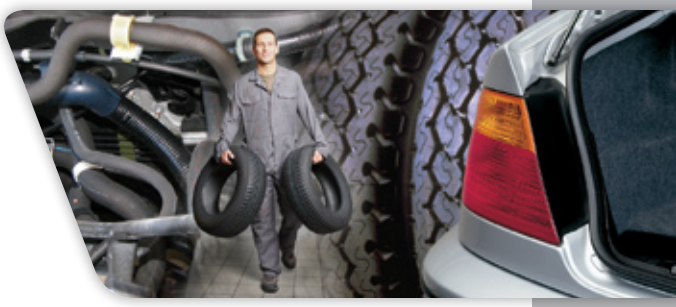
TECHNICAL UPDATE

CRAY VALLEY
Hydrocarbon Specialty Chemicals

Dymalink® 709
Improves Scorch Safety and Promotes High Crosslink Density in Sulfur-Vulcanized Systems



Benefits

- Extends scorch safety and maintains cure rate
- Increases crosslink density (ultimate state of cure)
- Efficient cure activation
- Rationalizes reduced-zinc formulations

Markets/Applications

- Rubber roller compounds
- Automotive tires
- Conveyor belts

Additional Information

MSDS/TDS: Dymalink® 709

Description

Dymalink® 709 demonstrates utility as a functional additive for accelerated sulfur vulcanization. The zinc salt of methacrylic acid can be used in place of traditional zinc oxide/stearic acid activating systems. Benefits include increased scorch safety and elevated crosslink density while maintaining cure rates. Dymalink® 709 may act as a more efficient activator, increasing the quantity of crosslinks while lowering the average sulfur rank of each linkage. By using Dymalink® 709 in the cure package, the compounder can lower reversion and compression set, increase resilience, lower hysteresis and improve the thermal stability of the compound. Dymalink® 709 allows the compounder to achieve the cured properties of a sulfur-donor or efficient sulfur-cure system using a conventional accelerator. Features and typical properties are shown in Table 1 below.

Table 1

Dymalink® 709 Features and Typical Properties

Product Description	Zinc monomethacrylate
Product Features	• Soluble metallic monomer • Potent activator for accelerated sulfur-cure
Physical Form	White powder
Molecular Weight	167
Specific Gravity @ 25C	1.88

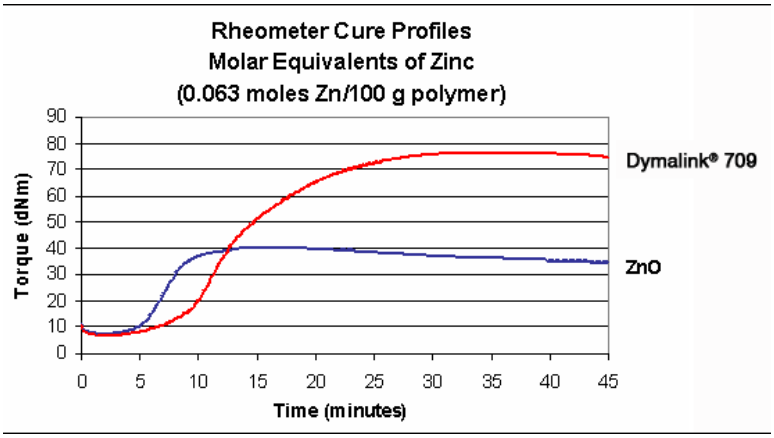
In the model sulfur-cure formulation in Table 2 below, zinc oxide can be replaced with various levels of Dymalink® 709 (zinc monomethacrylate or ZMMA).

Table 2
Model Sulfur-Cure Formulation

	Ingredient	phr
Stage 1	Synthetic PI	100
	N330 Carbon Black	50
	Processing Oil	10
	Zinc Oxide	Variable
	Stearic Acid	Variable
	ZDA, ZDMA, ZMMA	Variable
	Antioxidant	1
Stage 2	TBBS	0.7
	Sulfur	2.5

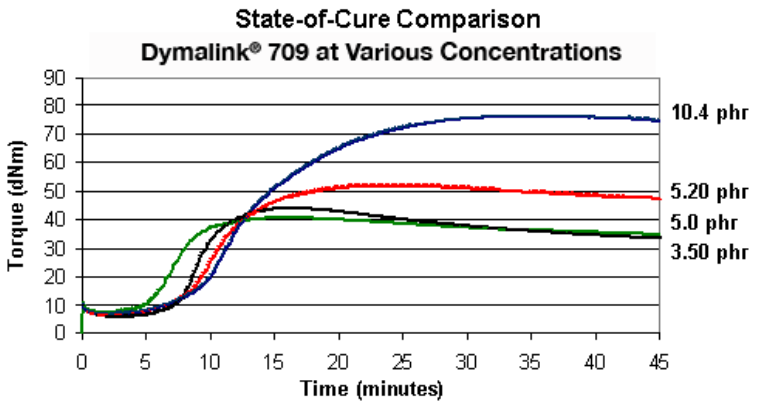
Figure 1 shows a comparison of rheometer cure profiles for Dymalink® 709 and zinc oxide (ZnO) at equivalent molar concentration of zinc. Scorch safety is noticeably improved at similar states of cure.

Figure 1



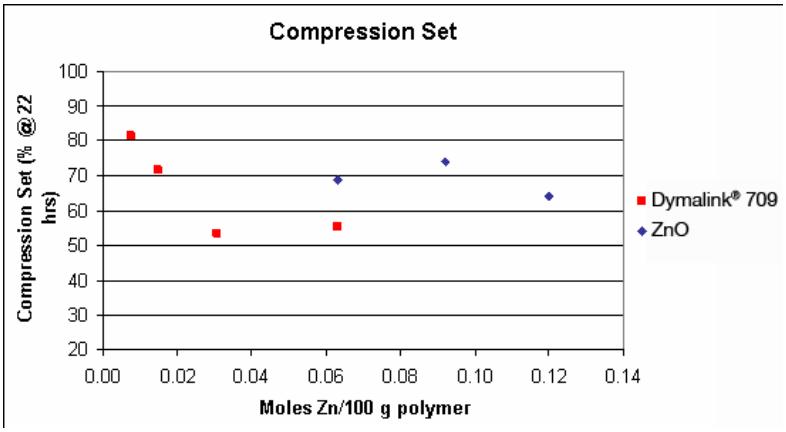
The chart below shows a comparison of elevated levels of Dymalink® 709 and 5 phr ZnO. State of cure continues to improve, while scorch protection is evident at even low levels of Dymalink® 709.

Figure 2



As illustrated in Figure 3 below, at equivalent concentrations of zinc activator, Dymalink® 709 provides lower compression set.

Figure 3



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The benefits of Dymalink® 709 are summarized below.

Benefits Summary

At Equivalent...	*Crosslink Density*	*Zn Concentration*
Dymalink® 709 Provides...	• Improved scorch protection • Reduced Zn activator requirement	• Higher crosslink density • Improved scorch protection • Reduced reversion

*The listed properties are illustrative only, and not product specifications. Cray Valley disclaims any liability in connection with the use of the information, and does not warrant against infringement by reason of the use of its products in connection with other materials or in any process.