EcoPiren

By Brucite+

Recommendations

EcoPiren® for TPO roofing membranes

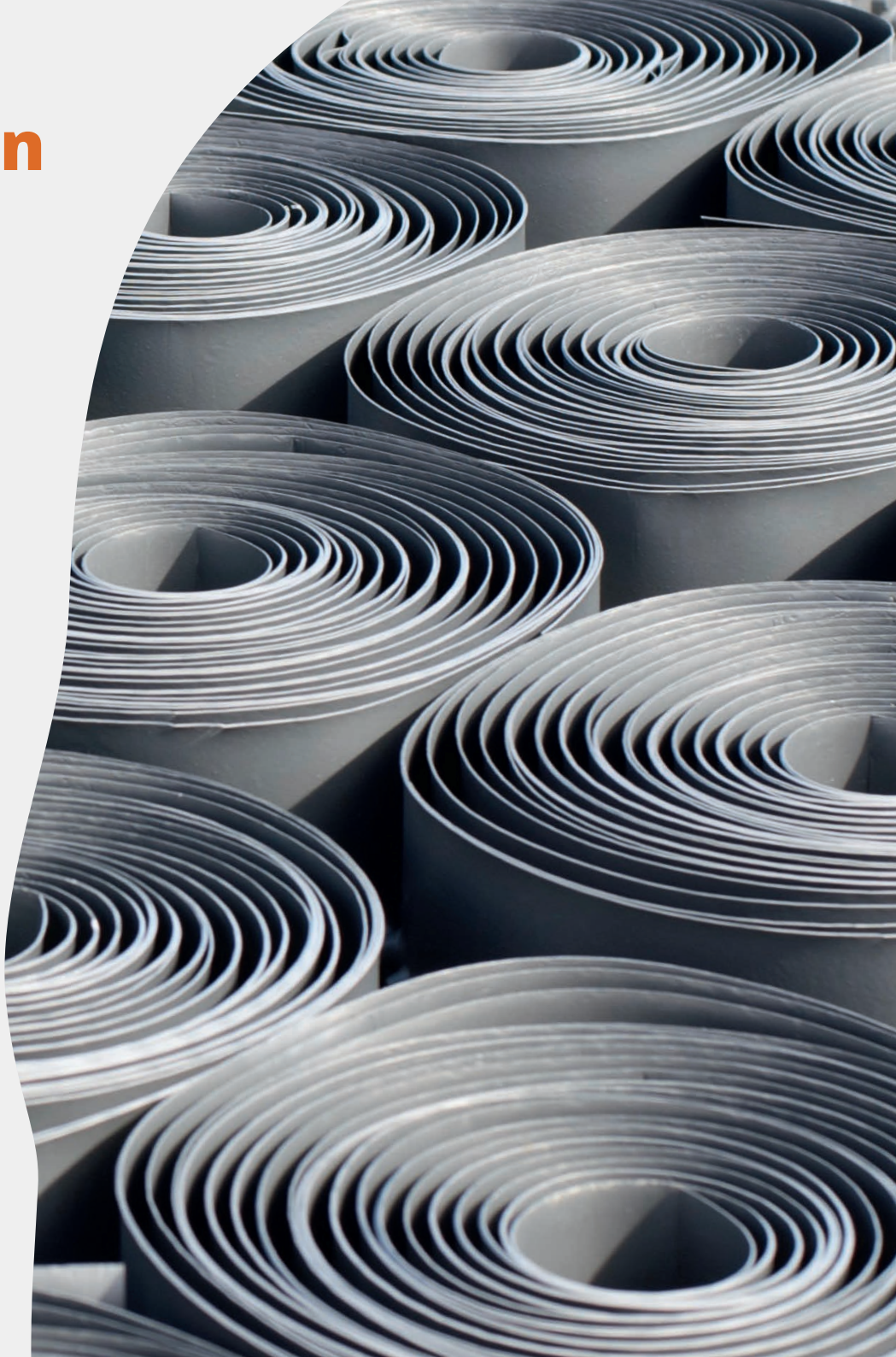
Description and application

EcoPiren® is a natural magnesium hydroxide obtained by separation and milling of brucite mineral.

The content of main component $Mg(OH)_2$ depends on the grade and is up to 96 %.

EcoPiren® appears as white or off-white powder and is used as a flame retardant filler for cable compounds of various nature — EVA, PE, PVC; Aluminum Composite Panels (ACP including A2 grade); roofing membranes (TPO, PVC, bitumen); engineering plastics for partial replacement of brominated Flame Retardants.

Incorporating EcoPiren® allows to diminish drawbacks of classic formulations: lack of fire performance, dripping, high smoke emission.



How does EcoPiren® work?

Exposed to heat, EcoPiren® decomposes emitting water vapor, forming strong char and absorbing heat.

Such behavior provides elimination of oxygen from reaction area, protection for undamaged parts and cooling of the specimen.

