Technical Training – Thermoplastics

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We supply material for good ideas

Thermoplastic Materials

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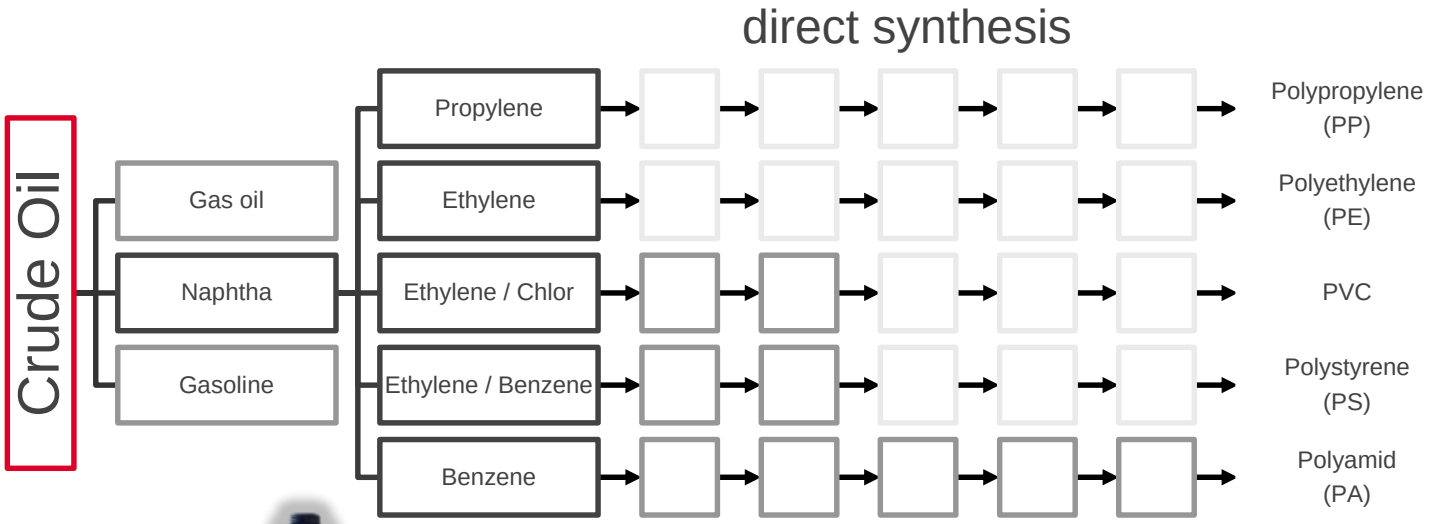
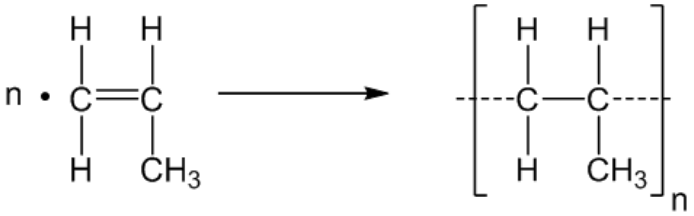
From Raw Material to Plastic

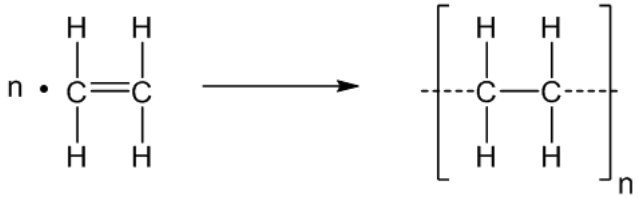


Thermoplastic Materials

Polypropylen (PP)

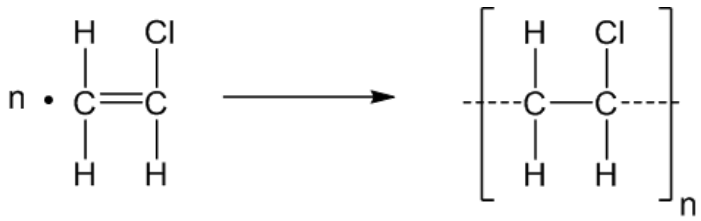


Polyethylen (PE)

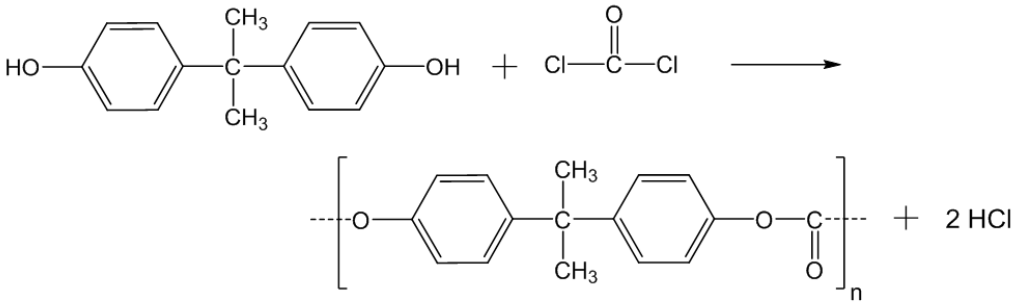


Thermoplastic Materials

Polyvinylchlorid (PVC)

