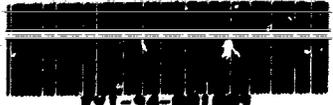


*EX-100-10107*



771-34-20100  
INIT 07/14/94



84940000109

UNIROYAL CHEMICAL  
Division of UNIROYAL, Inc.  
Spencer Street  
Naugatuck, Connecticut 06770

*25022404(1)*

(203) 723-3492

**Contains No CBI**

February 13, 1984

RECEIVED  
OPPT CBI/C  
24 JUL 14 AM 9:20

Mr. Martin Greif  
Executive Secretary  
Toxic Substances Control Act  
Interagency Testing Committee  
401 M Street, SW  
Washington, D.C. 20460

Re: Information Request on Substances Listed in  
the Federal Register of 11/9/83 (Your letter  
of 11/18/83)

Dear Mr. Greif:

*IR-437*

*IR-433B*

We are enclosing information packages on several substances  
that we manufacture. No information is enclosed on CAS  
No: 135-88-6 (PBNA) or 142-59-6 (Nabam) as they are no longer  
production items. Information is also enclosed on CAS No.  
120-78-5 (MBTS) which was not mentioned in your letter of  
11/18/83.

*IR-432*

The following summaries by CAS Number and UNIROYAL nomenclature are enclosed:

- |                           |                 |
|---------------------------|-----------------|
| <i>IR-414A</i> 95-31-8    | DELAC® NS       |
| <i>IR-414B</i> 95-33-0    | DELAC® S        |
| <i>IR-432</i> 120-78-5    | MBTS            |
| <i>IR-438</i> 63451-40-1  | Sodium TKR      |
| <i>IR-447A</i> 3081-01-4  | RROA            |
| <i>IR-447B</i> 61931-82-6 | FLEXZONE® 7L/7F |

We do not believe that the characteristics of these substances warrant priority listing for any extensive testing.

Very truly yours,

*Robert J. Dowling*

Robert J. Dowling  
Product Safety Specialist

RJD/eac

Enclosures

0003

**UNROYAL CHEMICAL**  
Division of UNROYAL, Inc.  
Spencer Street  
Naugatuck, Connecticut 06770

**DELAC® NS (UNROYAL Trade Name)**

**CAS Number: 95-31-8**

**CAS Name : N-tert-butyl-2-benzothiazolesulfenamide**

1. Enclosed are our current Sales Specifications, Material Safety Data Sheet, and Technical Bulletin.
2. Our annual production is in the range of 1-5M lbs. We don't foresee any major trends in production volume.
3. Up to 20 people may be involved in the production of this product. These same people are also involved in other manufacturing operations. Therefore, the number "20" should not be considered to represent man years.

The process is essentially a closed system. The product is made in conventional enclosed reactors, filtered, dried, pelletized and packaged. The only significant potential for worker exposure occurs in the finishing operations. A combination of engineering controls, personal protective equipment, and good workplace practices is used to minimize worker exposure. The entire manufacturing operation is regularly monitored by our Industrial Toxicology Department.

4. The product is sold for use in the rubber industry as a vulcanization accelerator. It is used mostly in hydrocarbon rubbers (SBR, natural, polybutadiene).
5. There is no significant release of the product into the environment during its manufacture. Waste-streams- i.e., filtrate and wash water (containing very small amounts of product) - are disposed of by authorized procedures- e.g., deep well injection at plant site. The nonvolatility of the product precludes the likelihood of air contamination. Functional use of the material results in complex reaction products which are trapped within the rubber polymer matrix. The product alone may break down into mercaptobenzothiazole and tert-butylamine.

(cont'd)

0 0 0 4

6. We do not have any extensive toxicological reports on this substance. Our production and use experience has not indicated any serious adverse effects to humans or the environment.

Our MSDS (attached) summarizes limited toxicology information from various industry sources. In addition, we have enclosed a recent report on the LD<sub>50</sub> of our specific product.

A simple fish bioassay was also run on Delac NS. The TLm for guppies in tap water was 1.5% at 48 hours.

RJD/eac  
2/13/84

0.005

UNIONVYL CHEMICAL CO.  
Division of UNIONVYL, Inc.  
Spencer Street  
Naugatuck, Connecticut 06770

UNIONVYL Emergency Phone 203/723-3570  
CHEMTREC Transportation Emergency Phone: 800/424-9300

# MATERIAL SAFETY DATA SHEET

## I. IDENTIFICATION

Trade Name: DELAC<sup>®</sup> NS

CAS Number: 95-31-8

Chemical Name(s):

Chemical Family: Thiazole

N-tert-butyl-2-benzothiazole  
sulfenamide

DOT Ident. No.: NA

DOT Hazard Class: NA

DOT Proper Shipping Name: NA

## II. PHYSICAL DATA

Appearance: Buff-colored powder

Melting Point: 104°C

Odor: Slight amine odor

Boiling Point: NA

Solubility:

Specific Gravity (H<sub>2</sub>O = 1): 1.29

Water: Insoluble

Vapor Pressure @ 20° C: NA

Other: Soluble in most organic solvents

Vapor Density (Air = 1): NA

pH: NA

Volatility @ 70° F: Low

Other Data:

## III. FIRE AND EXPLOSION HAZARD DATA

Flash Point: > 200°F (TCC)

Autoignition Temp: 660°F (dust cloud)

Extinguishing Media: Water fog, foam, CO<sub>2</sub>

Flammable Limits in Air: ND

Special Fire Fighting Procedures: Protect against inhalation of combustion products.

Unusual Hazards: None

## IV. REACTIVITY DATA

Stability: Stable at ambient temperatures and pressures.

Incompatibility: Strong oxidizing agents and acids.

Decomposition Products: Oxides of carbon, nitrogen and sulfur under burning conditions. Tertiary butylamine may be liberated under hot processing conditions.

Unionvyl makes no representation or warranty with respect to the information in this Material Safety Data Sheet. The information is however, as of this date provided, true and accurate to the best of Unionvyl's knowledge. This list of information is not intended to be all inclusive. Actual conditions of use and handling may require considerations of information other than, or in addition to, that which is provided herein.

**V. SPECIAL PROTECTION INFORMATION**

**Engineering Controls:** Local exhaust ventilation strongly recommended.

**Personal Protection Equipment:** Avoid all personal contact. Observe good personal hygiene. Impervious gloves & goggles should be worn when handling. In the absence of adequate ventilation NIOSH-approved respiratory protection for dust or organic vapor should be used as appropriate.

**VI. STORAGE, SPILLS, AND DISPOSAL INFORMATION**

**Storage:** Store in a cool, dry place away from sources of heat. Keep containers closed.

**Spills:** Sweep or vacuum up. Avoid creating dust. Put into secure containers for proper disposal. Use personal protective equipment as outlined above.

**Disposal:** In accordance with any applicable local, state or federal regulations regarding organic waste.

**Environmental Information:**

The environmental effects have not been determined for this material.

**VII. HEALTH RELATED DATA**

**Specific Hazard(s):** Overexposure may result in sensitization or irritation.

**First Aid Procedures:** If eye contact occurs, flush with water for 15 minutes and get medical attention. For skin exposure, wash well with soap and water.

**Toxicology Information:** Oral LD<sub>50</sub> (rats): > 10,000 mg/kg  
Dermal LD<sub>50</sub> (rabbits): > 6000 mg/kg  
Dermal Irritation (rabbits): slight  
Eye Irritation (rabbits): slight  
**Mutagenicity:** (Ames Salmonella): negative  
(E. coli): negative  
(L5178Y Mouse Lymphoma): positive  
(CHO Cytogenetics): negative  
Cell Transformation - (Balb 3T3): positive

Human patch testing indicates that dermal sensitization or cross sensitization may occur due to overexposure to this material.

