EcoPiren

By Brucite+

Recommendations

EcoPiren® in HFFR compounds for cables

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 uptake.

In case of HFFR compounds the most used Flame Retardant is synthetic precipitated aluminum hydroxide (ATH).

It allows to achieve great mechanical properties and rheology, but sometimes lacks fire resistance.

EcoPiren® is capable of replacing ATH both partially (improving fire performance and preserving mechanical properties) and totally.

EcoPiren® can be used in all three HFFR layers: insulation, bedding and sheathing.

ATH partial replacement

Partial replacement is suitable for low-voltage cables of low section which are produced at high speed. It is enough to incorporate 10–15% of EcoPiren® instead of ATH to improve cable's fire performance.

This step will improve char formation and decrease dripping. To preserve compound's mechanical properties some ULDPE (POE) is used. Standard formulations are presented in table 1.

Application

Table 1. Basic formulations of EVA-based HFFR compounds for low voltage power cables sheathing

		Sheathing		Insulation	
Component	**Comment**	**Content, %**			
Polymers					
EVA 28 MFI 3-7	Escorene UL 00728 or analogue	19	19	27	27
ULDPE MFI 3	Engage 8450 or analogue	6	6	6	6
LLDPE MFI 4	Exceed 3812 or analogue	5	5	5	5
ULDPE-g-MAH	Fusabond E226 or analogue	5	5	5	5
Fillers					
EcoPiren® 3,5C	Fine grade, stearic acid treated	15		15	
EcoPiren® 3,5NP	Fine grade, alkyl-silane treated		25		25
$CaCO_3$	Fine grade, stearic acid treated			10	10
Synthetic ATH	Apyral 40 CD or analogue	48	38	30	20
Additives					
Antioxidants	Silmastab	0.5	0.5	0.5	0.5
Processing aid	Silicone masterbatch 50%	1.5	1.5	1.5	1.5
	Total	**100**	**100**	**100**	**100**
Properties	**Standard**	**Value**			
Hardness (Shore D)	ASTM D2240	46–49	46–49	46–49	46–49
Density, g/cm^3	Internal method	1.49	1.49	1.49	1.49
Tensile strength, MPa	ISO 37-2	12	12–13	12	12–13
Elongation at break, %	ISO 37-2	160–200	175–225	160–200	175–225
MFI at 190 °C/21,6 kg	ISO 1133	10–15	10–15	10–15	10–15
LOI, %	ASTM D2863	36–40	38–42	35–38	36–39

