



Distributed in the Interest
of Product Development

VANDERBILT

Technical Data

VANOX[®] CDPA Antioxidant **4, 4'-Bis (alpha, alpha-dimethylbenzyl) diphenylamine**

R.T. Vanderbilt Company, Inc.
30 Winfield Street, P.O. Box 5150, Norwalk, CT 06856-5150
Telephone: (203) 853-1400
Fax: (203) 853-1452, Web Site: www.rtvanderbilt.com

Before using, read, understand and comply with the information and precautions in the Material Safety Data Sheets, label and other product literature. The information presented herein, while not guaranteed, was prepared by technical personnel and, to the best of our knowledge and belief, is true and accurate as of the date hereof. No warranty, representation or guarantee, express or implied, is made regarding accuracy, performance, stability, reliability or use. This information is not intended to be all-inclusive, because the manner and conditions of use, handling, storage and other factors may involve other or additional safety or performance considerations. The user is responsible for determining the suitability of any material for a specific purpose and for adopting such safety precautions as may be required. R. T. Vanderbilt Company does not warrant the results to be obtained in using any material, and disclaims all liability with respect to the use, handling or further processing of any such material. No suggestion for use is intended as, and nothing herein shall be construed as, a recommendation to infringe any existing patent or to violate any federal, state or local law or regulation.

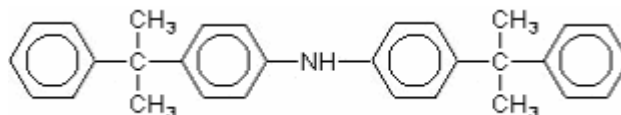
VANOX[®] CDPA Antioxidant
4, 4'-Bis (alpha, alpha-dimethylbenzyl) diphenylamine

VANOX CDPA is a low volatility, high amine activity antioxidant that is especially effective in HNBR and ACM rubbers for high temperature applications. In combination with the synergist antioxidant **VANOX ZMTI**, it provides maximum heat resistance to EPR, EPDM, IR, NBR, NR and SBR rubber compounds.

The following technical data demonstrate the equivalence of **VANOX CDPA** and Naugard[®] 445.

CAS Number and Chemical Structure Analysis:

- **VANOX CDPA and Naugard 445:**
 - CAS# 10081-67-1 (100%)
 - Chemical Nomenclature: 4, 4'-Bis(alpha, alpha-dimethylbenzyl)diphenylamine
 - Melting Point Range: 98 - 102°C
 - Chemical Structure:



As shown in Figure 1, the FTIR comparison indicates the equivalence of the major components.

