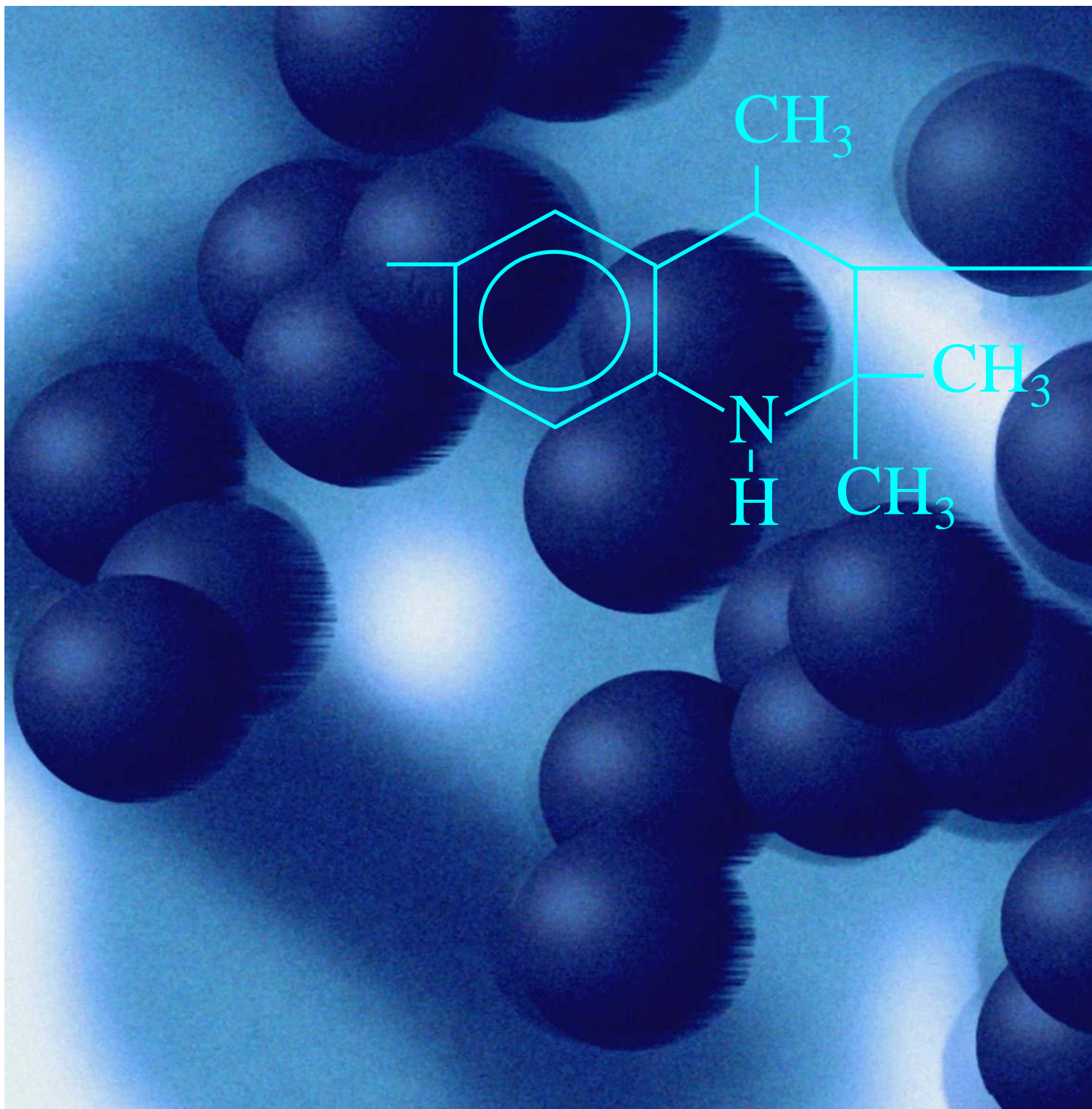


# NAUGARD<sup>®</sup> Q

Antioxidant



**Chemtura Corporation, Technical Business Support**

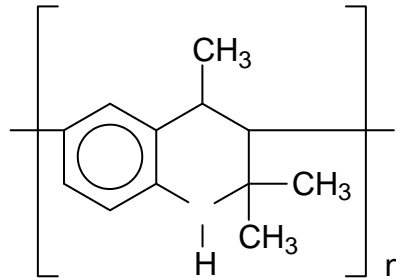
199 Benson Road, Middlebury, CT 06747

[www.chemtura.com](http://www.chemtura.com)

