases by Polyamide 12



partnership to built value along the whole supply chain



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Thank You For Your Attention!

michele.ficili@versalis.eni.com

maria.angelini@versalis.eni.com



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versalis the new face of chemicals



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versalis chemistry to evolve

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