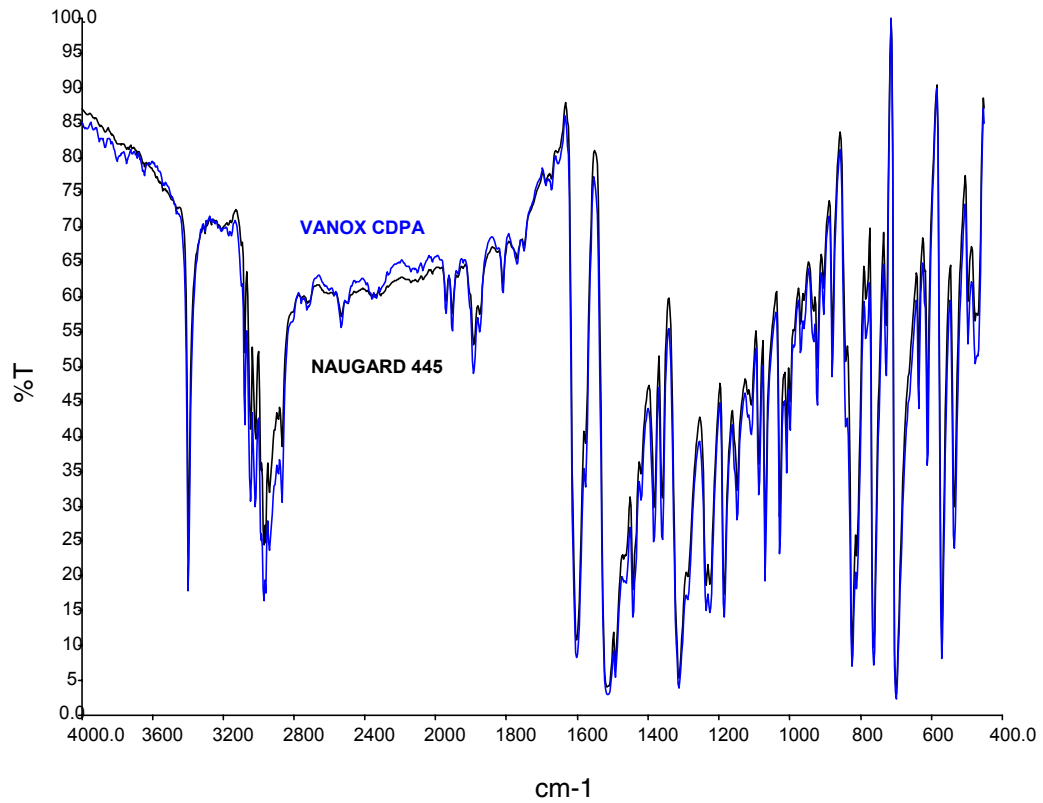


Figure 1: FTIR Comparison

Melting Point (DSC):

As shown in Figure 2, the melting points of **VANOX CDPA** and Naugard 445 are identical.

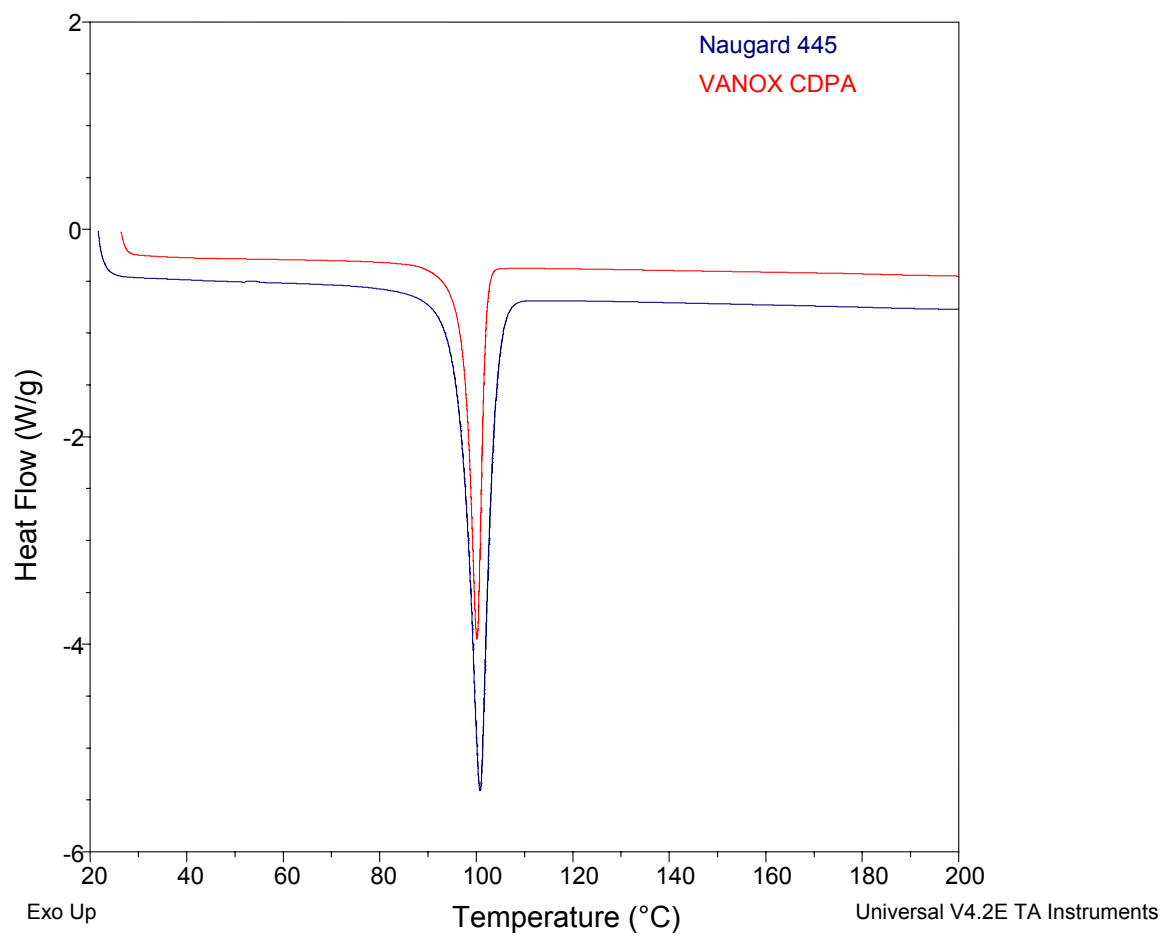


Figure 2: DSC Melting Point

VANOX CDPA vs. Naugard 445 in HNBR (RTV Rubber Laboratory Report R-1861)

In order to further demonstrate the equivalent performance of **VANOX CDPA** and Naugard 445, and to evaluate the effect of experimental error, Rubber Laboratory testing was run in duplicate.