(800) 243-5098 (203) 573-3773 FAX (203) 573-2525



**NAUGARD® Q**  
**Antioxidant**



**Polymerized 1,2-dihydro-2,2,4-trimethylquinoline**

Naugard Q 범용 고품질 노화방지제이다. 본 제품은 주로 천연고무, IR, SBR, polybutadiene, nitrile, EPDM (e.g. Royalene®) 컴파운드에 사용되어 타이어 카카스, 벨트, 호스, 실펴, 기계부품, 신발과 전선케이블에 응용할 수 있다. Naugard Q는 약간 오염이 있고 오존과 굴곡 피로에 대한 적절한 보호효과와 함께 열, 산소에 대해 우수한 보호효과를 준다.

Naugard Q 는 과산화물 혹은 유황가황 시스템에서 사용될 때 NR, SBR, 니트릴, BR, IR과 EPDM 고무의 가교에 영향을 거의 주지 않는다. Neoprene에서 Naugard Q는 가교는 활성화하는 반면, 가공 및 저장 안정성이 감소되는 경향이 있다.

Naugard Q를 포함한 유색 제품은 햇빛에서 황갈색 외관으로 변색된다. 1.0phr은 오염 이동이 거의 없다. 본 제품은 SBR과 NR에서는 8.0phr까지 비교적 불륨하지 않는다.

<b>CAS Number</b>	26780-96-1
<b>Form</b>	Amber powder or drop
<b>Melting range</b>	80-105°C (176-221°F)
<b>Specific Gravity</b>	1.06
<b>Storage Stability</b>	열과 빛원으로부터 떨어져 시원하고 건조한 일반 상태하에서 보관시 약 2년.
<b>Solubility</b>	물, 석유에테르에 불용, 아세톤, 톨루엔 에탄올, 나프타와 클로로포름에 용해.

Naugard<sup>®</sup> Q는 일반 열과 산소로부터의 보호를 위해 1.0 to 2.0 phr 사용 되고, 고온을 위한 노화방지제로써 toluimidazole 같은 시너지 노화방지제와 함께 2:1 조합으로 3.0~6.0 phr 가 사용된다.

서리방지제로써 , 0.5phr의 Naugard Q가 효과적이다.

오존노화방지제로써, 4.0 phr Naugard Q와 함께 10~20phr의 Royalene<sup>®</sup> 301T 같은 EPDM과 조합하여 사용된다.

아래 테이블은 다양한 고무 컴파운드에서 Naugard Q가 노화방지제로써의 쓰임과 효과를 보여준다.

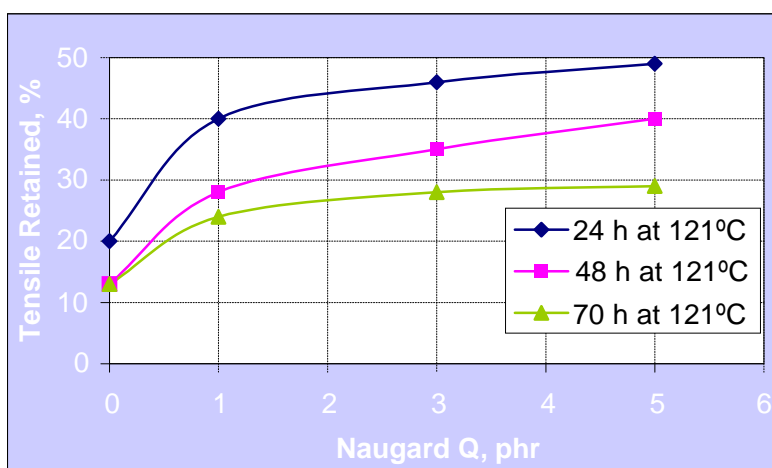
**Table 1**  
**Naugard<sup>®</sup> Q in a Heavy Service Tread Stock**

SMR Rubber	70.0
BR	30.0
N-339 Carbon Black	50.0
Pine Tar	5.0
Zinc Oxide	5.0
Industrene <sup>®</sup> R	3.0
Antioxidant	As indicated
Delac <sup>®</sup> NS	0.5
Sulfur	2.0

Naugard Q	A	B	C	D
	---	1.0	3.0	5.0
<b>Mooney at 132°C (270°F)</b>				
Scorch time, minutes	21.5	19.5	19.0	19.8
<b>Physical Properties</b>				
<b>Cured 15 min. at 160°C (320°F)</b>				
Hardness, Shore A	62	64	65	64
300% Modulus, MPa	10.7	12.1	13.2	11.7
(psi)	(1560)	(1750)	(1920)	(1690)
Tensile Strength, MPa	24.1	22.7	24.6	24.3
(psi)	(3490)	(3280)	(3560)	(3530)
Elongation at Break, %	540	480	500	550

