

# TAC & TAICROS®

Crosslinkers for Plastic Applications

## Introduction

Peroxide crosslinking of plastic materials is a growing technology due to increasing requirements for chemical and heat resistance as well as aging stability of the material.

In the plastic industry the main crosslinking technologies are peroxide crosslinking and crosslinking by electron beams. With the peroxide technology the crosslinking process can be combined with the shaping process, but it needs elevated temperatures. Peroxide crosslinking is limited to processing temperatures  $\leq 150$  °C due to limited thermal stability of the peroxides and therefore, is mainly used for polyolefins.

Electron beam crosslinking is a separate process step, which needs special equipment and a separate area with special safety requirements. It is applicable also for polymers with high processing temperatures like polyamide, polyesters etc.

The crosslinking additives TAC, TAICROS® and TAICROS® M improve the crosslinking efficiency and in some cases are even essential to obtain crosslinking (e.g. polyamide or polypropylene).



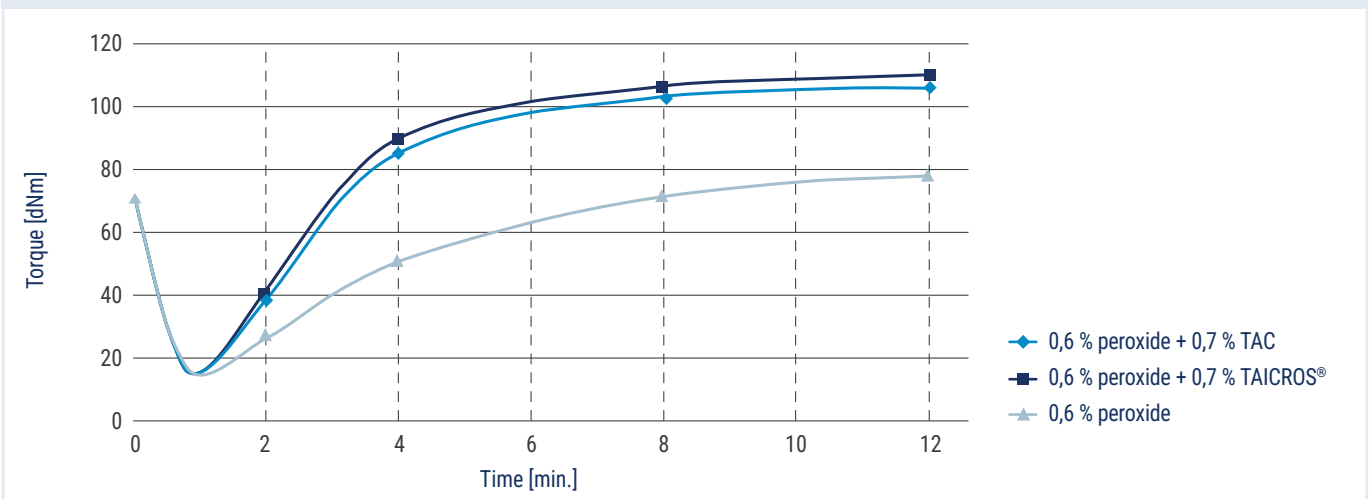
## Advantages of TAC, TAICROS® and TAICROS® M

### Crosslinking of plastic materials

When TAC and TAICROS® are used in combination with peroxides the increase of crosslinking efficiency can be utilized in two directions: on one side TAC or TAICROS® can be added on top of the regular peroxide concentration to increase the crosslinking density and improve all properties aligned with this as e.g. hot set behavior and aging resistance. Additionally, cure speed is increased (see Figure 1).

**Figure 1**

Crosslinking of HD-PE with TAC or TAICROS® (Measurement: Monsanto Rheometer 100 S, at 180 °C, arc 3°)