For further information, contact Uniroyal Industrial Toxicology Department. (803/723-3492)

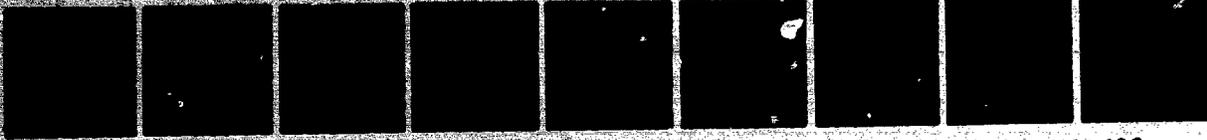
ND: Not Determined

N/A: Not Applicable

Date: Oct. 5, 1983  
Revised

INDUSTRIAL CHEMICAL  
DIVISION of UNION CARBIDE, Inc.  
Parsippany, Connecticut 06779

**Naugat'ck' Chemicals**



ISSUED 5/4/66  
REVISED 5/3/79

SALES SPECIFICATION

DELAC NS NAUGETS

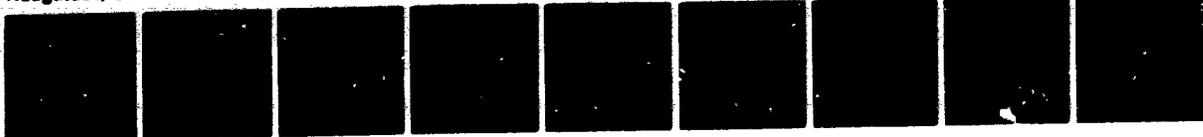
N-t-Butyl-2-Benzothiazole Sulfenamide

<u>TEST</u>	<u>MINIMUM</u>	<u>MAXIMUM</u>	<u>TEST METHOD</u>
Melt Point °C	104		G-1
Ash, %	-	0	G-18-A
Moisture, % (S&D)	-	0.5	G-24
Ether Insolubles, %	-	1.0	G-68
Color and Appearance	Buff colored rods		
Odor	Characteristic		

JAS/mt  
5/3/79

The recommendations for the use of our products are based on tests believed to be reliable. However, we do not guarantee the results to be obtained by others under different conditions. Nothing in this brochure is intended as a recommendation to use our products so as to infringe on any patent.



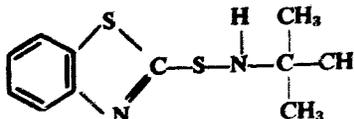


**DELAC® NS**

**Delayed Action Accelerator**

**CHEMICAL NAME AND STRUCTURE**

N-tert butyl-2-benzothiazole sulfenamide



**PHYSICAL PROPERTIES**

- Form:** ..... A light tan powder or flake
- Specific Gravity:** ..... 1.29
- Melting Range:** ..... Not less than 104°C.
- Storage Stability:** ..... Good
- Solubility:** ..... Soluble in acetone, benzol, alcohol, chloroform, ether and naphtha. Insoluble in water. Moderately soluble in n-hexane.

**Handling Precautions:** Normal handling precautions should be observed: Toxicity studies with animals have indicated no health hazards under normal industrial use.

**FDA Approval** ..... DELAC NS is approved under FDA Regulation 121.2562 up to 1.5% limit.

**COMPOUNDING PROPERTIES**

- Curing Range:** ..... Very long.
- Activity:** ..... A delayed action type which is very safe at processing temperatures but produces high modulus stocks at curing temperatures.
- Activation:** ..... By thiurams, dithiocarbamates, aldehyde amines, guanidines, and BIK. Acidic materials also activate.
- Discoloration:** ..... Nondiscoloring and nonstaining both to rubber stocks and materials in contact with them.
- Vulcanizing Aids:** ..... Requires fatty acids, zinc oxide and sulfur in normal amounts.

**RECOMMENDED USES**

**Type / Stock:** ..... Tire treads, carcass, mechanicals and wire jackets.

Amounts to use based on 100 R.H.C.

In Natural Rubber	DELAC NS	DPG	MONEX®	Sulfur
Tire Treads .....	0.5	—	—	2.5
Tire Carcasses .....	0.65	—	—	2.75
Mechanicals .....	0.75	0.3	—	3.0
<b>In Synthetic Rubbers</b>				
SBR/BR Treads .....	1.1	—	—	1.75
SBR Sidewalls .....	1.0	0.25	—	2.25
SBR Mechanicals .....	1.0	0.375	—	2.25
SBR Mechanicals .....	1.0	—	0.125	2.25
SBR Wire Jackets .....	1.5	—	0.25	2.0
Nitrile (PARACRIL®) Stocks .....	0.75	—	—	1.5

### HEAVY SERVICE TRUCK TREAD

As the speed of processing increases, it sometimes becomes necessary to use more delayed-action accelerators in tire compounds. DELAC NS is a special delayed-action accelerator, for optimum physical properties and satisfactory freedom from scorch. The following is a typical natural rubber tread stock:

Smoked Sheets.....	100.0	Pine Tar .....	5.0
HAF-Black (N 330).....	50.0	FLEXZONE® 5L.....	2.0
Zinc Oxide.....	4.0	DELAC NS .....	0.5
Stearic Acid .....	2.5	Sulfur.....	2.5

Mooney Scorch @ 270° F..... 11' (3 point rise)  
 Cure Rate..... 1.5' (Additional 20 point rise)

	Cure @ 292°F.		Cure @ 265°F.	
300% Modulus, psi .....	20'	1400	45'	1750
	30'	1710	60'	1940
	45'	1990	90'	2210
	90'	2140	120'	2540
Tensile Strength, psi.....	20'	4010	45'	4370
	30'	4010	60'	4200
	45'	3980	90'	4200
	90'	3850	120'	4200
Elongation, % .....	20'	610	45'	610
	30'	550	60'	550
	45'	520	90'	510
	90'	480	120'	470
Shore A.....	20'	61	45'	63
	30'	66	60'	65
	45'	67	90'	67
	90'	70	120'	70
Free Sulfur.....	20'	.44	45'	.45
	30'	.36	60'	.45
	45'	.11	90'	.18
	90'	.13	120'	.18

### TYPICAL HIGHWAY TRUCK TREAD

Smoked Sheets.....	50.0	Process Oil .....	10.0
Cis-4 Polybutadiene .....	50.0	FLEXZONE 5L .....	2.0
ISAF Black (N220) .....	60.0	DELAC NS .....	0.6
Zinc Oxide.....	3.0	Sulfur.....	2.25
Stearic Acid .....	1.0		

Mooney Scorch @ 270° F..... 16' (3 point rise)  
 Cure Rate..... 5' (Additional 20 point rise)

### TYPICAL HIGHWAY TRUCK TREAD

	Cure @ 292°F.		Cure @ 265°F.	
300% Modulus, psi .....	15'	760	—	—
	30'	1410	30'	960
	45'	1680	45'	1450
	90'	1600	90'	1690
Tensile Strength, psi .....	15'	2600	—	—
	30'	3290	30'	2930
	45'	3240	45'	3560
	90'	3130	90'	3360
Elongation, % .....	15'	670	—	—
	30'	540	30'	650
	45'	490	45'	580
	90'	460	90'	480
Shore A .....	15'	50	—	—
	30'	58	30'	45
	45'	61	45'	58
	90'	60	90'	60

### GENERAL PURPOSE SBR COMPOUND

SBR-1500 .....	100.0	Naphthenic Oil .....	10.0
ISAF Black (N220) .....	50.0	FLEXZONE 5L .....	2.0
Zinc Oxide .....	2.5	DELAC NS .....	1.25
LAUREX® .....	1.5	Sulfur ....	1.75

Mooney Scorch @ 280° F. .... 16' (3 point rise)  
 Cure Rate .....