**Table 1, Continued**  
**NAUGARD® Q in a Heavy Service Tread Stock, Aging Data**

Naugard Q	A	B	C	D
	---	1.0	3.0	5.0
<b>Aged 70 hrs at 100°C (212°F)</b>				
Hardness, Points Change	0	+7	+5	+9
Tensile Strength, % Retention	29	54	59	61
Elongation, % Retention	37	48	49	50
<b>Aged 24 hrs at 121°C (250°F)</b>				
Hardness, Points Change	0	+4	+2	+5
Tensile Strength, % Retention	20	40	46	49
Elongation, % Retention	31	43	42	41
<b>Aged 48 hrs at 121°C (250°F)</b>				
Hardness, Points Change	+5	+5	+7	+9
Tensile Strength, % Retention	13	28	35	40
Elongation, % Retention	12	25	25	27
	A	B	C	D
<b>Aged 70 hrs at 121°C (250°F)</b>				
Hardness, Points Change	+11	+8	+7	+11
Tensile Strength, % Retention	13	24	28	29
Elongation, % Retention	8	20	20	18
<b>Aged 90 hrs in O<sub>2</sub> at 70°C (158°F)</b>				
Hardness, Points Change	+8	+5	+6	+5
Tensile Strength, % Retention	27	71	78	81
Elongation, % Retention	17	78	77	78



**Table 2**  
**Naugard<sup>®</sup> Q in a Truck Tire Tread Compound**

SMR 5 CV Rubber	75.0
BR 1203	25.0
N-234 Carbon Black	50.0
Zinc Oxide	5.0
Aromatic Oil	15.0
Industrene <sup>®</sup> R	2.0
Antidegradant	As indicated
Delac <sup>®</sup> NS	0.6
Sulfur	2.1

	<b>E</b>	<b>F</b>	<b>G</b>
<b>Naugard Q</b>	---	<b>2.5</b>	<b>1.5</b>
<b>Sunproof<sup>®</sup> Regular</b>	---	<b>0.5</b>	<b>0.5</b>
<b>Flexzone<sup>®</sup> 7</b>	---	---	<b>1.0</b>
<b>Mooney at 132°C (270°F)</b>			
Scorch time, t3, minutes	22.5	22.8	22.2
<b>Physical Properties</b>			
<b>Cured 10 min. at 177°C (350°F)</b>			
Hardness, Shore A	56	57	56
300% Modulus, MPa	5.9	5.2	5.0
(psi)	(855)	(755)	(725)
Tensile Strength, MPa	18.5	21.0	20.9
(psi)	(2685)	(3045)	(3030)
Elongation at Break, %	570	670	640
<b>Cured 18 min. at 150°C (302°F)</b>			
Hardness, Shore A	58	61	59
300% Modulus, MPa	8.0	7.0	7.0
(psi)	(1160)	(1015)	(1015)
Tensile Strength, MPa	26.6	27.2	26.5
(psi)	(3860)	(3945)	(3845)
Elongation at Break, %	630	670	660

**Table 2, Continued**  
**Naugard<sup>®</sup> Q in a Truck Tire Tread Compound, Aging Data**

	<b>E</b>	<b>F</b>	<b>G</b>
<b>Naugard Q</b>	---	<b>2.5</b>	<b>1.5</b>
<b>Sunproof<sup>®</sup> Regular</b>	---	<b>0.5</b>	<b>0.5</b>
<b>Flexzone<sup>®</sup> 7</b>	---	---	<b>1.0</b>
<b>Aged 2 weeks at 70°C (158°F)</b>			
<b>Cured 10 min. at 177°C (350°F)</b>			
Hardness, Points Change	+6	+6	+6
Tensile Strength, % Retention	64	90	94
Elongation, % Retention	58	72	80
<b>Aged 2 weeks at 70°C (158°F)</b>			
<b>Cured 18 min. at 150°C (302°F)</b>			
Hardness, Points Change	+9	+5	+7
Tensile Strength, % Retention	73	94	96
Elongation, % Retention	68	81	80
<b>DeMattia Dumbbell Extension Testing</b>			
<b>Cured 10 min. at 177°C (350°F)</b>			
Kilocycles to Failure	819	1268	2019
<b>DeMattia Dumbbell Extension Testing</b>			
<b>Cured 18 min. at 150°C (302°F)</b>			
Kilocycles to Failure	450	781	915
<b>Goodrich Flexometer Test</b>			
<b>at Room Temperature</b>			
Temperature Increase, $\Delta T$ , °C	39	60	38



