

Calidria ASBESTOS

COMPARATIVE PERFORMANCE CHARACTERISTICS OF *CALIDRIA* R-G 244/POLYESTER RESIN SYSTEMS

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COMPARATIVE PERFORMANCE CHARACTERISTICS OF CALIDRIA R-G 244/POLYESTER RESIN SYSTEMS

CALIDRIA Resin-Grade 244 Asbestos, a new, modified asbestos fiber from UNION CARBIDE, developed for maximum thickening efficiency and thixotropy in polyester spray-up and hand lay-up laminating resins, is also an effective thickener for plastisols and organosols used in a broad variety of adhesives, coatings, mastics and sealants. In many systems, CALIDRIA Resin-Grade 244 Asbestos will not contribute color or opacity – a characteristic that makes it particularly attractive in polyester gel coats.

The distinctive characteristics of CALIDRIA Asbestos offer improved viscosity and thixotropic properties to polyester resin systems, superior to other commonly used thixotropic aids, at a considerable cost savings. On a pound-for-pound basis, CALIDRIA Resin-Grade 244 Asbestos has been found to contribute more than twice the viscosity of a typical pyrogenic silica. Savings up to 30 per cent or more are illustrated.

Though CALIDRIA Resin-Grade 244 Asbestos is designed for use in stir-in mixers, optimum efficiency and lowest cost are obtained through use of high-shear mixers such as "Cowles" Dissolvers, sonic dispersers and homogenizers.

Other desirable features of CALIDRIA
Resin-Grade 244 Asbestos include:

- Ease of incorporation
- Reduced dust
- Clear, colorless products at low loadings
- Long term shelf life

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COMPARATIVE PERFORMANCE CHARACTERISTICS OF CALIDRIA R-G 244/POLYESTER RESIN SYSTEMS

SCOPE

The rheological properties imparted by CALIDRIA R-G 244 Asbestos to polyester resin systems have been determined in a number of commercial laminating resins. Comparative evaluations of CALIDRIA R-G 244 versus pyrogenic silica have also con-

firmed the performance and economic advantages claimed for CALIDRIA R-G 244 Asbestos.

The following commercial polyester resins were used for these evaluations.

Polyester Resin	Manufacturer
"Hetron" 26869	Durez Div. of Hooker Chemicals Corp.
"Hetron" 17	Durez Div. of Hooker Chemicals Corp.
"Hetron" 130	Durez Div. of Hooker Chemicals Corp.
"Hetron" 19	Durez Div. of Hooker Chemicals Corp.
"Paraplex" 43	Rohm and Haas
"Marco" Resin	Marco Chemical Div. of W. R. Grace Co.
"Koplat" 1000-23	Koppers Company, Inc.
"Dion" DR-315	Diamond Alkali Company, Dion Polymer Prods.
Freeman Resin	Freeman Chemical Corporation

TEST PROCEDURE

To establish a sound and reliable basis for relative test comparisons, viscosities of the base resins were equated by the addition of styrene. CALIDRIA R-G 244 was evaluated in the resins at the 0.5, 1.0, 2.0 and 3.0 parts per 100 parts of resin (PHR). A commercial pyrogenic silica was used for comparative evaluations in several of the resins. Solids were incorporated by one of two procedures:

1. A high-shear laboratory "Homo-Mixer", with a 4-blade, 2-inch diameter impeller.

2. A low-shear "Lightnin'" Mixer, with a 6-paddle, 2-inch diameter impeller.

The degree of shear, implied herein, is in relative terms of impeller rpm. Mixing time was held constant at 3 minutes for all samples.

Viscosity measurements were obtained with a Brookfield Viscometer at 25°C. The samples were hand-stirred prior to measuring the viscosities.