Cure @ 292°F.	Unaged	Aged 24 hrs. @ 212°F.		Cure @ 330°F.	Unaged	Aged 24 hrs. @ 212°F.	
300% Modulus, psi .....	—	—	—	10'	1330	2610	
	30'	1490	2570	15'	1620	2480	
	45'	1800	2420	20'	1630	2270	
	60'	1750	2280	30'	1600	2190	
Tensile Strength, psi .....	—	—	—	10'	3200	2980	
	30'	3410	2770	15'	3330	2960	
	45'	3650	3250	20'	3350	3060	
	60'	3530	3100 (88%)	30'	3390	3130 (93%)	

**GENERAL PURPOSE SBR COMPOUND**

Cure @ 292°F.	Aged 24 hrs. @ 212°F.		Cure @ 330°F.	Aged 24 hrs. @ 212°F.	
	Unaged	Unaged		Unaged	Unaged
Elongation, %	—	—	10'	590	310
	30'	570	15'	550	330
	45'	540	20'	530	370
	60'	520	30'	550	410 (75%)
Shore A	—	—	10'	58	68
	30'	61	15'	58	68
	45'	61	20'	59	68
	60'	64	30'	58	68
Goodrich Flexometer Δ°F.	30'/292°F. -59°F.		20'/330°F. -59°F.		
150 psi—.125 Stroke—R.T.					

Additional processing safety with DELAC NS can be obtained by the use of RETARDER J. This is illustrated in the following general purpose SBR Compound.

SBR 1500	100.0	100.0	FLEXZONE 5L	2.0	2.0
ISAF Black (N220)	50.0	50.0	DELAC NS	1.25	1.25
Zinc Oxide	2.5	2.5	NAUGATUCK®	—	1.0
LAUREX	1.5	1.5	Sulfur	1.75	1.75
Naphthenic Oil	10.0	10.0			

**Mooney Scorch @ 280°F.**

Scorch Time	16'	21'
Cure Rate	9'	9'

**Unaged Physical Properties**

Cure @ 330°F.	300% Modulus—psi		Cure @ 330°F.	300% Modulus—psi	
	10'	15'		10'	15'
10'	1330	1140	10'	540	650
15'	1620	1370	15'	550	590
30'	1600	1490	30'	550	540

Tensile Strength—psi	300% Modulus—psi		Shore A Hardness	300% Modulus—psi	
	10'	15'		10'	15'
10'	3200	3130	10'	58	55
15'	3330	3350	15'	58	57
30'	3390	3270	30'	58	58

The recommendations for the use of our products are based on tests believed to be reliable. However, we do not guarantee the results to be obtained by others under different conditions. Nothing in this brochure is intended as a recommendation to use our products so as to infringe on any patent.



# MB Research Laboratories, Inc.

Delac NS

PROJECT NUMBER: MB 83-6805 A  
TEST ARTICLE : Delac NS CN 0215451  
SPONSOR : UNIROYAL, INC.  
TITLE : ORAL LD 50 DETERMINATION IN RATS  
PROTOCOL # : 3-01 R/A

steinsburg and wertz roads  
post office box 178  
spinnerstown, pennsylvania 18968  
215-536-4110

## ABSTRACT

Method Synopsis - Ten healthy male albino rats were dosed orally with Delac NS CN 0215451 at 5.0 g/kg of body weight. The rats were observed daily for 14 days for mortality and toxicity.

Summary - All animals survived the 5.0 g/kg oral dose in generally good health.

Conclusion - The LD 50 is greater than 5.0 g/kg of body weight. Therefore, the test article is not toxic as defined in 16 CFR 1500.3(c)(2)(i).

## QUALITY ASSURANCE EVALUATION

The quality assurance unit reviewed various aspects of the study, raw data and final report on the following dates:

August 10, 1983  
August 25, 1983  
August 26, 1983  
October 10, 1983  
October 11, 1983

*Bonnie W. Cerven* 10/11/83  
Bonnie W. Cerven  
Quality Assurance

Respectfully submitted,

*Oscar M. Moreno* 10/12/83  
Oscar M. Moreno, Ph.D.

*Daniel P. Cerven* 10 Oct 83  
Daniel P. Cerven, Study Director

*Elizabeth J. Altenbach* 8/16/83  
Elizabeth J. Altenbach, Archivist

Submitted: 10/14/83

MB

TITLE OF REPORT

ORAL LD 50 DETERMINATION IN RATS

PROTOCOL NUMBER

3-01 R/A

OBJECTIVE

To determine the oral dose level of the test article which is likely to result in the death of 1/2 of the treated animals. This study was designed to comply with the standards set forth by FHSA, 16 CFR 1500.3 (c)(2)(i).

TEST ARTICLE

Source and Date Received : UNIROYAL, INC. 7/28/83  
 Label : Delac NS CN 0215451  
 Storage : The test article was stored at ambient room temperature and humidity.  
 Description of Test Article : Light Beige Powder  
 Specific Gravity : Not Applicable  
 Sample Preparation : 15 g of test article was mixed with Mazola Oil to a total volume of 30 ml (50%) and dosed from a stir plate.

TEST ANIMALS

Ten healthy male Wistar Albino rats/group were selected for this test from a larger group which had been quarantined at least one week. The animals were received from Ace Animals on 8/02/83.

The pretest body weight range was 206 - 247 g.

The animals were identified by cage notation.

The animals were housed 5/cage in suspended wire mesh cages. Bedding was placed beneath the cages. Fresh Purina Rat Chow (Diet #5012) was freely available except for 16-20 hours prior to dosing. Water was freely available at all times.

The animal room, reserved exclusively for rats on acute tests, was temperature and humidity controlled, had a 12 hour light/dark cycle and was kept clean and vermin free.

TEST DATES

<u>DOSE</u> <u>g/kg</u>	<u>DATE STARTED</u>	<u>DATE ENDED</u>
5.0	8/10/83	8/24/83

EXPERIMENTAL DESIGN

The test article was administered orally, one time, by syringe and dosing needle on a g/kg basis. For liquid materials, the dose was based on the sample weight as calculated from the specific gravity. For solids and semi-solids, the test article was mixed with a vehicle to make dosing by gavage possible. The dose was based on the dry weight of the test article. The dose schedule follows:

<u>GROUP</u>	<u>DOSE</u> <u>g/kg</u>	<u>NUMBER OF ANIMALS</u> <u>MALES</u>
Delac NS CN 0215451	5.0	10

TYPE AND FREQUENCY OF OBSERVATION

In Vivo : Animals were observed 3-4 hours post dosing and once daily thereafter for 14 days for mortality, toxicity and pharmacological effects.

Post Mortem : No examination for gross pathology was performed.

ANALYSIS OF DATA

The LD 50 and 95% Confidence were calculated by the method of Litchfield, J.T. Jr., & F. Wilcoxon JPET 96:99, 1949.

The test article was; 1) not toxic if the LD 50 was greater than 5.0 g/kg; 2) toxic if the LD 50 was less than 5.0 g/kg and greater than 50 mg/kg; 3) highly toxic if the LD 50 was less than 50 mg/kg.

RETENTION OF DATA

The raw data is filed at MB Research by MB project number. The final report is filed at MB Research by sponsor name and MB project number.

The test article will be retained for six months from date of this report.

0015

GOOD LABORATORY PRACTICES

This study was conducted in accordance with the Good Laboratory Practices Regulations of the FIFRA effective 6/20/79, TSCA proposed 5/9/79 and FIFRA proposed 4/18/80.

REVISION OF THE PROTOCOL

As per client request, an LD 50 was not performed.

RESULTS

1. LD 50:

The LD 50 is greater than 5.0 g/kg of body weight.