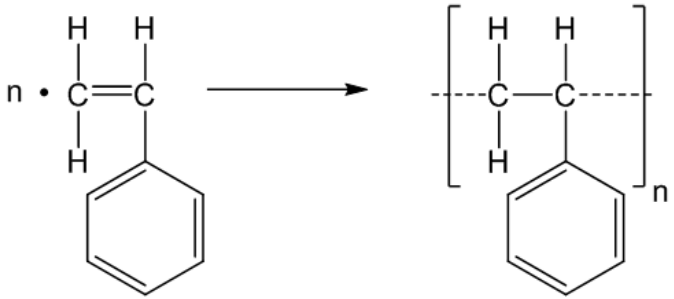


Polycarbonat (PC)

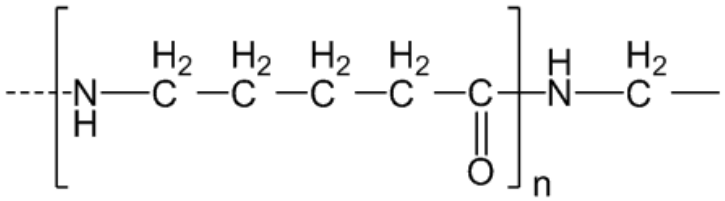


Thermoplastic Materials

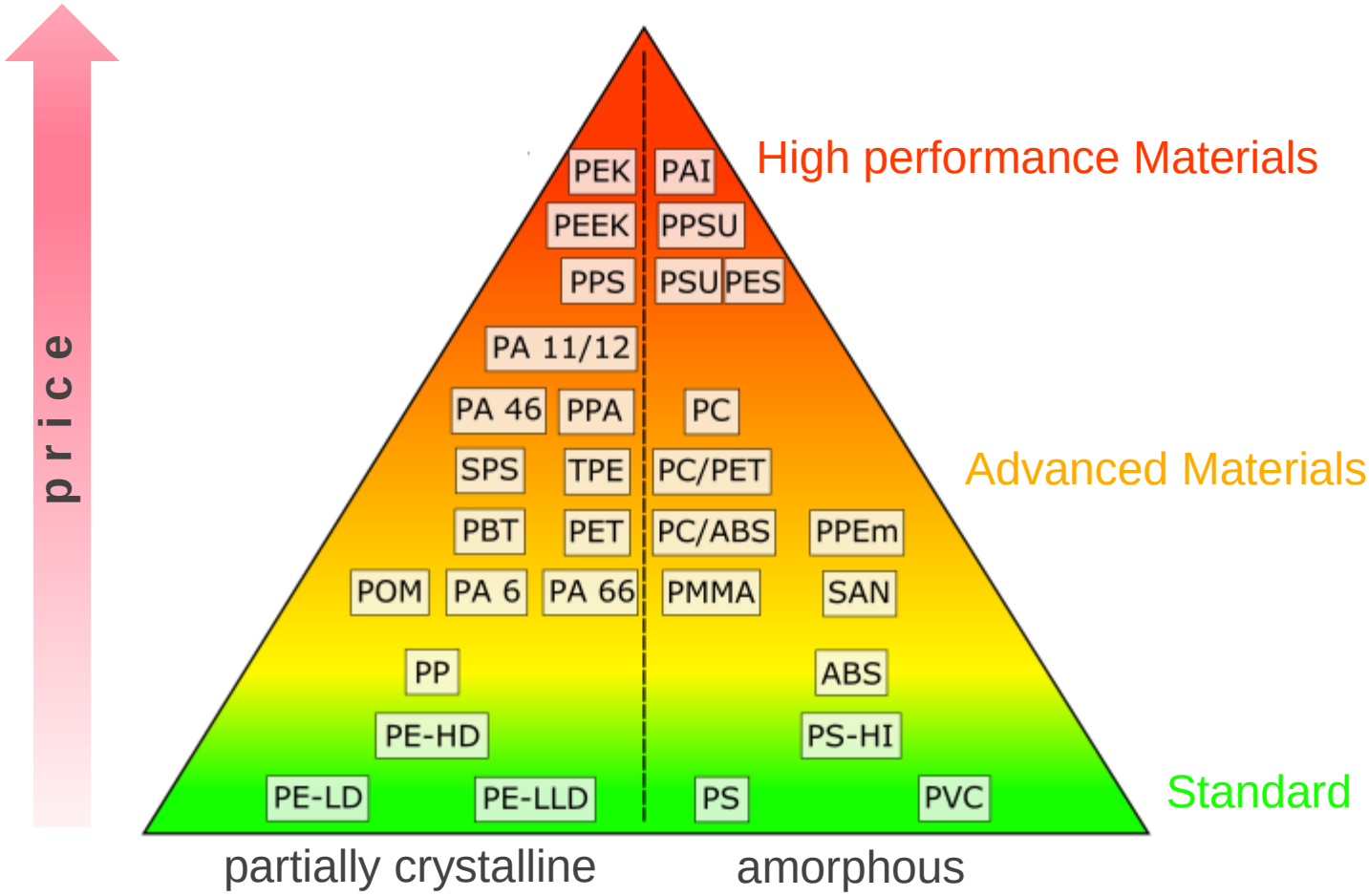
Polystyrol (PS)



