



## Recommendations

EcoPiren<sup>®</sup> PVC wire & cable

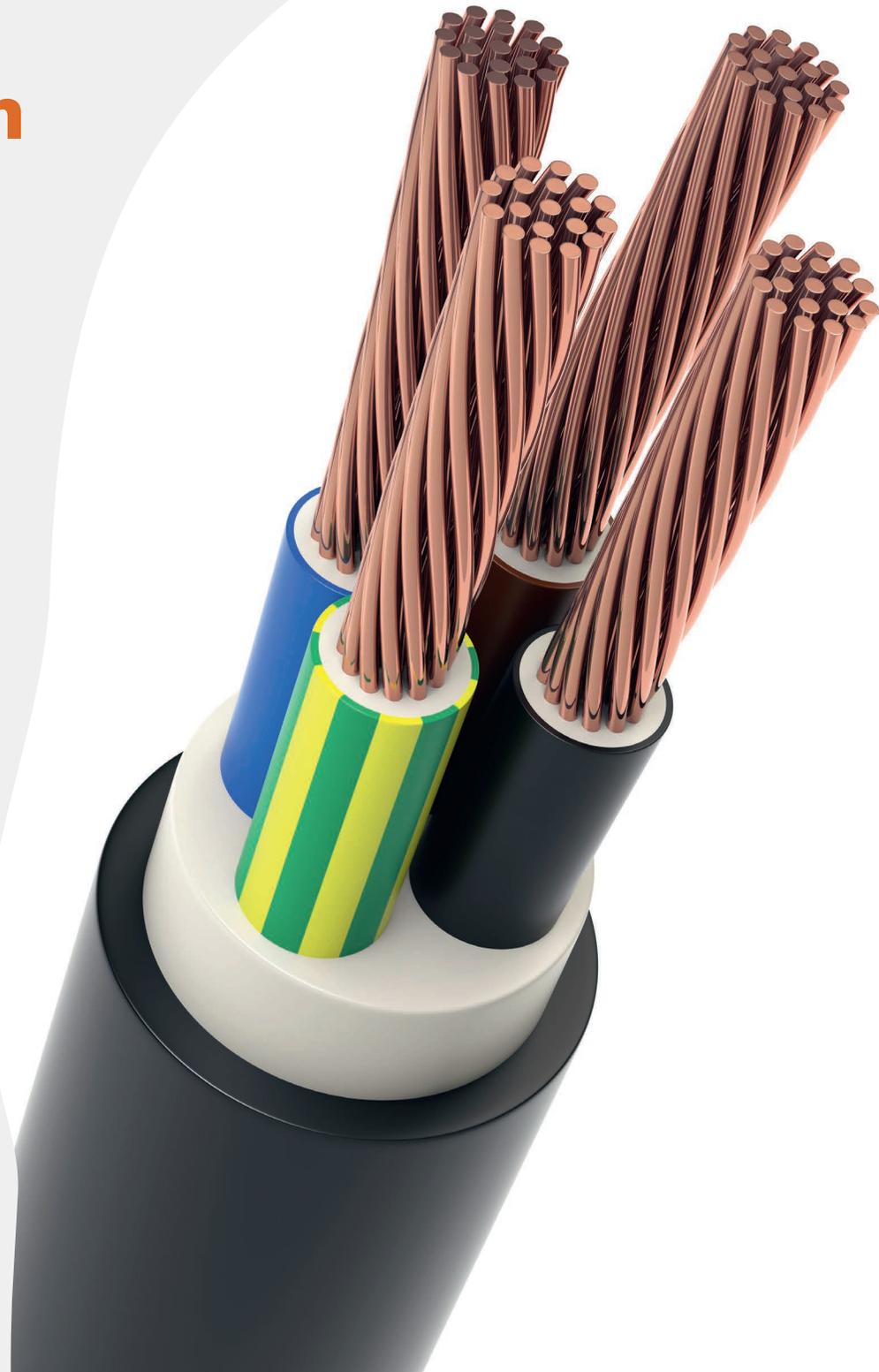
# Description and application

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.

PVC Cables have the biggest market share worldwide. This is due to ability to reach higher flame retardancy in comparison with other thermoplastic polymers.

However, there is a tightening of standards regarding environmental safety and flame retardancy in terms of fire and smoke, which creates increasing number of issues for PVC cable producers.

The main flame retardancy mechanism of FR PVC compound is a reaction between antimony trioxide (ATO) and HCl in the gas phase and char formation in the solid phase. Unfortunately, ATO being the main flame retardant for PVC for ages is also the main reason for very high smoke production.

EcoPiren® magnesium hydroxide (MDH) is the main flame retardant to introduce new mechanism of flame retardancy to PVC. This material decomposes under the heat exposure with evolution of water and solid char on the top of the cable. Another popular metal hydroxide like MDH is aluminum hydroxide (ATH). However, the use of ATH is limited by several reasons:

- Low decomposition temperature (170–180 °C) limits the processing speed.
- Char is amorphous and thus is too weak to withstand even convective air flow or slight vibration.
- Chemical reaction with emitting HCl is too slow, therefore smoke toxicity remains the same as without ATH.

EcoPiren® lacks such flaws and therefore can be effectively used to promote flame retardancy and to decrease smoke density and toxicity of PVC compounds.