2. MORTALITY:

<u>Dose Level</u> <u>g/kg</u>	<u># Treated</u>	<u># Dead</u>
5.0	10	0

3. PHYSICAL SIGNS:

One animal exhibited chromodacryorrhea on Days 2 thru 4 and one animal exhibited chromohemorrhhea on Day 2. At all other times, all animals were normal during the observation period.

**UNIROYAL**

**UNIROYAL CHEMICAL**  
Division of UNIROYAL, Inc.  
Spencer Street  
Naugatuck, Connecticut 06770

DELAC® S (UNIROYAL Trade Name)

CAS Number: 95-33-0

CAS Name : N-cyclohexyl-2-benzothiazolesulfenamide

1. Enclosed are our current Sales Specifications, Material Safety Data Sheet, and Technical Bulletin.
2. Our annual production is in the range of 1-5M lbs. We don't foresee any major trends in production volume.
3. Up to 20 people may be involved in the production of this product. These same people are also involved in other manufacturing operations. Therefore, the number "20" should not be considered to represent man years.

The process is essentially a closed system. The product is made in conventional enclosed reactors, filtered, dried, pelletized, and packaged. The only significant potential for worker exposure occurs in the finishing operations. A combination of engineering controls, personal protective equipment, and good workplace practices is used to minimize worker exposure. The entire manufacturing operation is regularly monitored by our Industrial Toxicology Department.

4. The product is sold for use in the rubber industry as a vulcanization accelerator. It is used mostly in hydrocarbon rubbers (SBR, natural, polybutadiene).
5. There is no significant release of the product into the environment during its manufacture. Waste-streams - i.e., filtrate and wash water (containing very small amounts of product) - are disposed of by authorized procedures - i.e., deep well injection at plant site. The nonvolatility of the product precludes the likelihood of air contamination. Functional use of the material results in complex reaction products which are trapped within the rubber polymer matrix. The product alone may break down into mercaptobenzothiazole and cyclohexylamine.

(cont'd)

6. We do not have any extensive toxicological reports on this substance. Our production and use experience has not indicated any serious adverse effects to humans or the environment.

Our MSDS (attached) summarizes limited toxicology information from various industry sources.

RJD/eac  
2/13/84

**UNIDROYAL**

**UNIDROYAL CHEMICAL CO.**

Division of UNIDROYAL, INC.  
Spencer Street  
Naugatuck, Connecticut 06770

UNIDROYAL Emergency Phone 203/723-3670  
CRENTREC Transportation Emergency Phone: 800/424-9300

# MATERIAL SAFETY DATA SHEET

## I. IDENTIFICATION

Trade Name: DELAC<sup>®</sup>S

CAS Number: 95-33-0

Chemical Name(s): N-cyclohexyl-2-benzothiazole sulfenamide

Chemical Family: Thiazole

DOT Ident. No.: NA

DOT Hazard Class: NA

DOT Proper Shipping Name: NA

## II. PHYSICAL DATA

Appearance: Cream to light tan powder

Melting Point: 95°C (min)

Odor: slight <sup>or prills</sup> amine odor

Boiling Point: NA

### Solubility

Specific Gravity (H<sub>2</sub>O = 1): 1.27

Water: Insoluble

Vapor Pressure @ 20° C: NA

Other: Soluble in most organic solvents

Vapor Density (Air = 1): NA

pH: NA

Volatility @ 70° F: Low

Other Data:

## III. FIRE AND EXPLOSION HAZARD DATA

Flash Point: 270°F (TCC)

Autoignition Temp: 662°F (dust powder)

Extinguishing Media: Water fog, foam, CO<sub>2</sub>

Flammable Limits in Air: ND

Special Fire Fighting Procedures: Protect against inhalation of combustion products.

Unusual Hazards: Cyclohexylamine may be liberated above 130°C (266°F).

## IV. REACTIVITY DATA

Stability: Stable at ambient temperatures and pressures.

Incompatibility: Strong oxidizing agents.

Decomposition Products: Oxides of carbon, nitrogen and sulfur under burning conditions. Cyclohexylamine may be emitted under hot processing conditions.

Unidroyal makes no representation or warranty with respect to the information in this Material Safety Data Sheet. The information is however, as of this date provided, true and accurate to the best of Unidroyal's knowledge. This list of information is not intended to be all inclusive. Actual conditions of use and handling may require consideration of information other than, or in addition to, that which is provided herein.

## V. SPECIAL PROTECTION INFORMATION

**Engineering Controls:** Local exhaust ventilation strongly recommended.

**Personal Protective Equipment:** Avoid all personal contact. Observe good personal hygiene. Impervious gloves & goggles should be worn when handling. In the absence of adequate ventilation, NIOSH approved respiratory protection for dusts or organic vapors should be used as appropriate.

## VI. STORAGE, SPILLS, AND DISPOSAL INFORMATION

**Storage:** Store in cool, dry place away from sources of heat. Keep containers closed. Product may degrade during storage to release mercapto-benzothiazole and cyclohexylamine.

**Spills:** Sweep or vacuum up. Avoid creating dust. Put into secure containers for proper disposal. Use personal protective equipment as outlined above.

**Disposal:** In accordance with any applicable local, state or federal regulations regarding organic waste.

**Environmental Information:** The environmental effects have not been determined for this material.

## VII. HEALTH RELATED DATA

**Specific Hazard(s):** Over exposure may result in sensitization or irritation.

**First Aid Procedures:** If eye contact occurs, flush with water for 15 minutes and get medical attention. For skin exposure, wash well with soap and water.

### Toxicology Information:

Oral LD<sub>50</sub> (rats): >5000 mg/kg  
Dermal LD<sub>50</sub> (rabbits): >2000 mg/kg  
Dermal Irritation (rabbits): None  
Eye Irritation (rabbits): Slight

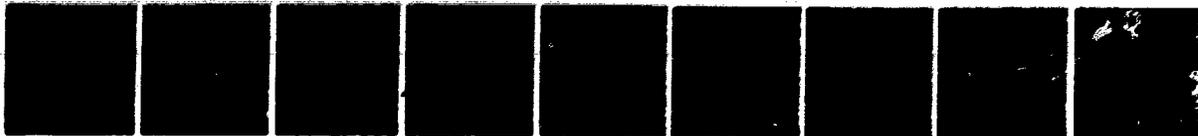
Human exposure indicates that over exposure to DELAC S may result in a sensitization reaction. This may be the result of cross sensitization with other chemicals used in the rubber industry or sensitivity to the compound itself.

For further information, contact Unroyal Industrial Toxicology Department. (903/723-3482)

ND: Not Determined

NA: Not Applicable

Date: December 1, 1982

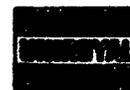
**UNROYAL CHEMICAL**Division of UNROYAL, Inc.  
Naugatuck, Connecticut 06770**Naugatuck Chemicals**Issued 12/13/62  
Rev. 10/3/75**SALES SPECIFICATION**

DELAC S Naugets

**N-Cyclohexyl-2-Benzothiazole Sulfenamide**

<u>TEST</u>	<u>MINIMUM</u>	<u>MAXIMUM</u>	<u>TEST METHOD</u>
Melt Point, °C final	97	-	G-1
Ash, %	-	0.5	G-18-A
Moisture, % ( S & D )	-	0.5	G-24
Methanol Insolubles, %	-	3	G-68
Color and Appearance	Cream to light tan rod		
Odor	Characteristic		

JAS:lmh

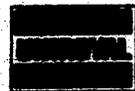


**UNROYAL CHEMICAL**  
Division of UNROYAL, Inc.  
Naugatuck, Connecticut 06770

**Delac-S**  
**Naugatuck Chemicals**



The recommendations for the use of our products are based on tests believed to be reliable. However, we do not guarantee the results to be obtained by others under different conditions. Nothing in this brochure is intended as a recommendation to use our products so as to infringe on any patent.