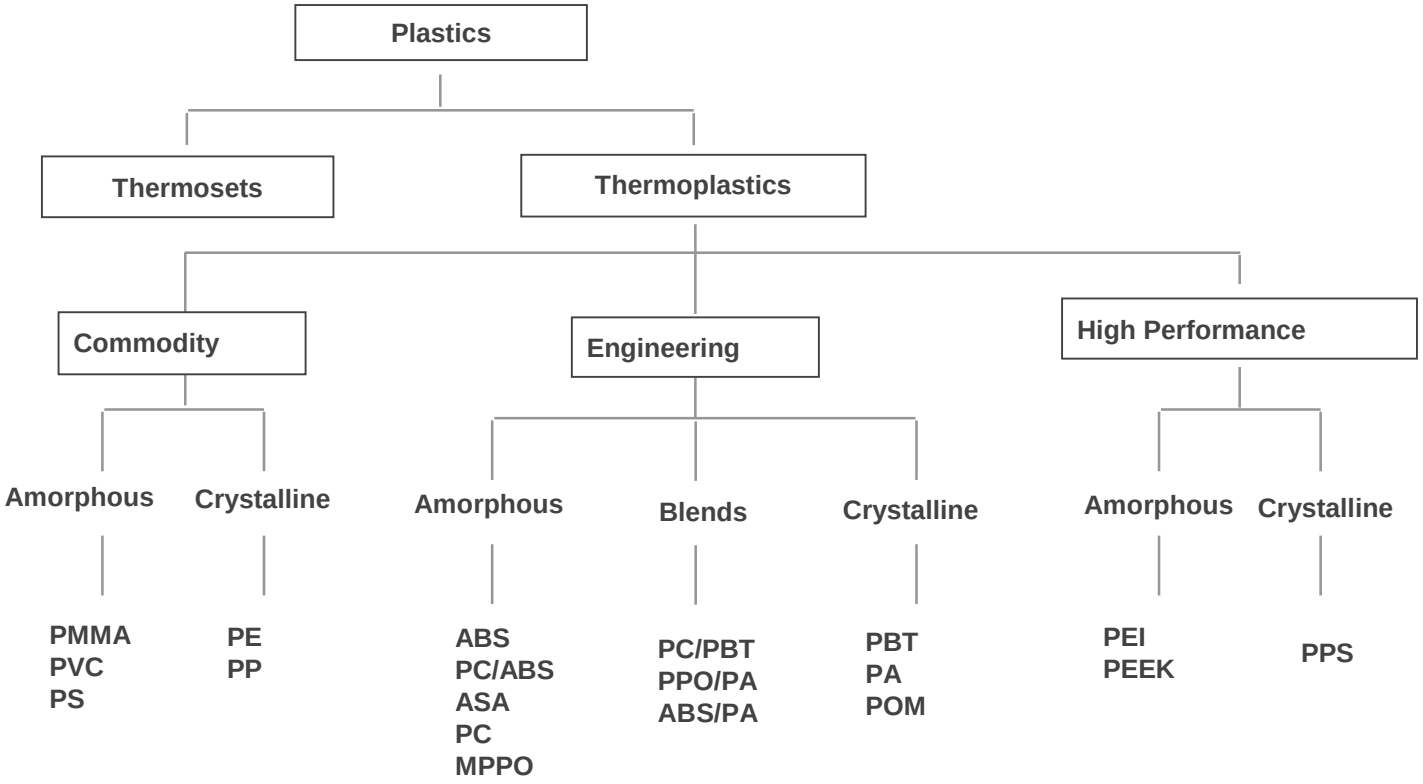
Polyamid (PA6, PA66)



Thermoplastic Materials



Thermoplastic Materials



Thermoplastic Materials

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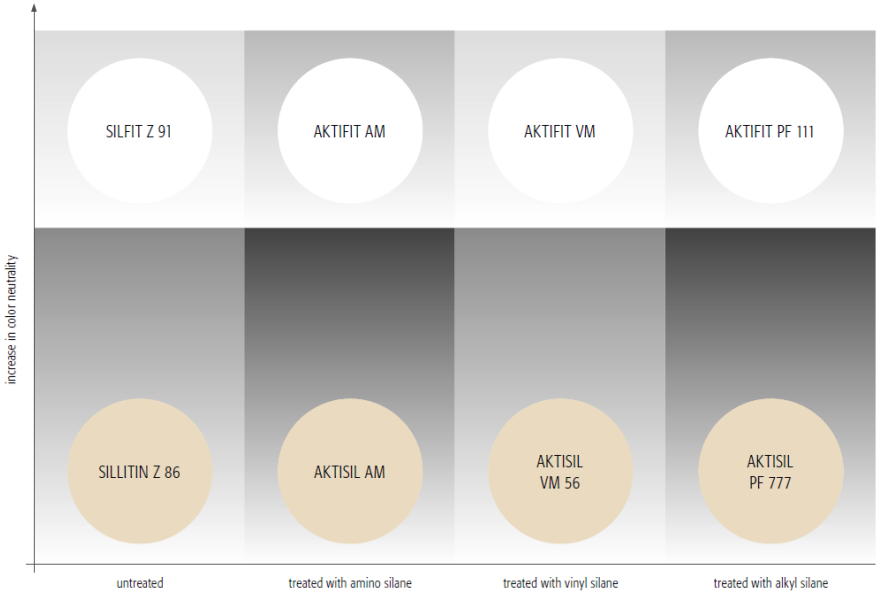
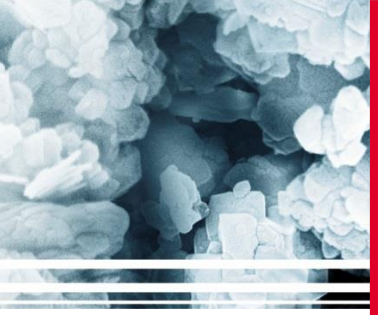
After calcination the Iron is not bound anymore in a Oxide-, but Spinell-structure in CNSE.

