

## Recommendations

MagPro<sup>®</sup> for rubber cables

# Description and application

The product under the trademarks MagPro® 150 and MagPro® 170 is high surface area magnesium oxide obtained by indirect calcination of milled natural magnesium hydroxide.

MagPro® is a white powder containing approx. 95% of magnesium oxide. Specific surface area is quite high: 150 m<sup>2</sup>/g for the MagPro® 150 and 170 m<sup>2</sup>/g for the MagPro® 170. It has a stable particle size distribution.

MagPro® is used as an effective acid acceptor, scorch controller, curing agent and heat stabilizer in the production of rubber cables sheathing based on the following rubbers:

- Polychloroprene (CR).
- Chlorinated polyethylene (CPE).
- Chlorosulfonated polyethylene (CSM).



# How does MagPro<sup>®</sup> work?

MgO is typically added in the above rubbers at 0.5–4 phr (special cases up to 10 phr) or at about 0.2% of the total compounding batch weight.

As a conclusion, MgO is typically compounded in rubbers that contain halogen (-Cl, -Br, -F) or nitrogen-carbon bonds (e.g., nitrile). A vulcanization activator is also present in all rubber compounds — usually zinc oxide. Irrespectively of the complexity of the corresponding action mechanisms, usually MgO's role is fulfilled



where X = -Cl, -Br, -F, -CN

ZnX<sub>2</sub> is very strong Lewis acid; it acts as a crosslinking catalyst facilitating the formation of C-C between different chains (crosslinking) at increased temperatures.

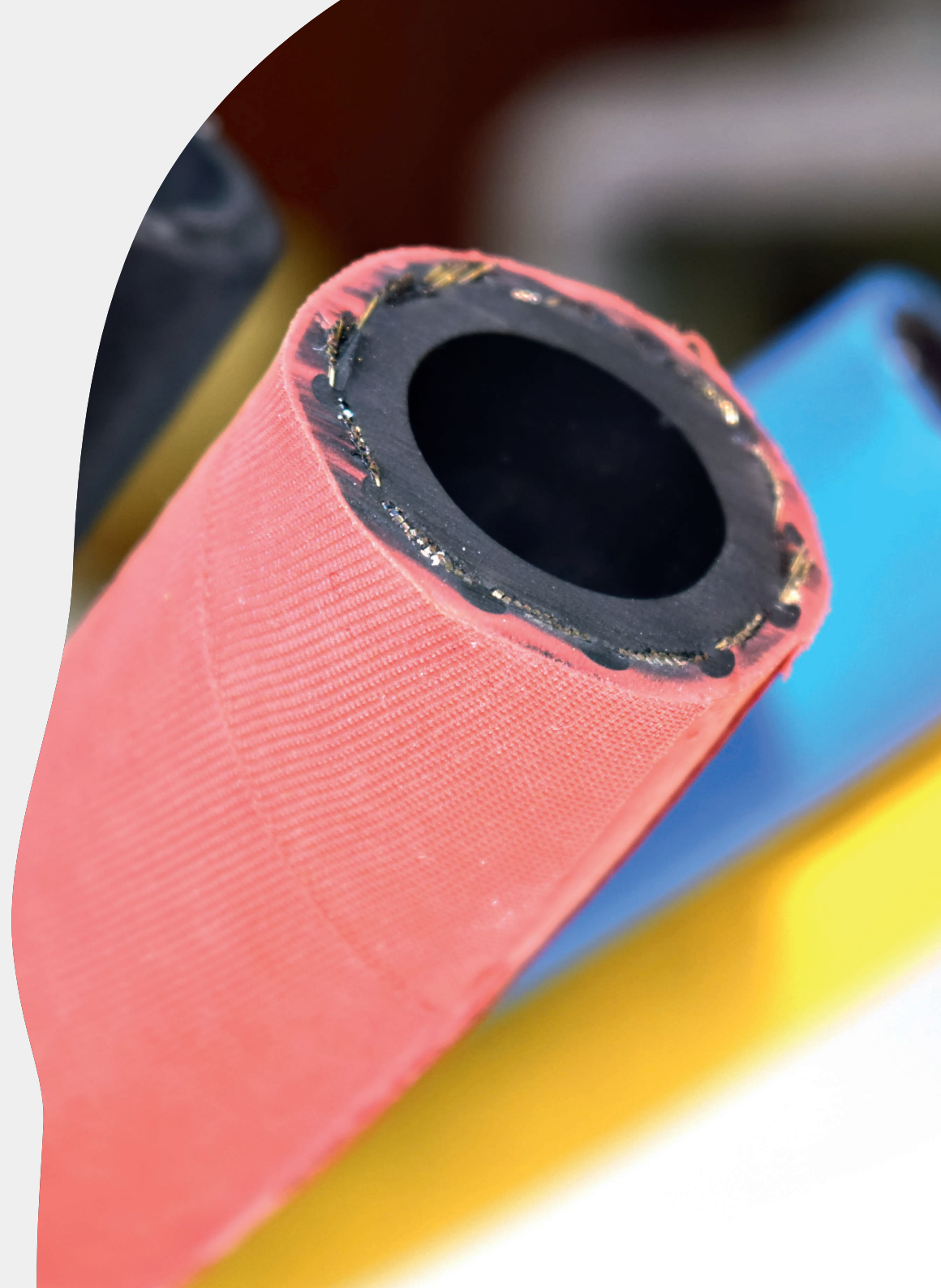
Whatever the case is, the formation of ZnX<sub>2</sub> is hindered by the presence of MgO either during mixing or during crosslinking, dampening in this way the overall curing rate resulting in greater processing stability.