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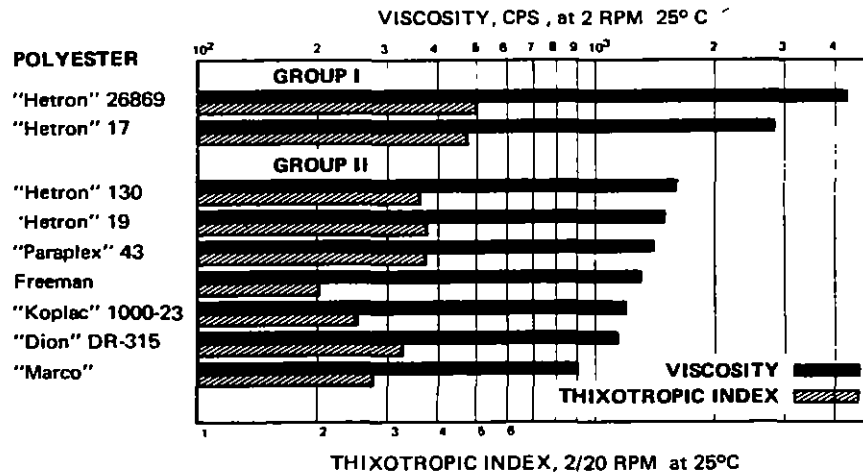
COMPARATIVE PERFORMANCE CHARACTERISTICS OF CALIDRIA R-G 244/POLYESTER RESIN SYSTEMS

PERFORMANCE CHARACTERISTICS

The comparative rheological properties of these commercial polyester resins containing CALIDRIA R-G 244 Asbestos are shown in

the bar graph, Figure 1 Viscosities are those determined at 2 rpm. Thixotropic Index is based on the 2/20 rpm. viscosities.

FIGURE 1
VISCOSITY AND THIXOTROPIC INDEX DATA
 COMPARATIVE PERFORMANCE CHARACTERISTICS OF CALIDRIA R-G 244 ASBESTOS IN VARIOUS COMMERCIAL POLYESTER RESINS AT 0.5 PHR ADDITION



Polyester base resins: adjusted to 100 cps. with styrene.

2-inch diameter impeller. Mixed for 3 minutes at 1600 rpm.

Mixing: "Lightnin'" Mixer, 6-paddle,

PROMOTED POLYESTER RESINS

Unlike most other thixotropes, CALIDRIA R-G 244 does not normally require polar additives such as glycol derivatives for viscosity build-up or thixotropic stabilization. However, in some promoted resins, particularly those containing cobalt-type

accelerators, nominal additions of ethylene glycol or similar additives will improve the viscosity, thixotropy, and stability of CALIDRIA R-G 244 dispersions significantly. This is illustrated in Table 1.

TABLE 1
 Viscosity of CALIDRIA R-G 244/Promoted Polyester (*) Resin Systems

CALIDRIA R-G 244 (PHR)	Ethylene Glycol (PHR)	Viscosity, cps., at 25°C.		Thixotropic Index at 2 and 20 rpm.
		2 rpm.	20 rpm.	
0.75	--	800	560	1.4
0.75	0.30	1600	630	2.5

(*) "Silmar Resin" J-379B -- Vistron Corporation
 Base viscosity 165 cps
 CALIDRIA R-G 244 incorporated with "Homo-Mixer" at 5000 rpm. for 3 minutes