Result:
no brown color of the end-compound!



- SILLITIN and AKTISIL work in thermoplastics with low melting point, e. g., **PE: 115 - 130 °C** melting point (Greenhouse films)
- SILFIT and AKTIFIT also work perfectly in thermoplastics with higher melting point, e. g., **PP: 170 °C** melting point (Automotive parts)
- **NO COLOR DISPLACEMENT!**



CNSE in Thermoplastics

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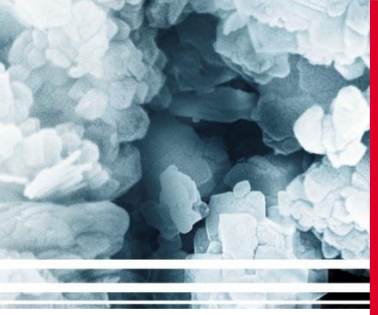
FILLER-RELATED ADVANTAGES

- low moisture content, low moisture absorption
- high fineness
- excellent dispersion properties
- very low sieve residue
- high brightness and color neutrality
- high hardness
- temperature resistance
- polymer-specific adaptation via silanization

EFFECTS IN PLASTICS

- low warpage
- high melt flowability
- high surface quality
- medium increase in modulus/rigidity
- very good scratch resistance
- high impact strength
- high ultimate elongation
- supports pigment dispersion (spacer effect), potential pigment savings
- low (soluble) iron content

➢ improved weathering stability



CNSE in Thermoplastics

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POLYMER/ APPLICATION	RECOMMENDED PRODUCT	ALTERNATIVE PRODUCT RECOMMENDATION	REMARKS	FLOWABILITY	ULTIMATE ELONGATION	IMPACT STRENGTH	SCRATCH RESISTANCE	TENSILE STRENGTH	FLEXURAL STRENGTH	NO CROSSLINKING
PA (polyamide)	AKTIFIT AM	SILFIT Z 91		•	•	•	•			
PBT (polybutylene terephthalate)	AKTIFIT VM	AKTIFIT Q			•	•	•			
PC (polycarbonate)	AKTIFIT VM	AKTIFIT PF 111	AKTIFIT VM and AKTIFIT PF 111 also for higher filler levels without any significant polymer degradation		•	•	•			
PP (polypropylene)	AKTIFIT AM, AKTIFIT AM + MAH-MODIFIED POLYMER	SILFIT Z 91, MAH-modified polymer, AKTIFIT PF 111	AKTIFIT PF 111 primarily for homopolymers for high ultimate elongation and impact strength with good flowability		•	•	•			
PK (aliphatic polyketone)	AKTIFIT AM	development product	development product available with better properties than AKTIFIT AM: brighter color (light gray/beige); sampling possible at any time	•	•	•	•		•	•
PPS (polyphenylene sulfide)	AKTIFIT AM	development product	development product available with better properties than AKTIFIT AM: brighter and white color, higher stiffness and flexural strength; sampling possible at any time	•		•		•	•	
other polymers	AKTIFIT AM, AKTIFIT VM, AKTIFIT PF 11 AKTIFIT Q		depending on the polymer for optimal interaction and other requirements	•	•	•	•	•	•	