Application

ATH total replacement

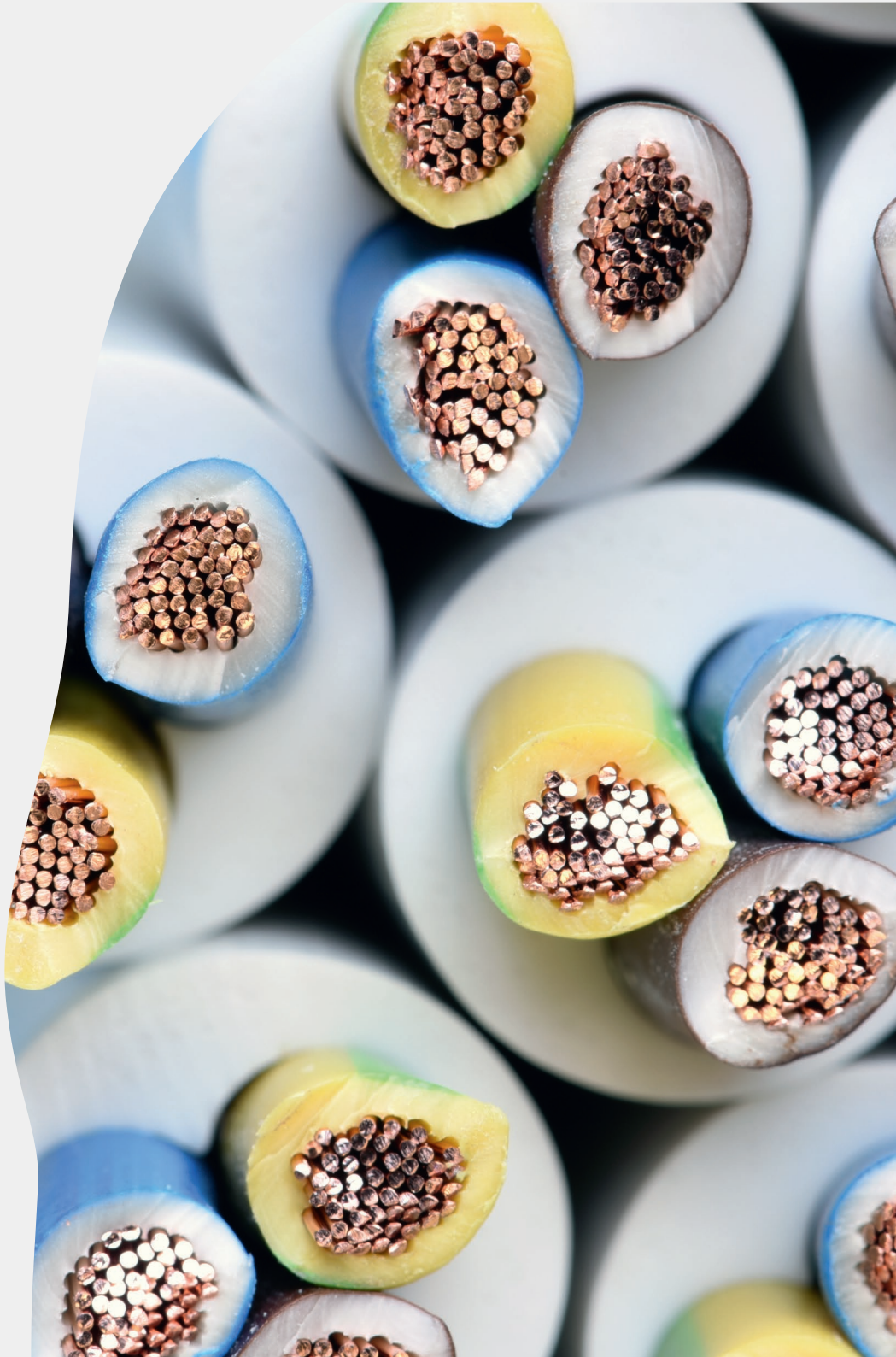
Total ATH replacement is suitable for high-voltage cables with larger section which are produced at lower speed.

Total replacement allows to greatly improve fire performance while mechanical properties remain suitable.

The SSA of EcoPiren® is still higher than of synthetic products, thus the formulation has to be optimized.

The use of POE as main polymer instead of EVA provides necessary mechanical properties.

Standard recipes are presented in table 2.



Application

Table 2. Basic formulations of ULDPE-based HFFR compounds for medium and high voltage power cables sheathing.

		Sheathing		Insulation	
Component	**Comment**	**Content, %**			
	Polymers				
ULDPE MFI 0,5-1	Engage 8003 or analogue	22	22	22	22
LLDPE MFI 3-6	Exceed 3812 or analogue	8	8	8	8
ULDPE-g-MAH	Compoline CO/UL or analogue	5	5	5	5
	Fillers				
EcoPiren® 3,5	Fine grade, no surface treatment	63			
EcoPiren® 3,5C	Fine grade, stearic acid treated		63		
EcoPiren® 3,5NP*	Fine grade, alkyl-silane treated			63	
EcoPiren® 3,5NA*	Fine grade, amino-silane treated				63
	Additives				
Antioxidants	Silmastab	0.5	0.5	0.5	0.5
Processing aid	Silicone masterbatch 50%	1.5	1.5	1.5	1.5
	Total	**100**	**100**	**100**	**100**
Properties	**Standard**	**Value**			
Hardness (Shore D)	ASTM D2240	46–49	46–49	46–49	46–49
Density, g/cm^3	Internal method	1.47	1.47	1.47	1.47
Tensile strength, MPa	ISO 37-2	11	8	12	11
Elongation at break, %	ISO 37-2	175	300	200	175
MFI at 190 °C/21,6 kg	ISO 1133	6	6	7.5	6.5
LOI, %	ASTM D2863	32–34	32–34	34–36	32–34