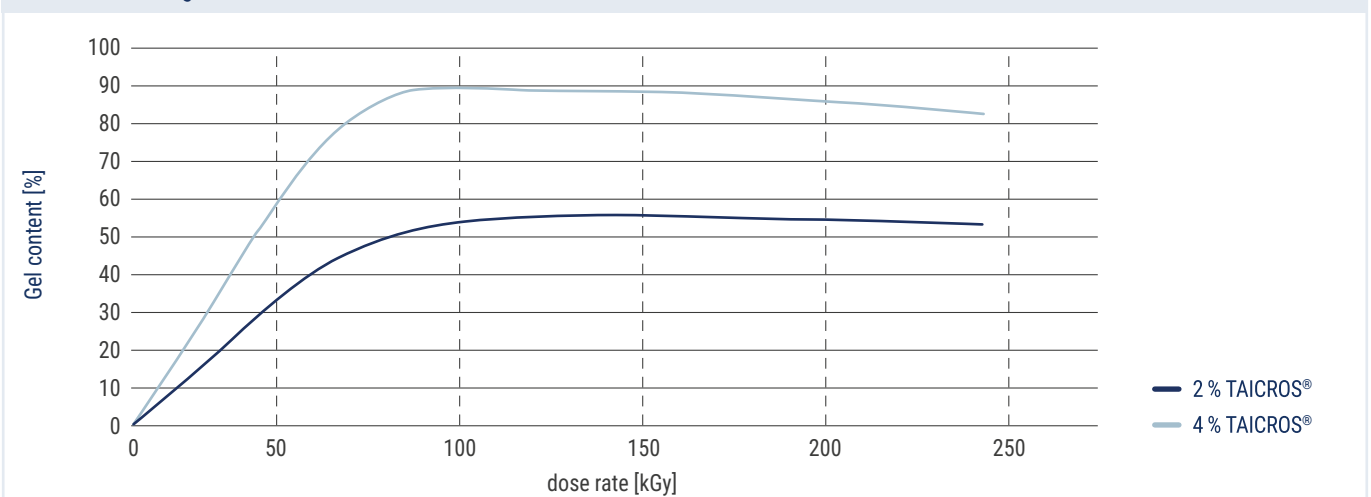


On the other side a part of the peroxide can be replaced by TAC or TAICROS® resulting in the same crosslinking degree. In this case disadvantages associated with peroxides like volatile or toxic byproducts or blooming can be reduced. In e-beam crosslinking of polymers with high processing temperatures like PA6 and PA6.6 TAICROS® and TAICROS® M are essential to enable crosslinking.

TAICROS® M has a higher thermal processing stability and a lower vapor pressure than TAICROS®, which can be required for compounds with very high processing temperatures or longer hold up times. Both additives increase crosslinking speed and efficiency (see Figure 2).

**Figure 2**

E-beam crosslinking of PA with TAICROS®



## Benefits

- Increased crosslinking density
- Excellent chemical resistance and aging properties
- Improved abrasion resistance and stress crack sensitivity
- Increased heat distortion temperature and hot set behavior
- Significant increase in HWI and RTI (UL 746A /UL 746B)

## Applications

*Typical applications of TAC, TAICROS® and TAICROS® M are:*

- Pipes & hoses (e.g. hydraulic, fuel and water)
- Electrical cable insulation and Electrotechnical equipment (e.g. connectors, contact holders, sensor houses, 3D-MID parts, component carriers, coil bobbins)
- Tribological parts (e.g. gear wheels)
- Filaments (for e.g. brushes)
- Membranes
- Electronic packaging materials for 5G applications (e.g. high-end PCB laminates, copper clad laminates, non-epoxy prepregs, and special adhesives)

## Handling and processing safety

TAC and TAICROS® are handled liquid, but can crystallize depending on storage conditions due to their melting point of 27/25 °C. In case they are crystallized, they need to be re-melted before use. Re-melting can be accomplished at max. 40 °C in a heating chamber or a water bath. Careful temperature control is important to avoid overheating and exothermic polymerization.

Complete liquefaction and thorough mixing are essential to ensure a uniform distribution of the stabilizer and thus, to guarantee uniform quality. TAICROS® M is a powder with a melting point of 84 °C.

For compounding the maximum processing temperatures have to be observed (see Table 1). Vacuum systems are required at the extruder due to the vapor pressure of the products.

**Table 1**

Product	CAS No.	Delivery Form	m. p. °C	Purity	Remelting temperature °C	Max. processing temperature °C
TAC	101-37-1	liquid or solid	27	≥ 99,0	max. 40	160
TAICROS®	1025-15-6	liquid or solid	25	≥ 99,0	max. 40	250
TAICROS®M	629-95-8	powder	84	≥ 95,0	n. a.	280

## Storage

TAC, TAICROS® and TAICROS® M should be stored under dry and cool conditions in a well-ventilated area, protected from direct sunlight. Storage temperatures above 40 °C over a longer period of time should be avoided. Under these conditions we guarantee a shelf life of 18 months (TAC) and 24 months (TAICROS®) starting from production date. Our TAICROS® M has a shelf life of 12 months.

## Regulations

TAC, TAICROS® and TAICROS® M are registered under REACH. All products do not contain any SVHC and are in accordance with RoHS guideline 2002/95/EC and its subsequent amendments. Additional information on regulatory aspects is available upon request.

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