Applications

Thermoplastic Molded Parts

Masterbatch Compounds

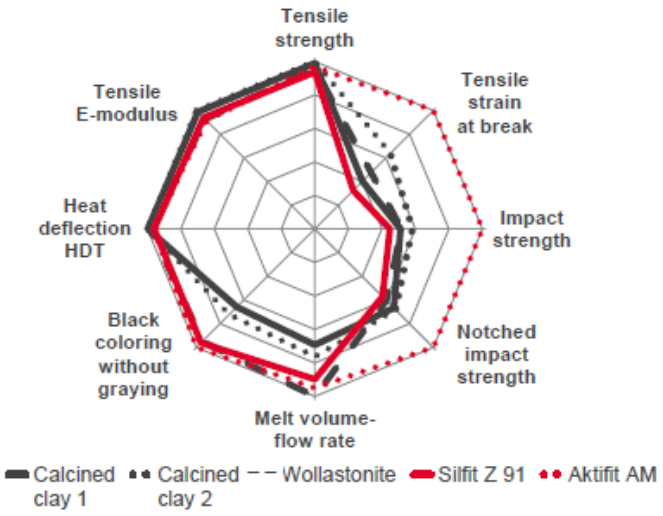
Thermoplastics TPE

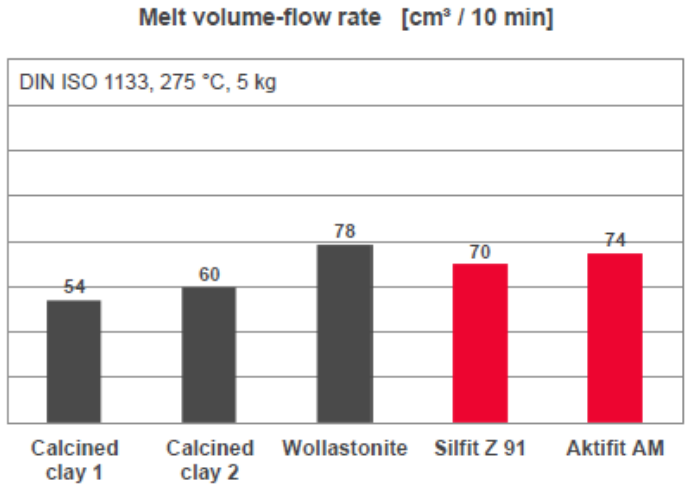
Thermoplastic Films

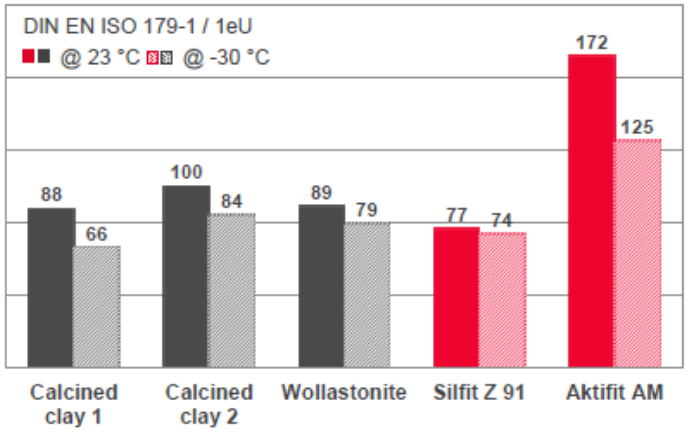
TPE

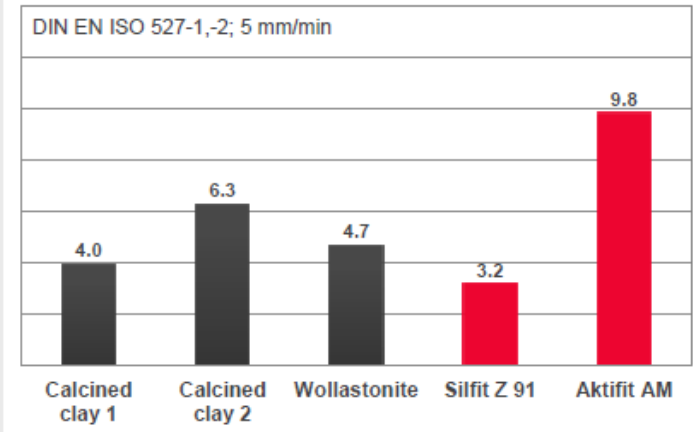
CNSE in Polyamid (PA66)

Impact Strength

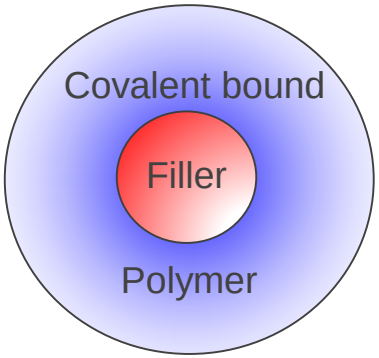


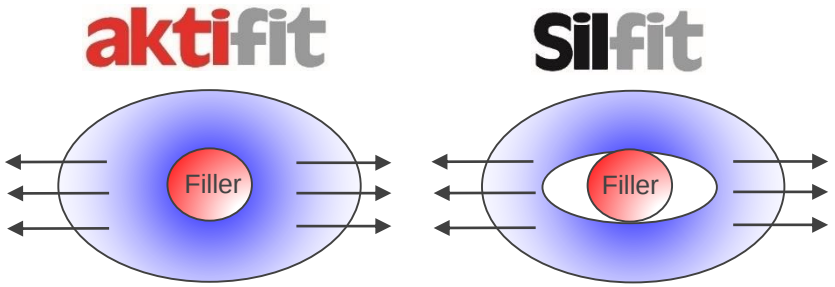




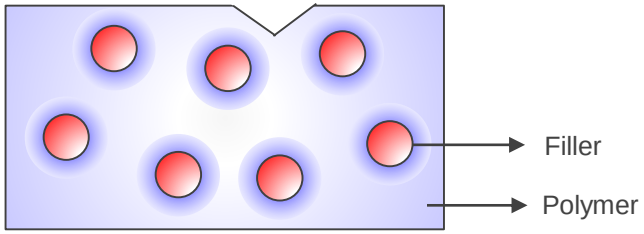


Scratch resistance (PP)

