



Discovering functional fillers: specific properties and key benefits

“Expanding Chemistry”

Golden Tulip Hotel Eindhoven-Leende NL

8 & 9 November, 2017

Historical overview

From the stone age

Pigments and fillers has been used for body painting and caves painting.

From 4th Century B.C. to 16th Century A.D.

Egyptian and Mediterranean cultures = white chalk, clay, gypsum and shells.

Greek = white lead from synthetic process to get opacity and brightness.

Roman Empire = ↑ demand by art ↓ production ... natural minerals (NL, UK, FR, ES, IT).

18th & 19th Century A.D.

Extended use of paints during the Industrial Revolution ↑ fillers demand.

Automatic processing, high power machines, mills, classifiers, etc.

20th Century A.D.

Chemistry and Technology used to go from empiric to science.

From Second World War = modernization, finer fillers, tailor made, coated, etc.

Pigment vs. fillers

DIN 55943, EN971 and ISO 3262

“...solid substances consisting of particles practically insoluble in the application medium, mainly used for:”

Pigment

Opacity & Colour
Corrosion inhibiting
Magnetic properties
Surface & optical effect
Organic
Inorganic

Filler

Modify volume or weight
Improve technical properties
Optimize manufacturing
Extend pigments
Carbonates - Silicates
Sulphates – Oxides

Fillers vs. Functional Minerals

Fillers were historically used just to reduce the costs of the product formulation.

Depending on its functionality, fillers can be named “functional minerals”.

Improve performance in three main areas:

Mechanical
Physical
Chemical

They can be natural or they can be synthetic or chemically treated.

Different characteristics

(i.e. particle size, density, inertness, surface stability, oil absorption, etc.)

Different function

(i.e.. chemical resistance, specific weight, film formation, rheology, flexibility, etc.)



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Baryte

Talc

Dolomite

Mica

Baryte

From the total world production: 90% drilling & 10% chemical and paint grades.

Crystalline mineral with impurities of quartz, carbonates, sulfide, clays, etc.

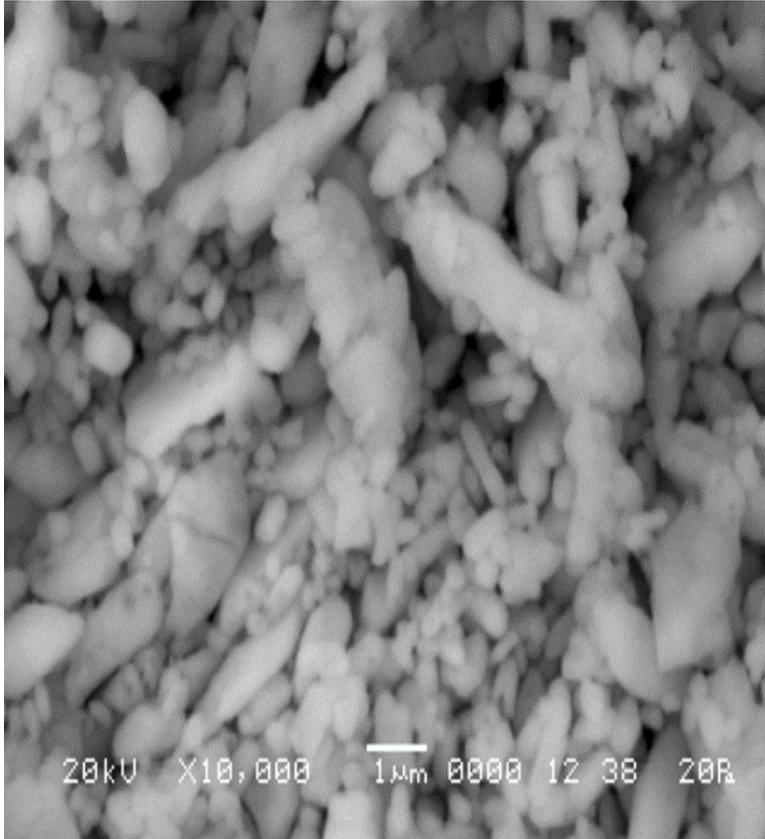
BaSO₄
Denisty = 4,25 g/cm³
Refractive index: 1,70 n
Mohs Hardness: 3,50
Resistant to RX and UV
Melting Point: 1.580 ° C
Chemically inert
Low oil absorption