# How does MagPro<sup>®</sup> work?

For being used in manufacturing of rubber cables, MgO must have a high surface activity, preferably a specific surface area greater than 130 m<sup>2</sup>/g. The higher the value, the higher the safety of processing and the properties of the vulcanizate.

The time before vulcanization begins is directly related to the activity of magnesium oxide in the rubber formulation, the larger the surface area of magnesium oxide, the longer it is for the same formulation.

As an approximate guideline, the faster vulcanization occurs, the higher MgO activity should be used.



# Application

Table 1. Chloroprene rubber (CR). Rubber cable sheathing compound

Function	Ingredients	Tradename	Dosage, phr
Rubber	Mercaptan modified rubber (M-type)	Baypren 211	100.0
Acid acceptor	High active MgO	MagPro® 150	4.0
Processing aid	Stearic acid	Rhenofit DDA	1.0
Antioxidant	Diphenylamine derivatives	Suprex	2.0
Reinforcing filler	Kaolin calcined	Carbon black N 774	120.0
Reinforcing filler	Carbon black		2.0
Plasticizer	Aromatic oil		20.0
Processing aid	Paraffin		5.0
Curing activator	Zinc oxide	ZnO	5.0
Curing accelerator	Thiourea derivatives	Rhenogran ETU-80	1.5
Scorch retarder	MBTS	Vulkacit DM	0.5
<b>Total</b>			<b>261.0</b>

Typical formulations for the manufacturing of rubber cables compounds based on halogenated rubbers are presented onwards.

**Curing conditions:** 90 seconds at 160° C in steam.

**Typical properties:**

- Tensile Strength 12,6 MPa.
- Elongation 760%.
- Hardness 56 Shore A.

# Application

Table 2. Chlorinated PE (CPE). Cables and wires compound — Peroxide curing

Function	Ingredients	Tradename	Dosage, phr
Rubber	Chlorinated PE Rubber	TYRIN CM 3630E	100.0
Acid acceptor	High active MgO	MagPro® 150	4.0
Filler	Kaolin calcined	Suprex	50.0
Plasticizers	Aromatic or naphthenic oils	DINP, DIDP, TOTM	5.0
Curing agent	Peroxide	Trigonox 101	2.0
Curing co-agent	Trimethylolpropane trimethacrylate (TMPTMA)	SR 350	2.0
Processing Aids	trimethacrylate (TMPTMA)		1.0
Curing activator	Zinc Oxide	ZnO	5.0
		<b>Итого</b>	<b>169.0</b>

**Curing conditions:** 10 min. at 180°C.

**Typical properties:**

- Tensile Strength 15 MPa.
- Elongation 570%.
- Hardness 78 Shore A.

# Application

Table 3. Chlorosulfonated PE (CSM). Extra Heavy-Duty Colored Mining Cable compound

Function	Ingredients	Tradename	Dosage, phr
Rubber	CSM rubber	Hypalon 40	70.0
Rubber	CSM rubber	Hypalon 4085	30.0
Acid acceptor	High active MgO	MagPro® 150	4.0
Curing activator	Titan dioxide	Ti-Pure R-902	5.0
Filler	Magnesium silicate	Pansil 100	30.0
Reinforcing filler	Precipitated silica	Ultrasil VN3	25.0
Processing aid	Stearic acid		1.0
Processing aid	LMWPE	Struktol PEH-100	1.0
Processing aid	Microcrystalline waxes		3.0
Plasticizer	Phthalic acid esters	DINP, DIDP	20.0
Curing accelerator	Tetramethyl thiuram disulfide	TMTD	2.0
Curing agent	Sulphur		0.5
<b>Итого</b>			<b>191.5</b>

**Curing conditions:** 90 min. at 145°C.

**Typical properties:**

- Tensile Strength 23 MPa.
- Elongation 560%.
- Hardness 70 Shore A.

# MagPro<sup>®</sup> advantages for manufacturing of rubber cables

- Effective acid scavenger, scorch controller, curing agent and heat stabilizer for halogen containing rubber compounds.
- Does not contain critical impurities — sulfates and chlorides.
- Precise and stable particle size distribution.
- Easy substitution in the formulations — MagPro<sup>®</sup> is replaced in a ratio of 1:1 by weight with the previously used type of active magnesium oxide.
- The best price/surface area ratio in the market.
- Wide range of packaging solutions (1 MT big-bags, 20 kg PE bags, pre-weighted 1 kg low melt EVA sachets).
- Safe in transportation, storage, production.
- Stable quality.



By choosing MagPro® 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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