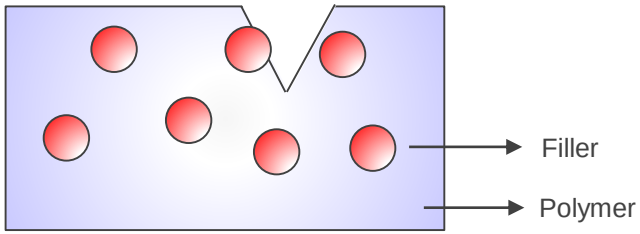




Filler is incorporated into the Polymer network – higher hardness



Filler can move within the Polymer matrix – deeper scratch



CNSE in PP-Copolymer
Scratch Resistance

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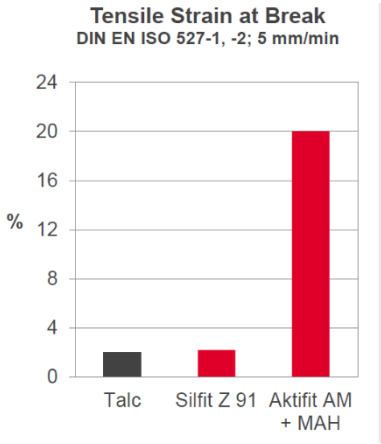
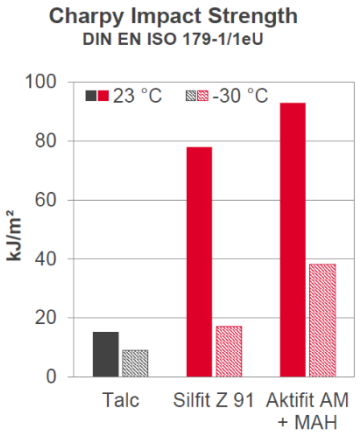
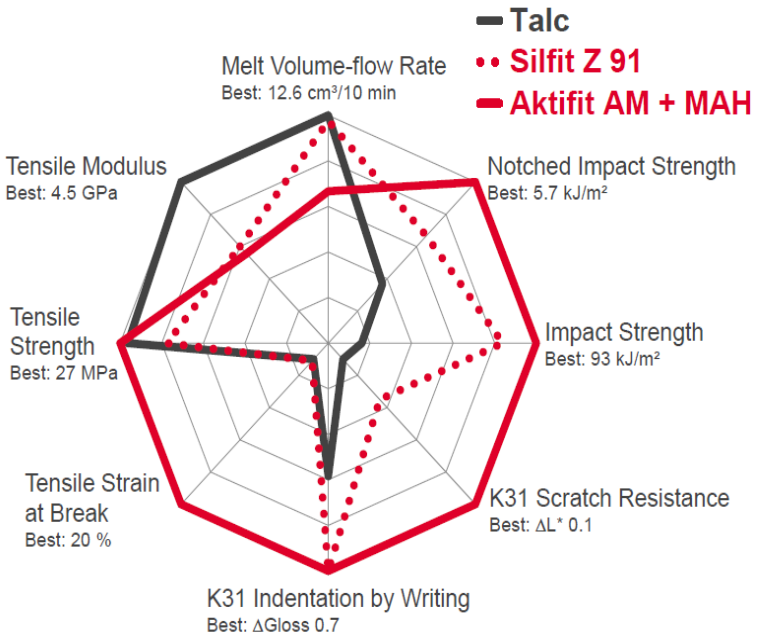
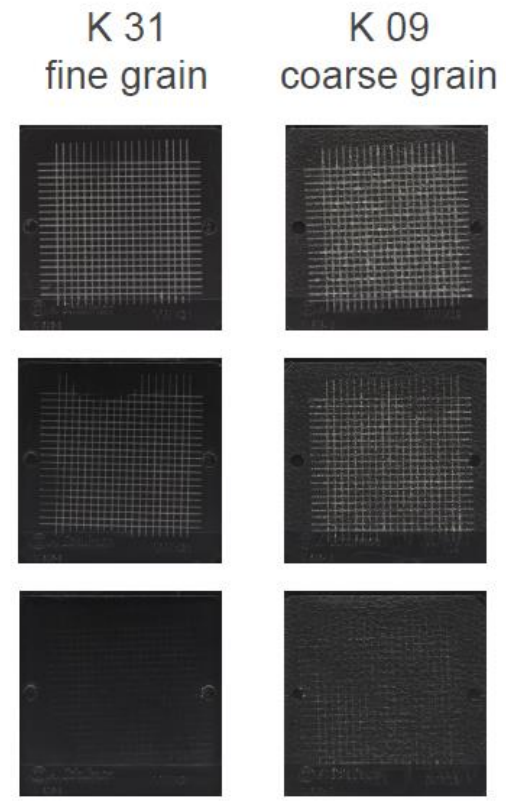




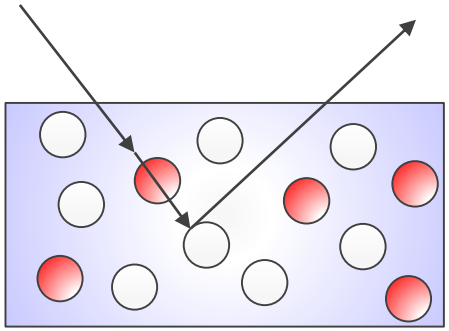


Scratch Resistance



TiO_2 Substitution (MB)