TiO₂ Extender
Weighting agent
Whiteness
Dispersion
Chemical resistance
Anticorrosive properties
Dispersion
Increases friction resistance

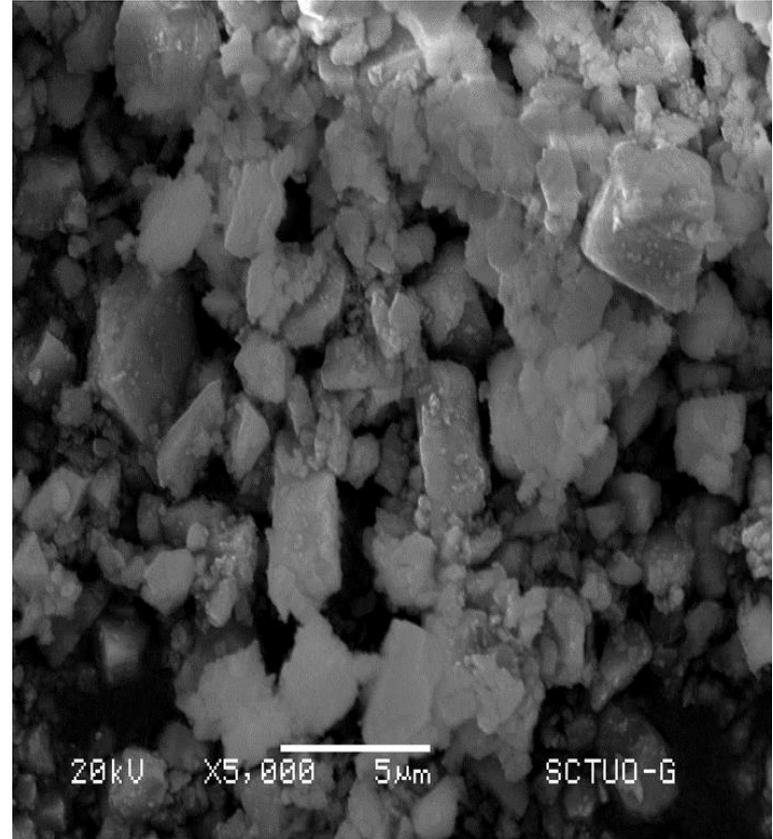
High whiteness paint grade micronized barite is used as a filler in many different applications, even to replace Blanc Fixe or Lithopone.

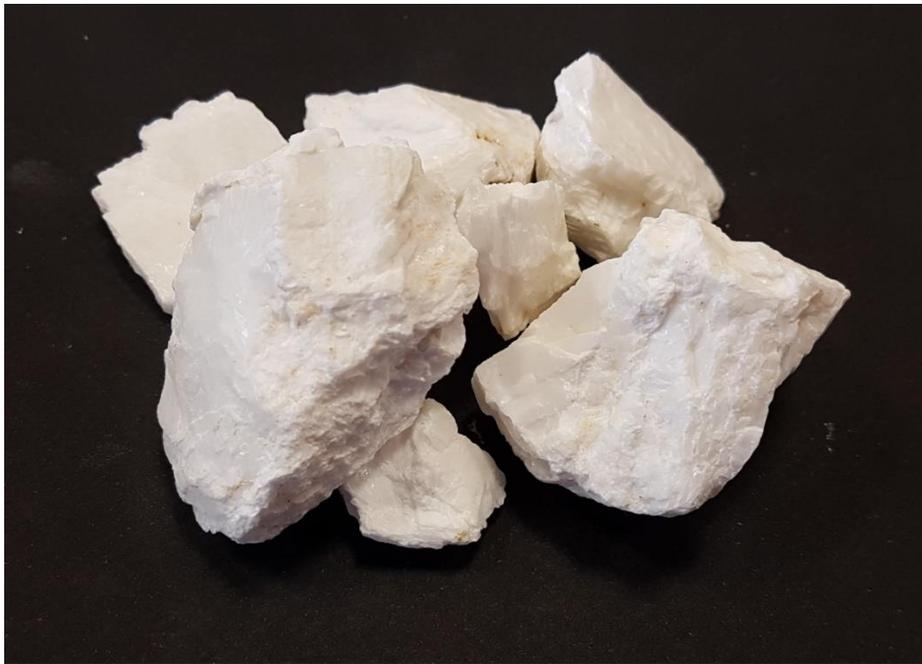
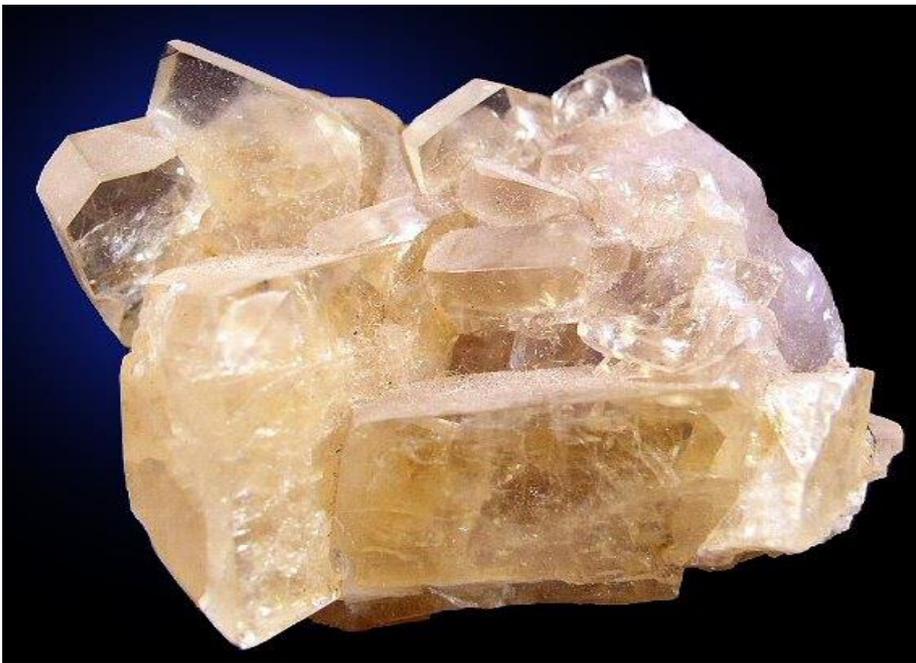
Comparative