**Table 3**  
**Naugard<sup>®</sup> Q in a Tire Carcass Compound**

NR	60.0
BR 1205	20.0
SBR 1707	27.0
N-660 Carbon Black	50.0
Zinc Oxide	4.0
Naphthenic Oil	7.5
Industrene <sup>®</sup> R	1.5
Octylphenol Formaldehyde	2.0
Resorcinol Condensate	2.0
Antioxidant	As indicated
Methylene Donor	1.00
Naugex <sup>®</sup> MBTS	1.20
DPG	0.25
80% Insoluble Sulfur	3.00

	<b>H</b>	<b>I</b>
<b>Naugard Q</b>	---	<b>1.0</b>
<b>Mooney at 132°C (270°F)</b>		
Scorch time, t3, minutes	11.9	11.6
<b>Physical Properties</b>		
<b>Cured 10 min. at 177°C (350°F)</b>		
Hardness, Shore A	57	56
300% Modulus, MPa	10.5	10.2
(psi)	(1525)	(1480)
Tensile Strength, MPa	19.5	18.8
(psi)	(2830)	(2725)
Elongation at Break, %	450	460
<b>Aged 2 weeks at 70°C (158°F)</b>		
Hardness, Points Change	+5	+4
Tensile Strength, % Retention	63	79
Elongation, % Retention	53	65
<b>DeMattia Flex Testing</b>		
Unaged	133	361
Aged 70 hours at 100°C (212°F)	25	80



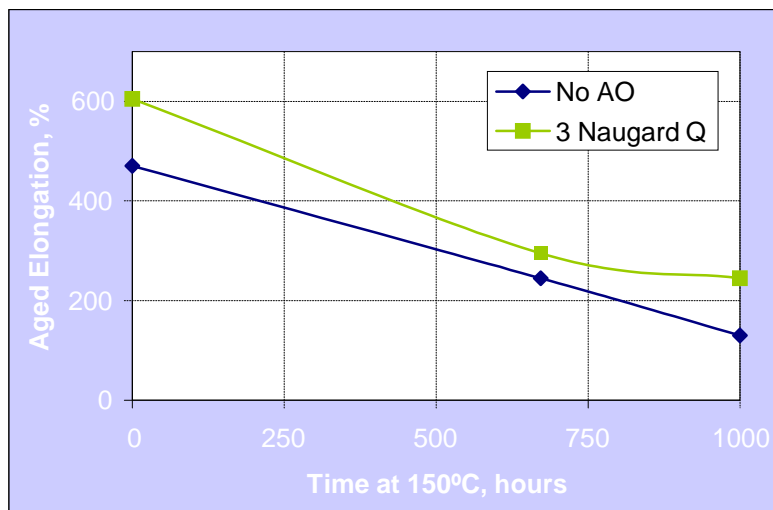
**Table 4**  
**Naugard® Q in an EPDM Compound**

Royalene® 580 HT	100
Hypalon 40 Chlorosulfonated PE	5
Zinc Oxide	20
Antimony Trioxide	5
N-650 Carbon Black	50
Paraffinic Oil	15
SR-350 Coagent	2
DiCup 40-KE	7
Antioxidant	As Indicated

	<b>J</b>	<b>K</b>
<b>Naugard Q</b>	<b>---</b>	<b>3.0</b>
<b>Mooney at 125°C (257°F)</b>		
Scorch time, t <sub>5</sub> , minutes	9.8	12.5
<b>Physical Properties</b>		
<b>Cured 20 min. at 165°C (329°F)</b>		
Hardness, Shore A	66	68
300% Modulus, MPa	7.5	4.7
(psi)	(1090)	(680)
Tensile Strength, MPa	12.5	10.5
(psi)	(1815)	(1525)
Elongation at Break, %	470	605

**Table 4, Continued**  
**Naugard® Q in an EPDM Compound, Aging Data**

Naugard Q	J	K
	---	3.0
<b>Compression Set</b>		
22 hrs. at 125°C (257°F), % set	34	42
<b>Aged 672 hrs. at 150°C (302°F)</b>		
Hardness, Points Change	+12	+8
Tensile Strength, % Retention	54	55
Elongation, % Retention	52	49
<b>Aged 1000 hrs. at 150°C (302°F)</b>		
Hardness, Points Change	+17	+14
Tensile Strength, % Retention	30	49
Elongation, % Retention	28	41



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