## GENERAL COMPOUNDING and PROCESSING CHARACTERISTICS of DELAC-S

The general compounding and processing characteristics of DELAC-S in natural and synthetic rubber compounds are excellent for mixing, tubing, calendering and curing operations. DELAC-S provides scorch safety with no sacrifice in speed of cure.

### Scorch Safety

The scorch safety of DELAC-S accelerated compounds may be varied over a wide range. DELAC-S may be used as the sole accelerator or in combination with activator or retarder to obtain desired speed of cure. New triangular accelerating systems offer excellent scorch safety in tire treads. With increasing emphasis being placed on high-speed mixing, tubing and calendering, together with an industry-wide use of the more scorchy furnace blacks, DELAC-S is the answer to the problem of eliminating excessive operational costs due to scorch on mills, calenders and tubers.

### Cure Rate

Coincident with emphasized requirements for scorch safety in processing operations there is a continued demand for shorter curing cycles. It is extremely important therefore to use scorch-free accelerating systems which are characterized by rapid vulcanization. For example in tire curing operations the compounds must develop sufficient strength after short cures so that when the mold pressure is released the tire will not blow. This requirement is found in all molded goods but is especially critical in goods of relatively thick cross-sections where a temperature gradient occurs during cure. If the article is undercured it is characterized by the development of porosity. Laboratory tests show that DELAC-S accelerated compounds require less curing time than other delayed action accelerators to reach full cure and eliminate costly blow-hole formation.

Triangular accelerating systems have been developed, based on DELAC-S which offer exceptional promise for speeding up the cure of passenger tread compounds without sacrificing scorch safety. These recommendations are discussed in the tire compounding section of this bulletin.

### Shelf Stability

DELAC-S is a stable chemical in the sulfenamide class. Shelf stability is good as evidenced by exaggerated storage tests at 50°C. and at room temperature storage.

#### Effect of 50°C. Aging on Sulfenamide Content

Weeks of Storage at 50°C.	Sulfenamide Content — % DELAC-S
0	95
4	82
8	74
12	67

Samples of DELAC-S aged for two years at room temperature have shown little or no change in either scorch safety or cure-rate when tested in a truck tread compound.

#### MOONEY SCORCH LIFE at 250°F.

	Scorch Time (3 pt. rise)	Cure Rate (additional) (20 pt. rise)
DELAC-S, Fresh preparation .....	25' 15"	4' 15"
DELAC-S, Aged two years .....	23' 30"	4' 0"

These data show that DELAC-S accelerated compounds are less susceptible to fluctuations in scorch and cure-rate imparted by less stable accelerators.

0 0 2 3

## TEST METHODS

The test data shown in this report were obtained under controlled conditions of temperature (73°F.) and relative humidity (50%).

Individual test methods employed in this work are identified below:

*Mooney Scorch .....	ASTM D1077-55T
200 and 300% Modulus .....	ASTM D412-51T
Tensile Strength .....	ASTM D412-51T
Elongation at Break .....	ASTM D412-51T
Tear Resistance .....	ASTM D624-54 Die C
Shore A Hardness .....	ASTM D676-55T
National Bureau of Standards Abrasion Index .....	ASTM D394-47
Ross Flexing .....	ASTM D1052-55T
Crack Growth .....	ASTM D813-57T
Heat Buildup .....	ASTM D623-52T
Oil Aging .....	ASTM D471-57T

\* The figures reported are for a three-point rise above the minimum. Cure Rate is the time required for additional 20 point rise.

## DELAC-S in TIRES

In tire producing units across the country more and more emphasis is placed on high speed mixing, extrusion and calendaring. At the same time the curing cycles are continually being reduced. The tire compounder must therefore develop stocks which combine adequate safety with fast vulcanizing ability. From the acceleration standpoint, DELAC-S offers the best available combination of scorch safety and fast cure.

The recipes and data shown on pages 3 through 8 illustrate the use of DELAC-S in typical truck and passenger tire compounds.

The tire compounder's attention is called in particular to the triangular acceleration systems proposed on page 7 for the reconciling of the two opposing compound characteristics—good scorch properties versus fast cure.

## DELAC-S in TRUCK TREAD

Modern truck tread compounds feature the use of the fine-particle furnace blacks for improved tread wear, lower road temperatures and improved cracking resistance. From a processing standpoint such compounds must show adequate scorch life during tread tubing operations in the range of 240° - 270°F. In evaluating scorch safety many tire compounders use the Mooney viscometer scorch test at 270°F, which is the basis of our work. The time-viscosity curve is obtained at a fixed-temperature (270°F.). Scorch time is set as the running time at which the Mooney curve shows an inflection of three points above the minimum. Cure rate is the time required to obtain an additional rise of twenty points in the Mooney curve.

The test can be run at any temperature within the range of the Mooney machine. In this work we use 250° - 290°F. because factory processing temperatures generally fall in this temperature range.

### Process:

The compounds were mixed using a two stage process. In the first mix the rubber, peptizing agent, black and softeners were masterbatched in a Size 27 Banbury. Additional milling was provided by passing the masterbatch through a chain of three 84" mills for a total milling time of 11 minutes. The stock was then cooled using water sprays followed by air drying.

In the second mix, additions of the DELAC-S, BLE-25, Flexamine and other chemicals were made in a Size B Banbury followed by laboratory milling.

### TRUCK TREAD COMPOUNDS

	HAF Black	SAF Black
Smoked Sheets .....	100.00	100.00
Rubber Peptizing Agent ...	.10	.10
HAF Black .....	45.00	.....
SAF Black .....	.....	45.00
Pine Tar .....	4.50	4.50
Stearic Acid .....	4.50	4.50
BLE-25 .....	1.00	1.00
FLEXAMINE .....	.60	.60
Zinc Oxide .....	4.50	4.50
Commercial Antiozonant ..	2.00	2.00
DELAC-S .....	.50	.50
Sulfur .....	2.50	2.50

Mooney — Compounded Stock		HAF Black		SAF Black	
ML-4 at 212°F.		59		69	
	At 270°F.	At 290°F.		At 270°F.	At 290°F.
Mooney Scorch Time	14' 45"	8' 00"		15' 30"	8' 15"
Cure Rate	2' 00"	1' 15"		2' 15"	1' 15"

Press Cure at 292°F.		Physical Properties — Unaged					
		psi Tensile	psi M-300	% Elong.	psi Tensile	psi M-300	% Elong.
30'	.....	3570	1640	530	3980	1520	580
45'	.....	3620	1670	540	3920	1680	540
90'	.....	3510	1570	530	3780	1720	540
Flexing	Crack Growth Inches/1000 per KC	Dumbbell Extension KC to Failure		Crack Growth Inches/1000 per KC	Dumbbell Extension KC to Failure		
45'	0.2	418		0.3	485		
90'	0.3	295		0.3	413		
Heat Buildup — Goodrich Flexometer — °F.							
45'	.....	126				135	
90'	.....	128				137	

Physical Properties — After Aging 96 Hours in Oxygen at 70°C., 300 psi							
		psi Tensile	psi M-300	% Elong.	psi Tensile	psi M-300	% Elong.
300 psi	.....	2600	1300	430	2730	1350	500
45'	.....	2330	1150	390	2470	1250	420
90'	.....	2080	1050	360	2020	1100	350
Flexing	Crack Growth Inches/1000 per KC	Dumbbell Extension KC to Failure		Crack Growth Inches/1000 per KC	Dumbbell Extension KC to Failure		
45'	0.2	215		0.3	167		
90'	0.2	183		0.6	110		

Aged 48 Hours in Air at 212°F.							
		psi Tensile	psi M-300	% Elong.	psi Tensile	psi M-300	% Elong.
30'	.....	2740	1350	300	2390	1200	300
45'	.....	2570	1250	270	2170	1100	230
90'	.....	2470	1200	270	2230	1050	260
Flexing	Crack Growth Inches/1000 per KC	Dumbbell Extension KC to Failure		Crack Growth Inches/1000 per KC	Dumbbell Extension KC to Failure		
45'	0.3	170		0.7	45		
90'	0.4	183		1.0	51		

0 0 2 5

## DELAC-S in COMBINATION with RETARDER-J for MAXIMUM PROCESS SAFETY

In the processing of truck treads a problem often arises with "coring" of extruded treads especially in the large size tires. When a cross section of a cored tread is examined, one notes a center section or core of solid, cured rubber surrounded by a ring of plastic uncured rubber. Coring is really a premature vulcanization of the in process rubber. Cored treads are difficult to handle at the building drum, splices are inferior and cracking and cut growth properties are apt to be poorer.