Precipitated



Natural Baryte





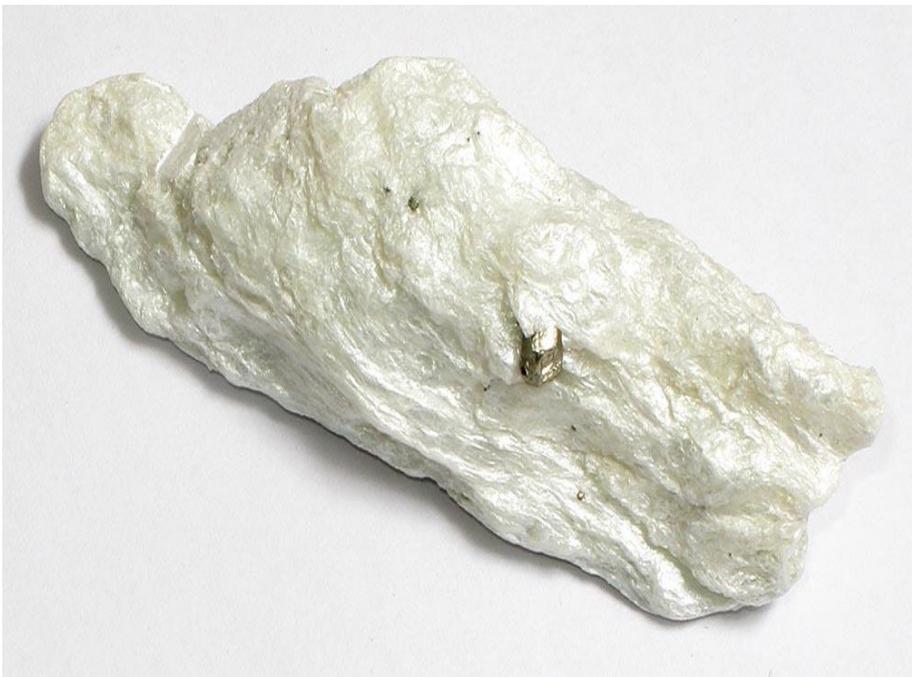
Talc

It is a lamellar hydrated magnesium silicate with soft, greasy and hydrophobic particles.
Provide high oil absorption, silky effect and low abrasion.