** 3,5NP and 3,5NA grades are recommended for high thermal ageing resistance*

Application

EcoPiren® for bedding compounds

Milled (ground) ATH in combination with $CaCO_3$ is the most used flame retardant system for bedding compounds. This combination well suits cables where every layer is flame retardant. On the other hand, XLPE-insulation, which has great processability and perfect mechanical and electrical properties becomes more and more popular.

In that case, ATH doesn't provide enough fire performance. This problem can be solved using more fire-resistant bedding layer, which would behave as a screen between flame and insulation.

EcoPiren®-based bedding compounds with very high flame resistance can play this role.

Standard recipes of bedding compounds without mechanical properties (but enough flexibility) are presented in table 3.

Table 3. Basic formulations of ULDPE-based HFFR compounds for power cables bedding

Component	Comment	Content, %		
Polymers				
ULDPE MFI 3-5	Engage 8450 or analogue			
LDPE MFI 10	Any grade	5	5	5
ULDPE-g-MAH	Compoline CO/UL or analogue	1.5	1.5	1.5
Fillers				
EcoPiren® 10R	Grade with D_{50}=10μm without any sur-face treatment	60	75	80
$CaCO_3$	Grade with D_{50}=5μm, stearic acid treated	20		
Additives				
Processing aids	PE or EVA wax	2	2	2
	Stearic acid	1	1	1
	Total	**100**	**100**	**100**
Properties	**Standard**	**Value**		
Hardness (Shore D)	ASTM D2240	40–43	39–42	40–43
Density, g/cm^3	Internal method	1.78	1.80	1.77
MFI at 190 °C/21,6 kg	ISO 1133	<8	<10	<8
LOI, %	ASTM D2863	38–40	43–45	58–62

Application

If good mechanical properties are required for the bedding compound then following recipes are recommended (table 4).

Table 4. Basic formulations of ULDPE- and EVA-based HFFR compounds for power cables bedding with good mechanical properties

Component	Comment	Content, %	
Polymers			
ULDPE MFI 3-6	Engage 8450 or analogue	14	12
EVA 18 MFI 1-5	Escoren Ultra LD 720 or analogue	5.5	14
LDPE MFI 1-5	Any grade	5.5	
ULDPE-g-MAH	Fusabond E226 or analogue	1	
Fillers			
EcoPiren® 5,5CR	Fine grade with stearic acid treatment	35	
EcoPiren® 10R	Grade wwith d_{50}=10μm without any surface treatment		70
Milled ATH	Grade with c d_{50}=5μm	35	
Additives			
Processing aids	EVA wax (Viscowax 343)	2	2
	PE or EVA wax	1	1
	Stearic acid	1	1
	Total	**100**	**100**
Properties	**Standard**	**Value**	
Hardness (Shore D)	ASTM D2240	42–48	42–48
Density, g/cm^3	Internal method	1.60–1.70	1.60–1.70
Tensile strength, MPa	ISO 37-2	>5	>5
Elongation at break, %	ISO 37-2	>70	>70
MFI at 190 °C/21,6 kg	ISO 1133	>10	5–10
LOI, %	ASTM D2863	36–40	40–44

EcoPiren® advantages

- Very high content of magnesium hydroxide in comparison with other brucite based products.
- Low contamination with iron, silica and calcium oxides — high aging resistance and light color of the compound.
- Solid structure char formation.
- Decrease in dripping.
- Best price/performance ratio on the market.
- Customized solutions.
- Technical support for compound and cable production (own polymer Lab).

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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