From an equipment standpoint improved tread cooling and storage facilities help to minimize coring. However, the use of the new fine particle blacks aggravate this problem because of higher processing temperatures and faster cure rate due to their basic nature. There is also question as to the feasibility of large investment in new equipment when a simple compounding technique such as the use of DELAC-S in combination with RETARDER-J would provide the necessary process safety. This compounding technique improves scorch resistance of truck tread compounds by a large factor. It not only improves the scorching resistance and coring resistance of natural rubber treads but also has the advantage of only slightly effecting cure rate, if at all, in the plant.

The following data illustrate the degree of process safety which may be obtained by using DELAC-S in combination with RETARDER-J

### HEVEA — I-S-A-F BLACK TREAD FORMULATION

Smoked Sheets .....	100.00
FLEXAMINE .....	1.00
B-L-E 25 .....	2.00
Zinc Oxide .....	5.00
LAUREX .....	3.50
I-S-A-F Black .....	45.00
Pine Tar .....	3.50
Sulfur .....	2.25
DELAC-S .....	.50
RETARDER-J .....	as indicated

0.50 DELAC-S		0.50 DELAC-S plus 1.0 RETARDER-J	
Mooney Viscosity — Compounded Stock	78		81
Mooney Scorch — MS			
Scorch Time at 250°F. (3 point rise) .....	20' 30"		25'
Cure Rate at 250°F. (additional 20 point rise) .....	3'		6' 30"

Press Cured at 271°F.	Physical Properties — Unaged							
	Tensile psi	psi M-300	Elong. %	Shore A Hardness	psi Tensile	psi M-300	% Elong.	Shore A Hardness
30' .....	3900	1600	580	62	3620	1360	600	58
45' .....	4030	1680	580	64	4010	1600	600	60
60' .....	4030	1600	580	65	3830	1870	570	62

### OVEN CORING TEST

In this test a cross section of an extruded tread, known to be free from incipient cure, is aged in a hot air oven at a relatively low temperature in the range of 150-175°F. The section is examined periodically and inspected for evidence of coring. The number of hours aging required to produce a cored center section is taken as the index of resistance to coring.

Generally speaking, degree of coring and its incidence vary from plant to plant, depending on equipment, tubing temperatures and heat history. While DELAC-S is generally adequate it is known that the use of RETARDER-J in combination with DELAC-S provides at least 25% longer coring time in furnace black treads.

## DELAC-S in TRUCK CARCASS

DELAC-S is used in truck carcass compounds to ensure freedom from scorch in modern, direct-mix, calender feeding operations. In this process the truck carcass compound is prepared in two mixes. The rubber, black and softeners are masterbatched in a Banbury mixer. The stock may be milled and formed into slabs or pellets for the second mix.

In the second mix, the chemicals are added to the masterbatch in high speed Banbury mixers on short cycles. After discharge from the Banbury the truck carcass is fed directly to the calender in strips or pigs. Modern calenders may run as fast as 100 yards per minute. At this high speed, shearing forces in the calender bite raise the temperature of the compound to scorching conditions. In these instances, and also during high-speed Banbury mixing, DELAC-S with its delayed action serves to extend process-life so that undue problems with premature scorching and resultant excess cost of calender operation, due to scrap, do not arise.

### TRUCK CARCASS COMPOUNDS

	SRF Black	FEF Black
Smoked Sheets .....	100.00	100.00
Rubber Peptizing Agent .....	.10	.....
SRF Black .....	35.00	.....
FEF Black .....	.....	20.00
Stearic Acid .....	3.00	2.00
B.L.E-25 .....	1.50	1.50
Pine Tar .....	5.00	3.75
#8 Oil .....	.....	.25
Zinc Oxide .....	10.00	10.00
DELAC-S .....	.60	.50
Sulfur .....	3.50	3.50

#### Process:

Both of these truck carcass compounds were processed in two stages, using the laboratory B Banbury. However, the masterbatch for the SRF compound was mixed in a Size 11 Banbury and given factory milling on 84" mills. The test compounds showed these uncured compound characteristics and vulcanized physical properties.

	SRF BLACK CARCASS		FEF BLACK CARCASS	
	51		45	
MI-4 at 212°F.	At 270°F.	At 290°F.	At 270°F.	At 290°F.
Mooney Scorch Time	19' 30"	10' 00"	21' 0"	11'
Cure Rate	2'	1' 30"	2' 45"	2'

#### Physical Properties — Unaged

Press Cured at 292°F.								
	psi Tensile	psi M-300	% Elong.	Shore A Hardness	psi Tensile	psi M-300	% Elong.	Shore A Hardness
15'	3740	700	650	48	3710	560	660	45
30'	3370	1070	550	50	3560	720	610	47
45'	3100	1040	530	57	3320	730	590	49
90'	2880	1000	550	58	2780	640	590	50

#### Heat Buildup — Goodrich Flexometer — °F.

15'	112	115
30'	112	112
45'	112	111
90'	113	112

## DELACS in CONVENTIONAL PASSENGER TREAD ACCELERATIONS

DELACS can be used as the sole accelerator for passenger treads or it can be used in combination with activators like DPG. The scorch safety imparted to SBR treads by DELACS is excellent so that in many plants activating chemicals can be used even at a slight sacrifice in scorch life where lower cost is desirable.

### PASSENGER TREAD COMPOUNDS

SBR 1500 .....	100.00	100.00	100.00	100.00
ISAF Black .....	50.00	50.00	.....	.....
HAF Black .....	.....	.....	50.00	50.00
Crossol 2XH .....	3.00	3.00	3.00	3.00
Paraffin .....	7.00	7.00	7.00	7.00
FLEXAMINE .....	1.00	1.00	1.00	1.00
Zinc Oxide .....	2.50	2.50	2.50	2.50
Stearic Acid .....	1.50	1.50	1.50	1.50
DELACS .....	1.25	.90	1.25	.90
DPG .....	.....	.25	.....	.25
Sulfur .....	1.75	1.75	1.75	1.75

#### Process:

These compounds were masterbatched in a Size B Banbury. The sulfur and accelerators were added on a second mix.