- Refractive index of the NSE is similar to the polymer



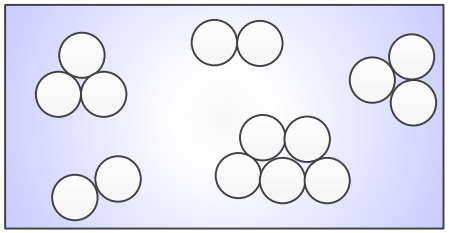
refractive indices (n)

n_{TiO2} = 2,61

n_{NSE} = 1,55

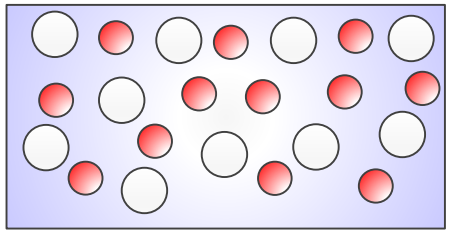
n_{PE} = 1,51

Conventional formulation



- TiO_2 can agglomerate

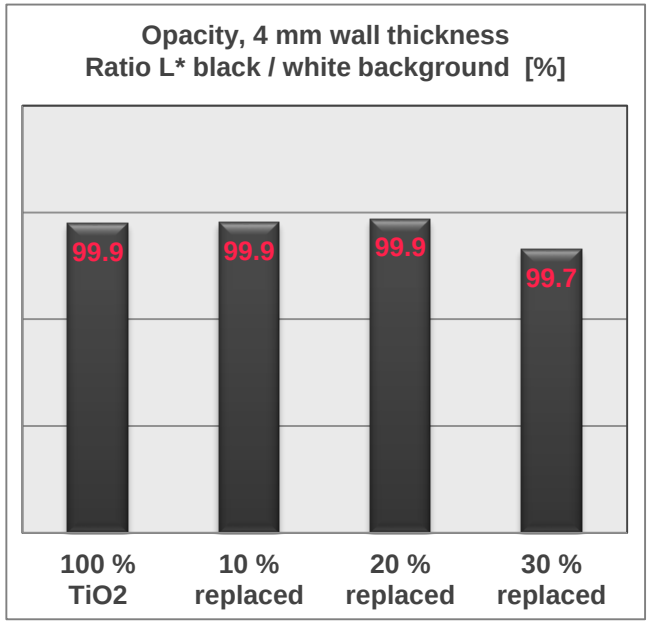
NSE Extender – TiO_2 red.

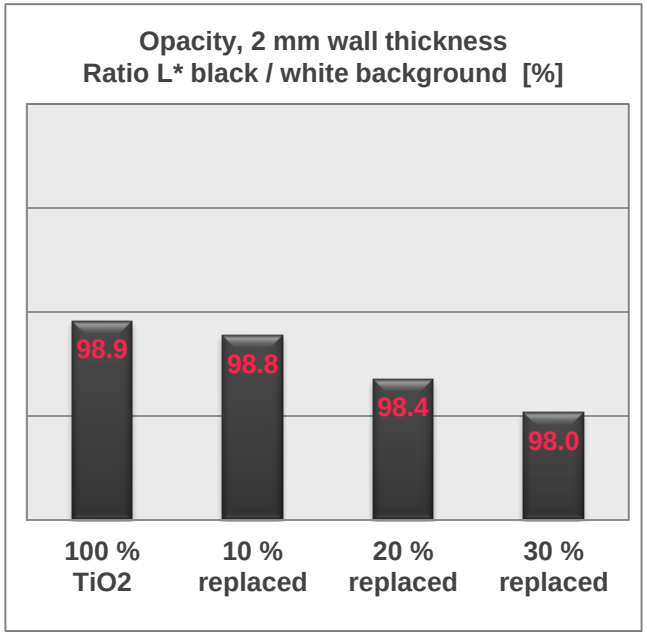


- Less TiO_2
- More homogenous distribution
- Only slight opacity change

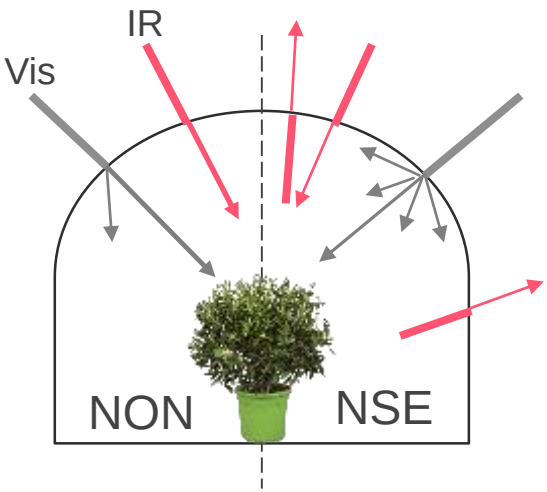
PS – partial TiO_2 replacement

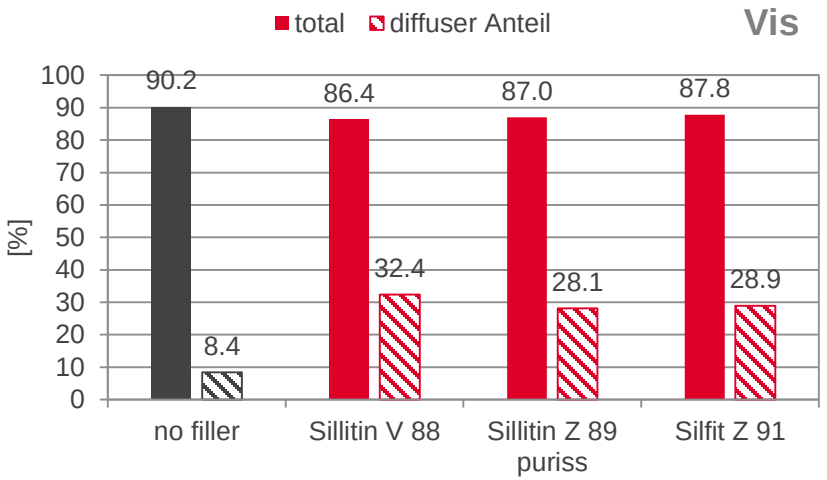
Replacement of TiO_2		10 %	20 %	30 %
Polystyrene	99	99	99	99
Titanium dioxide (rutile)	1	0.9	0.8	0.7
Silfit Z 91	-	0.1	0.2	0.3