Thus minimum damage is inflicted to the specimen.

Application

One of the mineral filler's most crucial characteristics is its humidity. Every EcoPiren® grade is packed in the way excluding any possibility of environmental water consumption.

There is a trend to use only the most pure flame retardants for TPO roofing membranes because of high thermal and UV ageing resistance requirements. That's why usually only synthetic flame retardants like magnesium hydroxide are used.

However, XRF separation allows to produce natural magnesium hydroxide from brucite mineral with outstanding purity, which can fulfill the requirements.

Basic TPO roofing formulations with different flame retardants comparison are presented in table 1.

Application

Table 1. Basic formulations of FR compounds for TPO Roofing membranes and their ageing performance

Component	Content, %						
	Polymers and Additives						
PP copolymer (roofing grade)	56	56	56	56	56	56	56
Complex Stabilizer masterbatch	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Titanium dioxide	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Fillers							
EcoPiren® 5,5C (1 % stearic acid coated), medium SSA	40						
EcoPiren® 5,5C (2 % stearic acid coated), medium SSA		40					
EcoPiren® 5,5 (uncoated + 0,8 % stearic acid), medium SSA			40				
Brucite with 0,35% Fe_2O_3 (stearic acid coated), D_{50}=5,5 µm, medium SSA				40			
Synthetic MDH (stearic acid coated, sea water grade), D_{50}=5 µm, medium SSA					40		
Synthetic MDH (uncoated), D_{50}=1,5 µm, low SSA						40	
Synthetic precipitated ATH (uncoated), D_{50}=1,5 µm, low SSA							40
Original mechanical Properties							
Tensile strength, MPa	10.5	8.4	9	11.6	10.9	11.3	11.4
Elongation at break, %	823	628	560	840	990	925	910
Properties after accelerated thermal aging 4 weeks (672 hours) at 140°C, ventilated							
Tensile strength variation, %	-23	-12	-18	-35	-20	-19	-25
Elongation variation, %	-40	-37	-17	-64	-49	-27	-40

Continuation of Table 1. Basic formulations of FR compounds for TPO Roofing membranes and their ageing performance

	Content, %						
	Polymers and Additives						
Properties after accelerated thermal aging 10 weeks (1680 hours) at 140°C, ventilated							
Tensile strength variation, %	10	29	-46	crack	crack	2	-64
Elongation variation, %	-85	-93	-83	crack	crack	-85	-93
Accelerated UV aging: 4000 hours (ASTM D 4329 cycle A) Light: 0,89 W/m² at 340 nm for 8 hours at 60° C. Dark: 4 hours at 50° C with condensed water on the specimens surface							
OIT* original, min	404	n/a	n/a	109	161	326	205
OIT* after 1500 hours, min	319	n/a	n/a	84	101	211	128
OIT* after 2500 hours, min	239	n/a	n/a	61	79	137	75
OIT* after 4000 hours, min	113	n/a	n/a	15	42	82	18

** Oxidation induction time — shows the speed of consumption of stabilizers.*

- Stearic acid coated EcoPiren® provides the same level of mechanical properties as synthetic flame retardants.
- Compounds with highly contaminated brucite and middle quality synthetic MDH do not have enough thermal ageing resistance.
- Stearic acid coated EcoPiren® provides the same level of thermal and UV ageing resistance as synthetic flame retardants.

Application

Other important property of such membranes is flame retardancy.

Classic flame retardant aluminum hydroxide (ATH) has some drawbacks in this case: high dripping, weak char formation.

Results of two burning test (internal method, flame is applied on the surface of the membrane, inclination angle is 15° and DIN 4102 B2) are presented in table 2 and table 3.

Table 2. Fire performance in internal surface test

Properties	EcoPiren® 5,5C	Synthetic MDH	Synthetic ATH
Self-extinguishing (yes/no)	да	да	да
Burning time after fire source stop, sec	15	30	73
Dripping out of the sample (yes/no)	нет	нет	нет

Table 3. Fire Test DIN4102 B2 (vertical single fire test)

Properties	EcoPiren® 5,5C	Synthetic MDH	Synthetic ATH
Self-extinguishing (yes/no)	нет	нет	нет
Burning time, sec	95	105	80
Dripping (yes/no)	да	да	да
Time to start dripping, sec	33	33	40
Dripping type	frequent burning small particles	medium burning particles	infrequent burning big particles
Horizontal Flame propagation, cm	5	4	8

EcoPiren® advantages

- Provides the same mechanical properties as synthetic fillers.
- Provides best thermal and UV ageing resistance.
- Best price/performance ratio in comparison with synthetic flame retardants.
- High thermal stability — high processing temperature and production speed.

By choosing EcoPiren® products you ensure best technical support for application of product and receive a possibility to develop a custom solution with individual properties.

Please contact us via request form.

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