ML-4 at 212°F.	ISAF Black				HAF Black			
	DELACS		DELACS DPG		DELACS		DELACS DPG	
	61	63	61	60	61	60	61	60
	250°F.	280°F.	250°F.	280°F.	250°F.	280°F.	250°F.	280°F.
Mooney Scorch	49'	18'	47'	17'	over 60'	23'	59'	21'
Cure Rate	10'	3'	12'	3'	.....	4'	over 60'	5'

### Physical Properties — Unaged

Press Cure at 292°F.	psi		psi		psi		psi	
	Tensile	M-300	Tensile	M-300	Tensile	M-300	Tensile	M-300
30' .....	3970	1530	3730	1440	3470	1270	3430	1200
45' .....	3840	1790	3600	1630	3400	1600	3360	1370
60' .....	3640	1880	3770	1690	3530	1730	3560	1440
	% Elong.	Shore A Hardness						
30' .....	620	58	600	58	610	56	640	56
45' .....	530	59	560	59	520	58	600	57
60' .....	510	59	540	59	550	58	550	58

### Flex Crack Growth — Inches/1000 per Kilocycle

30' .....	0.40	0.85	0.40	0.50
45' .....	1.05	1.00	0.85	0.95
60' .....	1.60	1.40	1.10	1.00

### Physical Properties — Aged 48 Hours in Air at 212°F.

	psi		psi		psi		psi	
	Tensile	% Elong.	Tensile	% Elong.	Tensile	% Elong.	Tensile	% Elong.
30' .....	3370	340	3290	370	2730	370	2850	340
45' .....	3350	350	2730	330	3000	330	3100	390
60' .....	3170	370	3330	420	3090	380	2730	350

### Flex Crack Growth — Inches/1000 per Kilocycle — Aged 24 Hours in Air at 212°F.

30' .....	3.45	2.80	2.40	1.40
45' .....	2.60	1.75	1.75	1.40
60' .....	2.65	1.75	1.85	1.40

## TRIANGULAR ACCELERATIONS of PASSENGER TREAD with DELAC-S

Triangular accelerations of passenger tread have been developed by NAUGATUCK to meet the demands of the tire industry for passenger tread compounds which will vulcanize in the high temperature Bag-o-matic cures in less than 18 minutes. These triangular accelerations based on DELAC-S provide extremely rapid cures, yet are free from scorch in mixing and tubing processes. In the recommended systems DELAC-S may be used with either M-B-T — DPG or M-B-T-S — DPG activation, depending on the precise balance of scorch-cure rate properties desired. In order to eliminate tread blows on the short-high temperature cures it is necessary for the tread compound to develop appreciable physical properties before the tire is removed from the mold.

Experience shows that the accelerating system must produce appreciable physical properties when cured 15' to 20' at 292°F. if the compound is to be free from tread blows in tires cured at 340°F. or higher. The recommended triangular systems do this. They also produce satisfactory scorch life.

Of further interest to the tire compounder is the result that these triangular accelerations based on DELAC-S do not produce excessive modulus development on the longer cures, while the conventional systems often do. Since high modulus SBR treads show poor cut growth and cracking in tires the advantages of the DELAC-S triangular acceleration will be appreciated by tire compounders.

### TRIANGULAR CURING SYSTEMS with DELAC-S PASSENGER TREAD COMPOUNDS

#### CARBON BLACK MASTERBATCH

SBR 1711 .....	68.75
SbR 1500 .....	50.00
ISAF Black .....	25.00
HAF Black .....	25.00
Stearic Acid .....	1.00
FLEXAMINE .....	1.00
	170.75

#### Test Stocks

Above C.B.M.B. ....	170.75	170.75
Zinc Oxide .....	3.00	3.00
DELAC-S .....	.60	.60
M-B-T-S .....	.50	.50
M-B-T .....	.30	.30
DPG .....	.30	.30
Sulfur .....	2.00	2.00

#### Process:

The masterbatch shown above was processed in a Size 11 Banbury and given normal factory milling. The zinc oxide, accelerators and sulfur were added on a second mix in a Size B Banbury.

ML-4 at 212°F.	68	72
	At 270°F.	At 270°F.
Mooney Scorch Time	17' 30"	22' 0"
Cure Rate	7' 45"	9' 15"

#### Physical Properties — Unaged

Press Cured at 292°F.	psi Tensile	psi M-300	% Elong.	psi Tensile	psi M-300	% Elong.
10' .....	1470	350	880	.....	...	.....
15' .....	2660	600	760	1240	200	1000
20' .....	3070	800	710	2730	430	870
30' .....	3400	1030	610	3390	810	700
45' .....	3250	1270	500	3570	1060	620
90' .....	3200	1370	500	3500	1200	570

Direct replacement of M-B-T with M-B-T-S in this system increases scorch life and produces a slower cure rate.

0029

### DELACS in CAMELBACK

In the highly competitive camelback field DELACS is widely used because of its scorch safety and its ability to cure rapidly even if it is necessary to store the camelback for weeks or for months before use.

The data shown below demonstrates the effectiveness of DELACS - M-B-T-S acceleration in ISAF black passenger camelback compounds.

#### CAMELBACK COMPOUNDS

	SBR Type	Oil Extended SBR Type
SBR 1500 .....	100.00	.....
SBR 1711 .....	.....	100.00
ISAF Black .....	50.00	50.00
FLEXAMINE .....	1.00	1.00
B-L-E-25 .....	1.00	1.00
Paraffin .....	6.00	6.00
Stearic Acid .....	1.00	1.00
Zinc Oxide .....	3.00	3.00
DELACS .....	.60	.60
M-B-T-S .....	.60	.60
Sulfur .....	1.60	1.60

#### Process:

These compounds were processed in two stages using the B size Banbury. The sulfur and accelerators were added on the second mix.

ML-4 at 215°F.	Normal SBR Type 73		Oil Extended SBR Type 68	
	At 270°F.	At 290°F.	At 270°F.	At 290°F.
Mooney Scorch Time	26' 30"	14' 0"	24' 0"	13' 0"
Cure Rate	14' 30"	7' 0"	11' 30"	4' 0"
Uncured Camelback — Aged 24 Hours in Air at 150°F.				
Mooney Scorch Time	24' 30"	14' 0"	23' 0"	14' 0"
Cure Rate	18' 30"	7' 0"	13' 30"	5' 0"

#### Physical Properties — Unaged

Press Cured at 292°F.	Normal SBR Type 73				Oil Extended SBR Type 68			
	psi Tensile	psi M-300	% Elong.	Shore A Hardness	psi Tensile	psi M-300	% Elong.	Shore A Hardness
30'	2450	470	600	58	2900	550	720	53
45'	3410	840	730	59	3100	820	710	53
90'	3690	1270	610	64	3380	1050	640	56
	Tear		% Free Sulfur		Tear		% Free Sulfur	
	lbs. per inch				lbs. per inch			
30'	354		0.50		317		0.39	
45'	401		0.35		365		0.22	
90'	463		0.11		367		0.07	

#### Physical Properties — Aged 96 Hours in Air at 212°F.

	Normal SBR Type 73			Oil Extended SBR Type 68		
	psi Tensile	% Elong.	Shore A Hardness	psi Tensile	% Elong.	Shore A Hardness
30'	3670	450	69	2950	470	65
45'	3530	420	70	2900	450	66
90'	3560	420	70	2900	460	65

#### Physical Properties — Aged 96 Hours in Oxygen at 70°C. and 300 psi

	Normal SBR Type 73			Oil Extended SBR Type 68		
	psi Tensile	% Elong.	Shore A Hardness	psi Tensile	% Elong.	Shore A Hardness
30'	3240	650	60	2800	720	58
45'	3460	610	62	2930	650	59
90'	3420	590	63	2810	550	61

## DELACS in OAK SOLING

The combination of scorch safety and fast cure found with DELACS in oak soling recommend its use in this application.

### SBR OAK SOLE COMPOUND

SBR 1502 .....	60.00
NAUGAPOL-K-50 .....	80.00
Cun-ar MH 2½ .....	12.00
Zinc Oxide .....	5.00
Hard Clay .....	15.00
Silene EF .....	75.00
Mapico Yellow DO .....	4.50
Red Iron Oxide .....	.50
DELACS .....	2.00
Stearic Acid .....	1.50
DOTG .....	.45
Sulfur .....	2.00

**Process:**

This compound was mixed in two stages using a B size Banbury. The accelerators and sulfur were added in the second mix.

