TECHNICAL UPDATE

CRAY VALLEY
Hydrocarbon Specialty Chemicals

Ricon® 153 Improves Hardness in Sulfur-Cured EPDM

Benefits

- Greater viscosity reduction in EPDM versus traditional hardening agents
- Excellent compatibility with EPDM and sulfur
- Improved cured properties versus traditional hardening agents

Additional Information

MSDS/TDS: Ricon® 153

Description

Ricon® 153 is an 85% vinyl liquid polybutadiene. Although it is used widely in peroxide-cured EPDM rubber, sulfur-cured EPDM formulations can also benefit by using this material as a high hardness plasticizer and coagent.

Ricon 153 Product Features, Properties, and Regulatory Information

Product	Class	Appearance	Properties	International Inventories
Ricon 153	Polybutadiene Resin	Viscous Liquid	• 85% 1,2 vinyl • 60,000 cps at 45 °C • M_n = 4,700	• TSCA • DSL • AICS • ENCS • ECL • PICCS

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The following table highlights the characteristics of the most commonly used hardening agents.

Resin Characteristics

Resin	Compatibility in EPDM	Compatibility with Sulfur	Level of Thermal Deformation
Ethylene Octene Resin	High	None (fully saturated)	High
High Styrene SBR	Low – Medium	High	High
Phenol Formaldehyde Resin	Low – Medium	Low – Medium (methylene donor typically required)	Low
Ricon 153	**High**	**High**	**Low**

Relative to traditional hardening agents Ricon 153 has greater compatibility with both sulfur and EPDM. Thus, higher levels of sulfur can be incorporated into the rubber formulation. The products listed below were formulated and cured to result in hardnesses between 37 and 46 Shore D.

Test Formulations

Formulation	1	2	3	4	5
Nordel IP 4725 EPDM	100	100	100	**100**	100
Ethylene Octene Resin	-	15	-	-	-
High Styrene SBR	-	-	15	-	-
Ricon 153	-	-	-	**12**	-
Phenol Formaldehyde Resin	-	-	-	-	12
Zinc Oxide	5	→	→	→	→
Stearic Acid	1	→	→	→	→
Carbon Black (N550)	70	→	→	→	→
Calcium Carbonate	60	→	→	→	→
Paraffin Oil	15	→	→	→	→
ZDBC	0.5	→	→	→	→
TBBS	1.5	→	→	→	→
DPTT	0.5	→	→	→	→
TMTD	0.5	→	→	→	→
Vulkalent E/C	1	→	→	→	→
Sulfur	1.5	1.5	1.5	**6**	1.5
HMT – 80% (methylene donor)	-	-	-	-	2

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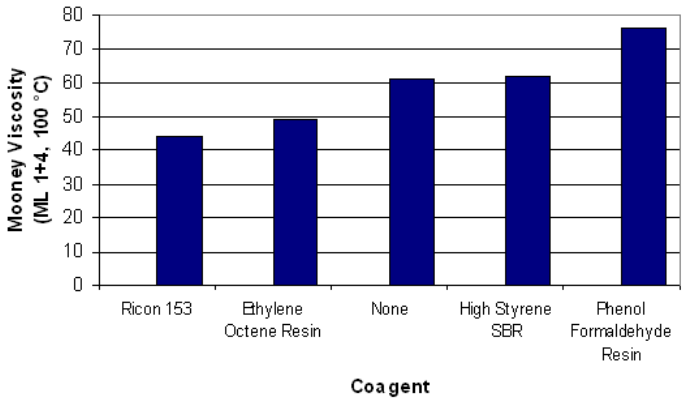
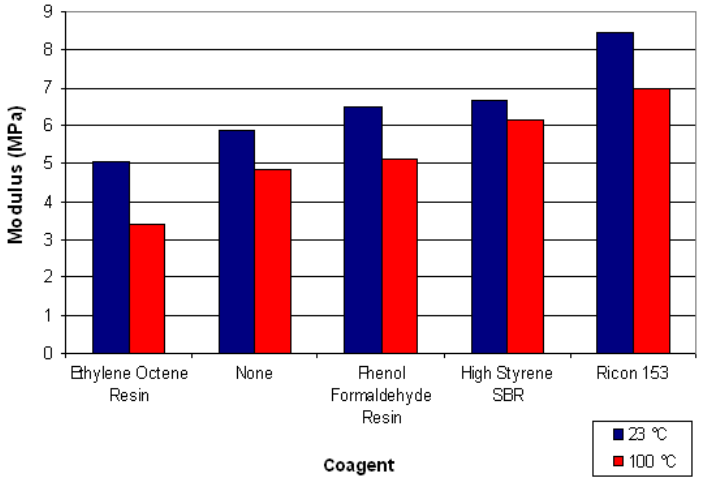
The figure below shows process viscosity values using the four types of hardening agents in EPDM. The system incorporating Ricon 153 shows the largest overall drop in process viscosity. This is especially useful when processing higher ethylene (crystalline) grades of EPDM.

Mooney Viscosity

The graph below shows high- and low-temperature stress values at 100% strain. Again, Ricon 153 shows the strongest performance in EPDM.



Modulus Values at 100% Strain(1)



(1) Cured 12-18 minutes at 160 °

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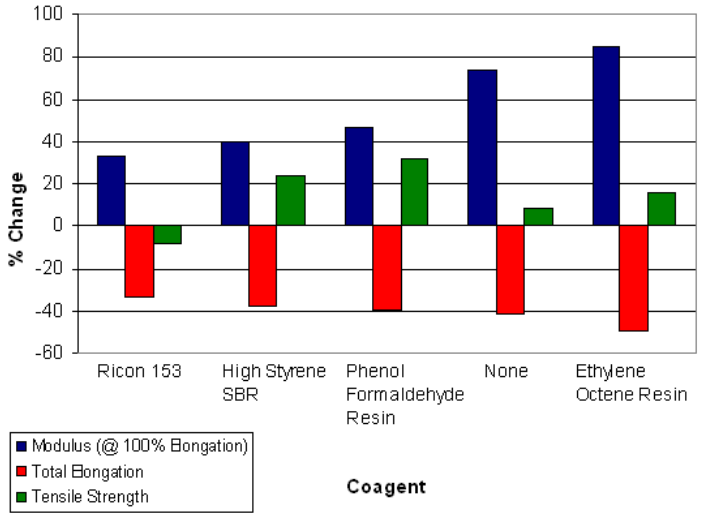
The figure below presents heat-aging data (70 hrs. at 125 °C). Even though a higher level of sulfur is used in the Ricon 153 compound, it has greater stability upon heat aging versus the other resins.

Heat Age Data (70 hrs. at 125 °C) (2)



(2) Cured 12-18 minutes at 160 °C