HVA-2
Curing Agent

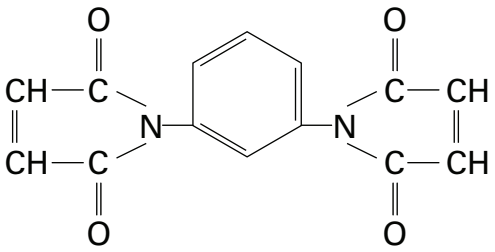
A Curing Agent for Elastomers

Product Information

Features and Benefits

HVA-2 is useful as a curing agent in several elastomers:

- Coagent for peroxide curing systems in ethylene-based elastomers (EPDM, EPM, EVA, EOM), acrylate-based elastomers (AEM, ACM), and chlorinated and chlorosulfonated polyethylene (CPE, CSM)
- Safe processing accelerator for curing of polychloroprene rubber (CR)



Product Description

Chemical Composition	N,N-m-phenylenedimaleimide
Physical Form	Oil Coated Paste
Color	Yellow to light brown
Odor	None
Specific Gravity at 25 °C (77 °F)	1.44
Melting Point, °C (°F), Min.	195 (383)
Dispersion Characteristics	Excellent
Discoloration and Staining	Non-discoloring and non-staining
Storage Stability	Excellent
Solubility, % by weight	
Dimethylformamide	12
Acetone	5
Benzene	0.28
Ethyl Alcohol	0.3
Hexane	1
Carbon Tetrachloride	Insoluble
Water	Insoluble

Handling Precautions

HVA-2 Curing Agent

Please refer to the technical information bulletin, "Handling Precautions for HVA-2 Curing Agent." For additional information, read the Safety Data Sheet (SDS) for HVA-2.

Chemours™

HVA-2 As a Coagent for Peroxide Cures

Multi-functional coagents are frequently used with peroxide curing agents to increase the yield of cross-links and obtain a satisfactory rate and/or state of cure. Although the exact role of a coagent has not been established, it appears to act as a cross-linking bridge between polymer chains.

HVA-2 is useful as a coagent for peroxide curing of EPDM elastomers, where it increases both the rate and state of cure. An example is shown in Table 1; addition of HVA-2 increases tensile strength by 20%, improves resistance to heat aging, and markedly improves resistance to compression set. For a given amount of peroxide, HVA-2 will also shorten the time to achieve 90% cure (t_c90).

Table 1. HVA-2 As a Coagent for Peroxide Curing of EPDM

Compound	4A	4B
Nordel® IP 4570	100	100
Zinc Oxide	5	5
Zinc Stearate	1	1
SRF Carbon Black (N774)	180	180
Paraffinic Oil	75	75
Vulcup® 40KE	6	6
HVA-2	—	1
Stock Properties		
Mooney Scorch, MS at 132 °C (270 °F)		
Minimum Viscosity, units	24	24.5
Time to 10-unit rise, min	>30	18
Vulcanizate Properties		
Press Cured 20 min at 177 °C (351 °F)		
Stress/Strain and Hardness		
Original		
200% Modulus, MPa	3.8	7.0
Tensile Strength, MPa	8.2	9.8
Elongation at Break, %	400	290
Hardness, Durometer A	57	61
After Oven-Aging 7 days at 150 °C (302 °F)		
Tensile Strength, % change	−26	−15
Elongation at Break, % change	+28	+14
Hardness, pts change	+5	+5
Compression Set, Method B, %		
Pellets Cured 24 min at 177 °C (351 °F)		
After 70 hr at 150 °C (302 °F)	30	15

HVA-2 is also a very effective coagent for use in peroxide curing of ethylene acrylic elastomers (AEMs), providing fast cure rates and good cure properties as shown in Table 2.

Table 2. HVA-2 As a Coagent for Peroxide Curing of AEMs

Compound	7A
Vamac® D	100
Naugard® 445	1
Stearic Acid	1.5
Armeen® 18D	0.5
FEF Black (N550)	50
Vulcup® R	2
HVA-2	2
Stock Properties	
Mooney Viscosity	
ML 1 + 4 at 100 °C (212 °F)	37
Mooney Scorch at 121 °C (250 °F)	
Minimum Viscosity, units	13
Time to a 5-unit rise, min	>30
ODR, 180 °C (356 °F), 3° arc, 100 range, 12 min chart	
M_L, dN-m	3
M_H, dN-m	59
t_s2, min	1.3
t_c90, min	6.2
Vulcanizate Properties	
Press Cured 5 min at 193 °C (379 °F)	
Stress/Strain	
Original	
100% Modulus, MPa	3.1
Tensile Strength, MPa	13.2
Elongation at Break, %	370
Hardness, Durometer A	61
Compression Set, Method B, %	
After 70 hr at 150 °C (302 °F)	18
After 168 hr at 150 °C (302 °F)	24
Oil Resistance After Aging 70 hr at 150 °C (302 °F) in IRM903 Oil	
Volume Change, %	54