ML-4 at 212°F.

67

Mooney Scorch Time

Did not scorch in 60'

Cure Rate

.....

#### Physical Properties — Unaged

Press Cured at 320°F.	psi Tensile	psi M-100	psi M-300	% Elong.	Shore A Hardness
7' 30" .....	1010	600	890	400	94
10' .....	1150	650	1000	410	94
15' .....	1130	670	1000	400	94

#### Physical Properties — Aged 24 Hours in Air at 212°F.

	psi Tensile	psi M-100	psi M-300	% Elong.	Shore A Hardness	B. Standard Abrasion Index
7' 30" .....	990	740	.....	280	96	.....
10' .....	1070	740	1000	340	96	.....
15' .....	1100	710	1000	380	96	34

#### Ross Flexings — Aged 24 Hours in Air at 212°F. Kilocycles for 200% and 500% Increase in Crack Growth

	200%	500%
7' 30" .....	2	26
10' .....	7	71
15' .....	9	76

## DELACS is a NATURAL RUBBER WHITE MOLDED COMPOUND

DELACS is useful in obtaining self-processing, fast curing white compounds. DELACS is nondiscoloring and maintains an optimum cure.

### NATURAL RUBBER WHITE COMPOUND

Pale Crepe .....	100.00
Blue Oxide .....	10.00
Lithopone .....	60.00
Keystone Whiting .....	60.00
LAUREX .....	.50
DELACS .....	1.00
Sulfur .....	3.00

Process: Mill-mixed

ML-4 at 212°F.

44

At 250°F.

Mooney Scorch Time

34' 0"

Cure Rate

2' 30"

#### Physical Properties — Unaged

From Cure at 392°F.	psi Tensile	psi M-300	% Elong.	Shore A Hardness
30' .....	2060	670	530	56
60' .....	1850	630	540	55

### DISCOLORATION PROPERTIES

#### RS-100 Sunlamp Exposure Test — After 24 Hours

Exposed Stock ..... 1Y  
Rigid Nitrocellulose Lacquer by Contact ..... 0

#### Window Discoloration Test — 2 Months Exposure

Exposed Stock ..... 1Y  
Rigid Nitrocellulose Lacquer by Contact ..... 0  
White Cotton Cloth by Contact ..... 0

#### Outdoor Discoloration Test — 2 Months Exposure

Exposed Stock ..... 1Y  
Rigid Nitrocellulose Lacquer by Contact ..... 0  
White Cotton Cloth by Contact ..... 0

0 = None    1.0 = very light to 10 = very dark  
Y = Yellow

### DELACS in PARACRIL MECHANICAL GOODS

DELACS is used in many PARACRIL applications but is especially useful where scorchy ultra accelerators are required for heat aging. In these cases DELACS may be used in combination with TUEX to produce safe-processing PARACRIL compounds which also possess the additional advantages of rapid cure.

### DELACS in A SUPERAGING PARACRIL COMPOUND

PARACRIL BJ .....	100.00
Pelletex .....	75.00
Stearic Acid .....	1.00
Diocetyl Sebacate .....	10.00
Zinc Oxide .....	5.00
AMINOX .....	1.50
DELACS .....	2.00
TUEX .....	3.00

**Process:**

The test compound was mixed in two stages. The accelerators were added, on a laboratory mill, to a previously mixed masterbatch containing the remaining ingredients shown above. The masterbatch was processed in a Size B Banbury.

ML-4 at 212°F.	41.5
	At 250°F.
Mooney Scorch Time	26' 0"
Cure Rate	0' 15"

#### Physical Properties — Unaged

Press Cured	psi Tensile	psi M-300	% Elong.	Shore A Hardness
10' .....	1890	980	600	59
20' .....	1870	990	570	58
30' .....	2090	1250	530	57
40' .....	2270	1530	470	58

#### Physical Properties — Aged 11 Days at 250°F.

	psi Tensile	psi M-300	% Elong.	Shore A Hardness
10' .....	2500	....	160	78
20' .....	2670	....	180	79
30' .....	2690	....	190	78
40' .....	2580	....	170	78

#### Physical Properties — Aged 21 Days in Oxygen at 80°C. and 300 psi

	psi Tensile	psi M-300	% Elong.	Shore A Hardness
10' .....	1680	1420	420	65
20' .....	1800	1600	400	65
30' .....	1910	1710	400	66
40' .....	1950	1750	400	66

#### Compression Set — % of Original Deflection

Aged 70 Hours in Air at 250°F.

40' .....	36.1
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## DELACS is a PARACIL OIL FIELD COMPOUND

Illustrated below is a PARACIL compound based on DELACS acceleration in combination with MONEX for smooth curing and rapid cure. With the fast curing furnace block this combination allows safe processing and adequate bin storage.

### PARACIL - SBR OIL FIELD COMPOUND

PARACIL BLT .....	60.00
SBR 1700 .....	40.00
ISLP Block .....	50.00
Diethyl Adipate .....	5.00
Zinc Oxide .....	5.00
Stearic Acid .....	1.00
OCTAMINE .....	1.50
DELACS .....	.80
MONEX .....	.20
Spider Sulfur .....	1.50

**Process:**

Two stage mix. The sulfur and accelerators were added to previously mixed Banbury-masterbatch using a laboratory mill.

ML-4 at 312°F.	66.5
	At 250°F.
Mooney Scorch Time	32' 45"
Cure Rate	3' 45"

#### Physical Properties — Unaged

Press Cured at 310°F.	psi Tensile	psi M-300	% Elong.	Shore A Hardness
10' .....	2880	1970	410	63
20' .....	2970	2060	410	63
30' .....	2870	2190	390	64
40' .....	2750	2240	350	64

#### Tear Test — ASTM Die Type C — Pounds per Inch

30' .....	27.5
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#### Percent Volume Swell — Aged 24 Hours at 212°F.

	ASTM Oil #1	ASTM Oil #3
20' .....	+.40	+39.67
30' .....	-.31	+39.98

8 0 3 4

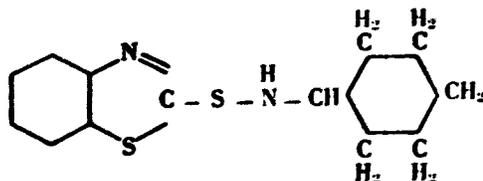
# DELAC-S

## DESCRIPTION and PROPERTIES

DELAC-S is a standard sulfenamide, delayed action accelerator for natural and synthetic rubbers.

## CHEMICAL STRUCTURE

DELAC-S is N-cyclohexyl-2-benzothiazole sulfenamide. Its chemical structure is:



## Applications

DELAC-S is an all-purpose accelerator. It is used in tires, footwear, soles and mechanical goods. It is generally useful in natural rubber as well as in SBR and nitrile rubbers such as PARACRIL.

DELAC-S combines the advantages of superior scorch safety in the mill room with shorter curing cycles in the press room. This valuable combination of properties results in overall greater productivity in the rubber plant. DELAC-S provides these advantages at a lower cost than other commercial sulfenamide delayed action accelerators.

## Typical Properties

Form:	Cream colored powder
Specific Gravity:	1.27
Melting Range:	95 - 100°C.
Storage Stability:	Good
Solubility:	Soluble in acetone, ethylene di-chloride and benzol. Insoluble in water and gasoline.
Handling Precautions:	None See current Material Safety Data Sheet

The recommendations for the use of our products are based on tests believed to be reliable. However, we do not guarantee the results to be obtained by others under different conditions. Nothing in this brochure is intended as a recommendation to use our products so as to infringe on any patent.

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