$Mg_3 Si_4 O_{10} (OH)_2$
Denisty: 2,55 g/cm ³
Refractive index: 1,55 n
Mohs hardness: 1,00 (Softness)
Oleophilic & hydrophobic
Melting Point: 1.100 °C
Chemically inert
Magnesite - Chlorite - Dolomite - Calcite

TiO ₂ Extender
Matting Effect
Surface Stability – Leveling
Film Integrity control
Chemical resistance
Barrier Effect
Reinforcing properties
Increases stability & flexibility

Resists high temperatures with good thermal expansion and flexibility.
Used in plastics, paints & coatings, ceramics, sealants, paper, cosmetics, etc.



Dolomite

It is a trigonal rhombohedral crystal, mix of CaCO_3 and MgCO_3 .
Sedimentary or metamorphic rocks of dolomite, marble or calcite

$\text{Ca Mg (CO}_3)_2$
Density: 2,80 g/cm ³
Refractive index: 1,50 n
Mohs hardness: 3
Dry hiding power
Melting Point: 3.500 °C
Resistant to acid
Transparent, white or pink

TiO ₂ extender
Mg source for chemistry
Metallurgy
Exterior white paints
Exterior mortars
Ceramic and glass
Reinforcing properties
Refracting materials

Resistant to high temperatures and sunlight effect.

Use as filler in carpet backing compounds, thermosetting resins and tempered glass.



Mica

Is a group of sheet hydrated aluminum silicate minerals with strongly related materials.
Obtained in igneous, metamorphic and sedimentary areas.

Muscovite (K) and Phlogopite (Mg)

Denisty: 2,75 g/cm³

Refractive index: 1,60 n

Mohs hardness: 2,50

Melting Point: 800 °C

Electrical insulator

Thermal conductor

Coloured, vitreous and pearlescent

Metallic pigment production

Anticorrosive - H₂O repellent

Cables and electronics

Resistant to cracking and reinforce

Insulation in light plastic

Anti blocking and anti sticking

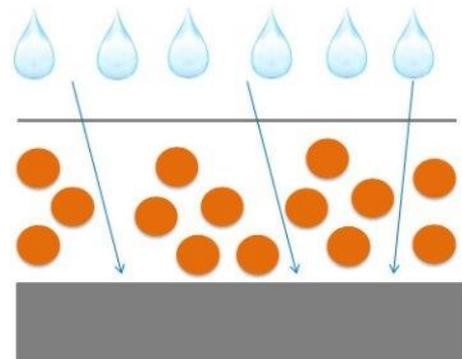
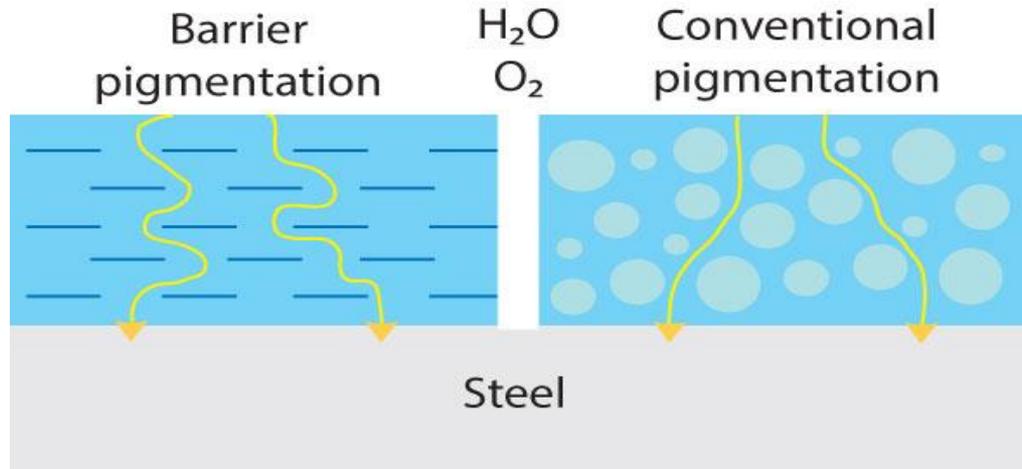
Adhesion promoter in paints

Weathering resistance

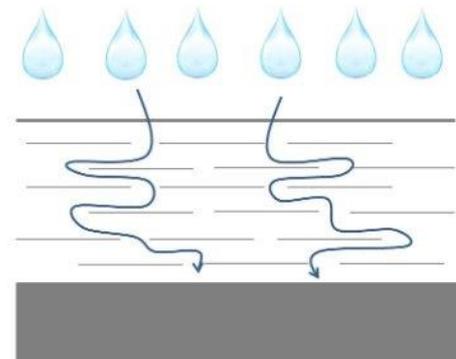
Layers that can be split or delaminated into thin sheets by specific milling systems.
Dielectric, elastic, flexible, hydrophilic, insulating, lightweight, platy, reflective.