HVA-2 As a Curative for Polychloroprene Rubber (CR)

The combination of HVA-2 with MBTS or TMTD effectively cures CR, yet provides considerably more processing safety than thiourea curing agents. The effect of 1 phr HVA-2 plus 0.5 phr MBTS in a black loaded CR compound is shown in Table 3. Compared with ethylene thiourea, it provides nearly four times the processing safety and about equivalent physical properties when cured at 177 °C (351 °F). At lower temperatures (e.g., 153 °C [307 °F]), the HVA-2 system is somewhat slower curing than ethylene thiourea.

Table 3. HVA-2 As a Curing Agent in CR

Compound	6A	6B
Neoprene W	100	100
Agerite® Powder	2	2
Magnesia	4	4
SRF Carbon Black (N774)	29	29
Zinc Oxide	5	5
Ethylene Thiourea	0.5	—
MBTS	—	0.5
HVA-2	—	1.0
Stock Properties		
Mooney Scorch, MS at 121 °C (250 °F)		
Time to 10-unit rise, min	9	35
Vulcanizate Properties		
Press Cured at 177 °C (351 °F) for Time Indicated		
Stress/Strain and Hardness—Original		
100% Modulus, MPa		
Cured 5 min	1.7	1.4
Cured 10 min	1.8	1.7
Cured 20 min	1.8	2.2
300% Modulus, MPa		
Cured 5 min	9.4	7.6
Cured 10 min	11.0	10.0
Cured 20 min	12.2	12.8
Tensile Strength, MPa		
Cured 5 min	21.8	23.4
Cured 10 min	22.4	23.8
Cured 20 min	23.2	23.4
Elongation at Break, %		
Cured 5 min	500	580
Cured 10 min	450	470
Cured 20 min	440	450
Hardness, Durometer A		
Cured 5 min	63	60
Cured 10 min	64	63
Cured 20 min	65	66
Press Cured 20 min at 177 °C (351 °F)		
Compression Set, Method B, %		
After 22 hr at 70 °C (158 °F)	8	7
After 22 hr at 100 °C (212 °F)	12	18

Table 4 shows the HVA-2/MBTS cure system is also useful at lower temperatures. The MBTS may be replaced with TMTD for a tighter cure with good safety and shelf life.

Table 4. HVA-2 As a Curing Agent in CR

Compound	7A	7B
Neoprene W	100	100
SRF Carbon Black (N762)	58	58
Stearic Acid	1	1
Agerite Stalite S	2	2
Sundex® 790	10	10
Maglite® D	4	4
Zinc Oxide	5	5
Sulfur	0.25	0.25
HVA-2	1	1
MBTS	0.75	—
TMTD	—	0.75
Stock Properties		
Mooney Scorch, MS at 121 °C (250 °F)		
Minimum Viscosity, units	23	24
Time to 5-unit rise, min	>30	>30
Mooney Scorch at 121 °C (250 °F), Air Oven-Aged 2 weeks at 38 °C (100 °F)		
Minimum Viscosity, units	25	25
Time to 5-unit rise, min	>30	>30
ODR, 160 °C (320 °F), Microdie, 3° arc, 30 min chart		
M_L, N-m	1.6	1.7
M_H, N-m	7.9	9.3
t_s2, min	3.8	4
t_c90, min	23.9	19.2
Vulcanizate Properties		
Press Cured at 160 °C (320 °F), min	29	24
Stress/Strain and Hardness—Original		
100% Modulus, MPa	3.3	3.5
Tensile Strength, MPa	18.7	18.1
Elongation at Break, %	453	385
Hardness, Durometer A	65	66
After Oven-Aging 168 hr at 125 °C (257 °F)		
Tensile, % change	–24	–15
Elongation, % change	–72	–63
Hardness, pts change	19	18
After Aging 70 hr at 100 °C (212 °F) in IRM903 Oil		
Volume Change, %	67	63
Compression Set, Method B, %		
After 70 hr at 100 °C (212 °F)	29	25
Tear Strength, Trouser, kN-m	7.1	6.6

Replaces: HPE-H68554-00-E1102
C-11844 (7/19)