Compounds	A1	A2	A3	A4
Zetpo [®] 2020 HNBR	100.0	100.0	100.0	100.0
Zinc Oxide	5.0	5.0	5.0	5.0
Stearic Acid	0.5	0.5	0.5	0.5
N330 Carbon Black	20.0	20.0	20.0	20.0
N990 Carbon Black	45.0	45.0	45.0	45.0
Naugard 445	1.5	1.5	-	-
VANOX CDPA	-	-	1.5	1.5
VARO[®] DCP-40KE	8.0	8.0	8.0	8.0
Totals	180.0	180.0	180.0	180.0

ASTM D 1646, Mooney Viscosity @ 100°C (212°F), ML1+4

Viscosity, mu	87.2	84.7	85.1	86.2
---------------	------	------	------	------

Mooney Scorch at 121°C (250°F)

Minimum Viscosity, mu	55.0	53.4	53.0	53.9
t5, minutes	24.36	24.82	25.42	24.82

ASTM D 5289, Moving Die Rheometer @ 171°C (340°F), 0.5° Arc

Minimum Torque, M _L , dN·m	1.33	1.31	1.37	1.34
Maximum Torque, M _H , dN·m	25.08	25.32	25.51	25.22
Ts1, minutes	0.52	0.52	0.52	0.51
T' 90, minutes	6.34	6.42	6.35	6.28
Cure Rate Index, min ⁻¹	17.2	16.9	17.2	17.3
Cure Rate, dN·m/min	4.08	4.07	4.14	4.14
Tan Delta at M _L	1.22	1.23	1.21	1.22
Tan Delta at M _H	0.06	0.06	0.06	0.06

ASTM D 412, Method A, Die D, Stress Strain Tests @ 21°C (70°F)

(Cure test slabs Tc90 + 2 minutes at 171° C)

200% Modulus, MPa	14.84	16.11	15.93	16.22
Tensile, MPa	24.68	25.17	25.33	24.82
Elongation at Break, %	341	332	326	334

	<u>A1</u> 445	<u>A2</u> 445	<u>A3</u> CDPA	<u>A4</u> CDPA
ASTM D 2240, Shore A Durometer @ 21°C (70°F)				
Hardness, Points	66.8	67.1	67.1	66.9
ASTM D 573, Rubber Deterioration, 70 hrs. @ 175°C (347°F)				
Retained Tensile, %	59.5	67.0	54.9	67.4
Aged Tensile, MPa	14.69	16.86	13.90	16.73
Retained Elongation, %	24.3	26.2	22.7	26.0
Aged Elongation, %	83	87	74	87
Hardness, Pts. Change	+11.4	+12.0	+12.1	+11.6
Hardness, Aged Points	78.2	79.1	79.2	78.5
ASTM D 573, Rubber Deterioration, 168 hrs. @ 150°C (302°F)				
Retained Tensile, %	100.3	101.1	99.1	100.8
Aged Tensile, MPa	24.74	25.43	25.10	25.01
Retained Elongation, %	53.4	54.8	54.9	52.7
Aged Elongation, %	182	182	179	176
Hardness, Pts. Change	+10.0	+9.8	+9.7	+10.5
Hardness, Aged Points	76.8	76.9	76.8	77.4
ASTM D395, Method B – Compression Set, 70 Hours at 150°C (302°F) (Cure Buttons at Tc90 + 12.5 minutes at 171° C)				
Set, %	28.7	29.7	29.8	30.3

- VANOX and VAROX are registered trademarks of R.T. Vanderbilt Company, Inc.
- Naugard is a registered trademark of Chemtura Corporation
- Zetpol is a registered trademark of Zeon Chemicals L.P.

**For additional information regarding our
high quality minerals and chemicals,
please visit our website:**

www.rtvanderbilt.com

- Technical data sheets
- MSDS information
- Sample requests
- Specifications
- Product brochures
- Articles
- Presentations
- Reports