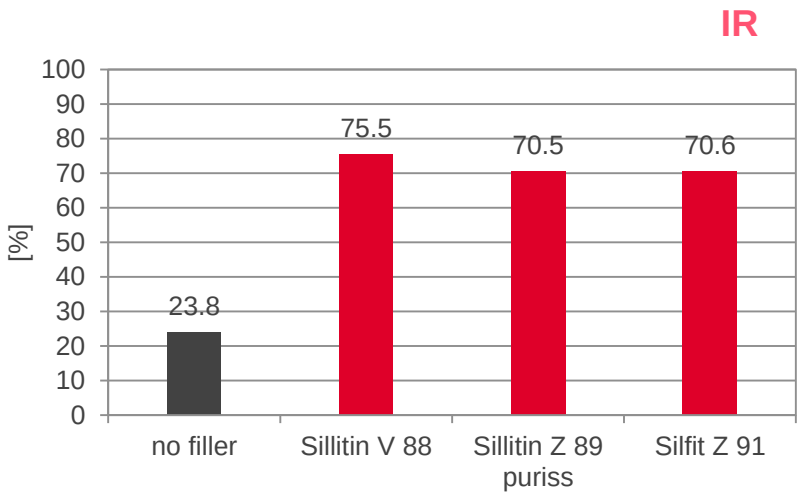




Greenhouse films







Greenhouse films

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Optical Impression LDPE Films - See-through photo of a tree

without film

pure PE film

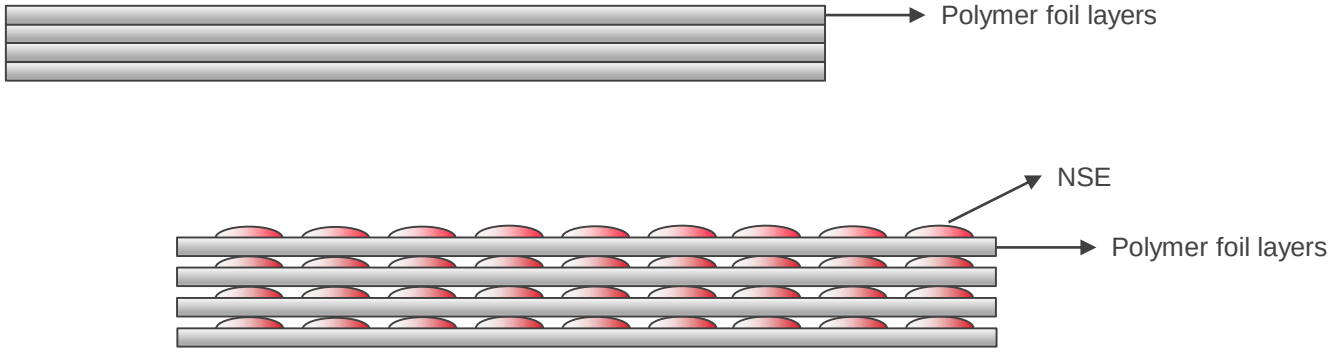
Sillitin V 88

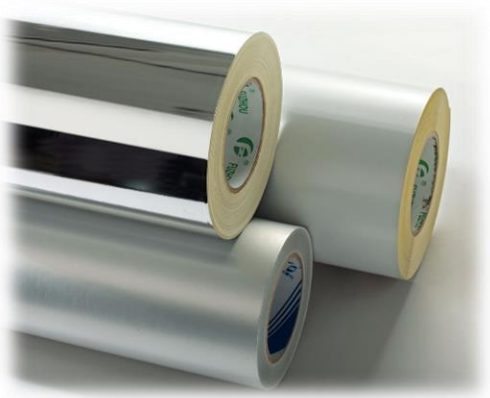
Sillitin Z 89 puriss

Silfit Z 91

Film – Antiblocking (PE, PET)

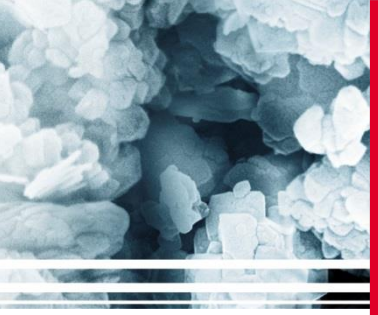
- NSE reduces the friction between the different Polymer layers which is responsible for the antiblocking behavior.





New trend: biopolymers

- Currently, there is a trend from polymers based on oil to biopolymers
- **Advantages:**
  1. Bio-based, because there are also biopolymers based on oil
  2. renewable
  3. biodegradable and not degradable
  4. compostable
- **Polymers (organic Polyesters):**
  1. Polyactic acid (PLA)
  2. Cellulose
  3. Polyhydroxyalkanoates (PHA)
  4. PBS, PBAT
- **Suitable NSE:** SILFIT and AKTIFIT



Thank you very much for your attention!

For more information please visit our website:

www.hoffmann-mineral.com

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