Barrier effect & packing



Spherical pigments not provide a barrier effect and protection against water.



Flake-like pigments provide a barrier effect protecting the coating from the water.

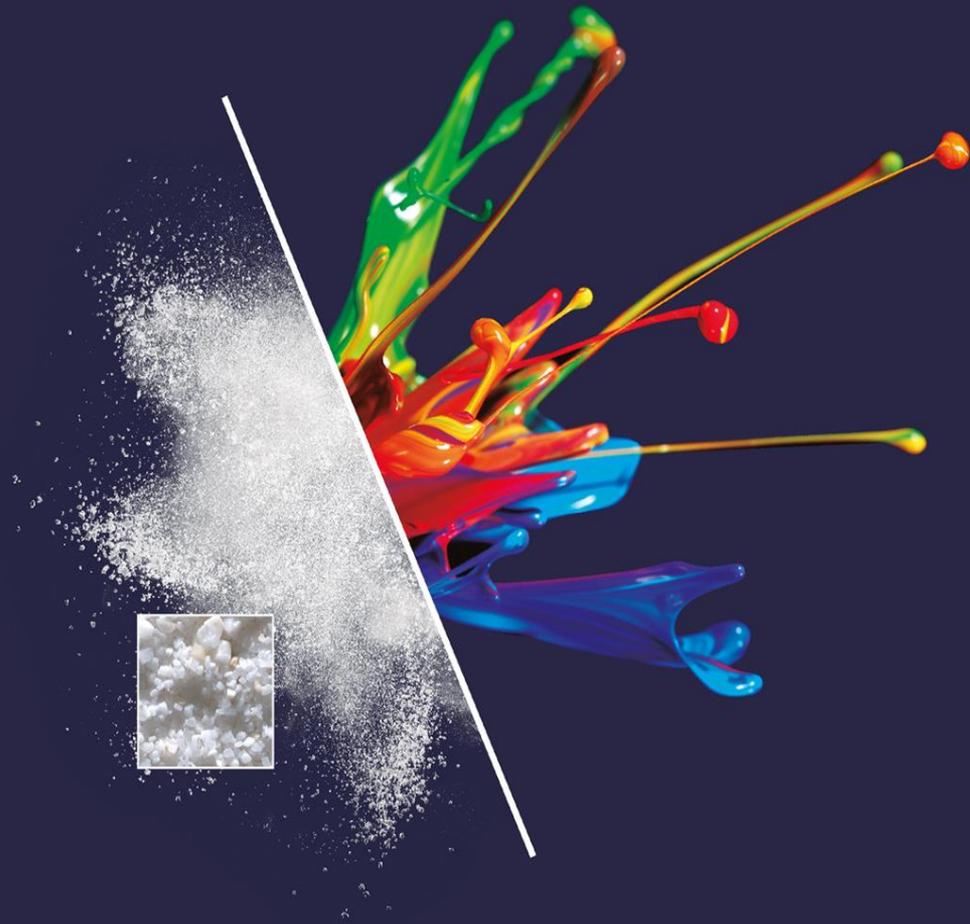
DOP & particle sizes

Filler (5 μm)	DOP
Barite	13 g/100g
Calcite	35 g/100g
Dolomite	38 g/100g
Talc	50 g/100g
Mica	75 g/100g



Main areas of application

Area	Activity	Products
Automotive	OEM	Liquid coatings Powder coatings Electrostatic Primer Marine coatings Friction material Soundproofing material Sealants Adhesives Anticorrosive primers DIY coatings Wood varnishes and coatings Pigment paste Mortars Heavy density concrete Road coatings PVC, PE & PP pipes Extrusion or injection plastic Inks Paper and cardoard
	Car Refinish	
Industry	Heavy machinery and tools	
	Naval and nautical	
	Metallic structures	
	Off – shore platforms	
	Electrodomestics	
	Metal furniture	
Construction	Architecture y decoration	
	Infraestructure	
	Road safety	
Polymers	Masterbatches	
	Exterior and interior furniture	
	Sanitary	



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