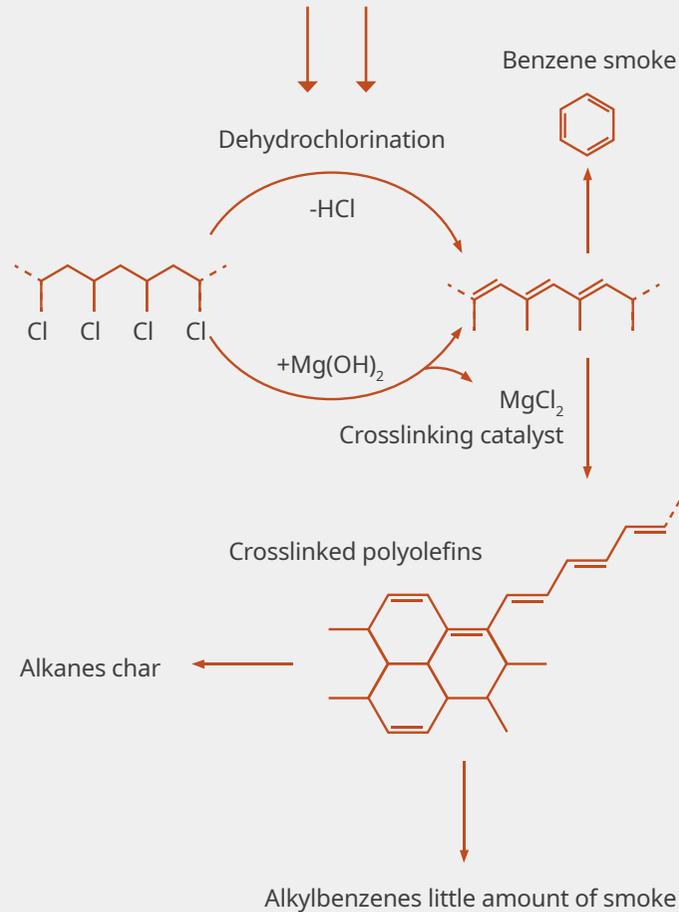
# Application

## EcoPiren® introduces a 4-stage mechanism of flame retardancy to PVC

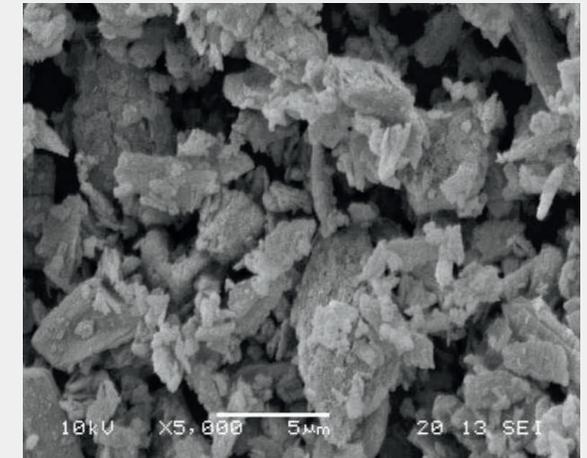
II. When heated, EcoPiren® traps the emitting HCl and decreases smoke toxicity.

III. After this reaction it turns into magnesium chloride which is crosslinking catalyst. That's why EcoPiren® also decreases the smoke density

I. At 300–330 °C EcoPiren® starts to decompose cooling the compound with evolution of water vapor which decreases oxygen content in the fire area



IV. After decomposition, EcoPiren® forms solid char that consists of inflammable MgO which blocks the access of oxygen to the unburned compound



Picture.1. A 4-stage mechanism of flame retardancy

# Application

EcoPiren® provides both flame retardancy and smoke suppression and can be used even in ATO-free PVC compounds with extremely low smoke S1 classification in accordance with the CPR for cables (table 1).

*Table 1. Basic formulations of PVC compounds for cable sheathing*

Components	Formulations, phr.			
	1	2	3	4
PVC K70	100	100	100	100
Plasticizer DINP/DOTP	50	50	50	50
Ca/Zn stabilizer	5	5	5	5
CaCO <sub>3</sub> (stearic acid treated)	90	50	50	10
Zn Borate	4	4	4	-
ATO	3	3	3	-
Metals oxides mixture (synergist)	-	-	-	15
EcoPiren® 3,5CR or 5,5CR	-	40	-	65
Synthetic ATH, D <sub>50</sub> 1,5 µm	-	-	40	-
<b>Total</b>	<b>252</b>	<b>252</b>	<b>252</b>	<b>245</b>
Density, g/cm <sup>3</sup>	1.54	1.55	1.55	1.54
Hardness (Shore D)	92	92	92	95
LOI, %	28	33	32	33
Smoke density (ASTM D 2843), %	86	76	75	47

# Application

EcoPiren® can also be used to produce very low smoke PVC bedding compounds (table 2).

*Table 2. EcoPiren®-based low smoke PVC cable sheathing formulation*

Components	Formulation, phr
PVC K70	100
Plasticizer DINP/DOTP	60
Ca/Zn stabilizer	5
EcoPiren® 10R	200
<b>Total</b>	<b>365</b>
Density, g/cm <sup>3</sup>	1.75–1.90
LOI, %	>45
Smoke density (ASTM D 2843), %	<40

# EcoPiren<sup>®</sup> advantages

- Very high concentration of magnesium hydroxide part in comparison with other brucite based products.
- High thermal stability — high processing temperature and production speed.
- Providing flame retardancy and decrease in smoke production and its toxicity at the same time.
- Allows to reach the highest flame retardancy with low smoke density and toxicity.
- High stability in quality.
- Best price/performance ratio on the market.

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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