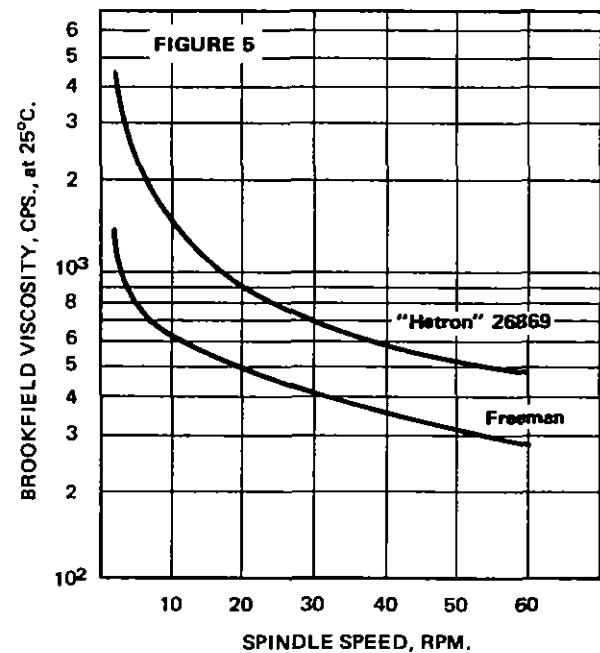
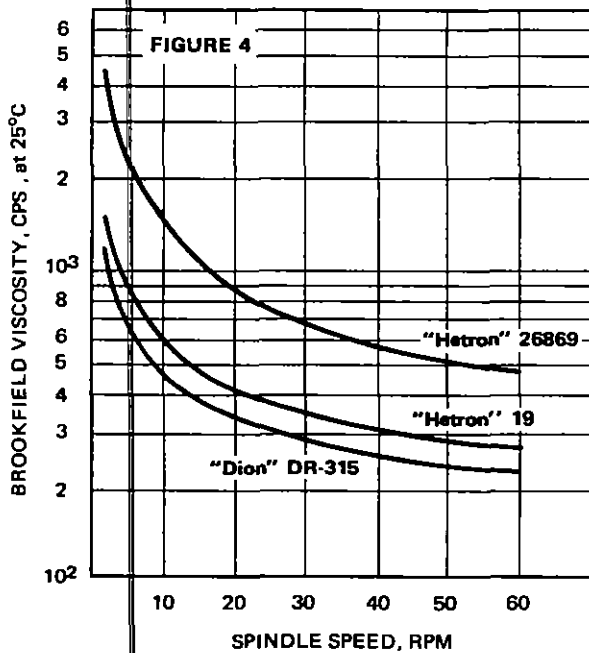
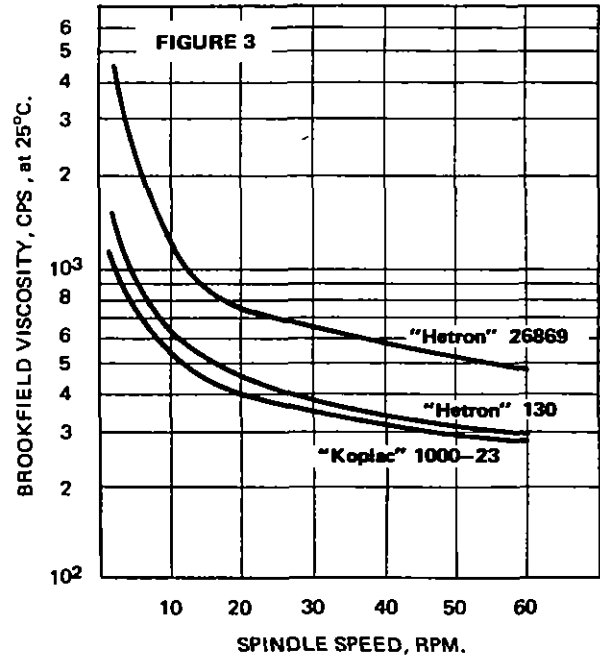
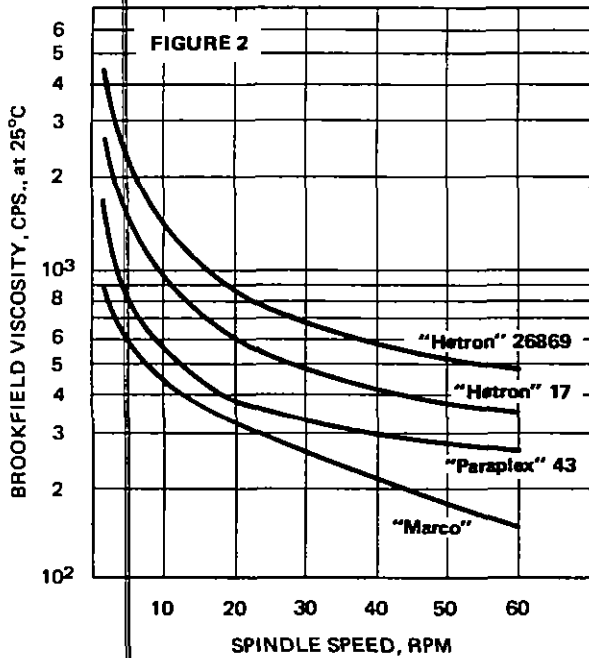
COMPARATIVE PERFORMANCE CHARACTERISTICS OF CALIDRIA R-G 244/POLYESTER RESIN SYSTEMS

RELATIVE VISCOSITIES

Figures 2 through 5 compare the relative viscosities of the various polyester resins over a range of 2 to 60 rpm, each containing 0.5

PHR of CALIDRIA R-G 244 Asbestos. "Hetron" 26869 is used as the standard for comparison.

FIGURES 2 THROUGH 5 - COMPARISON OF RELATIVE VISCOSITIES



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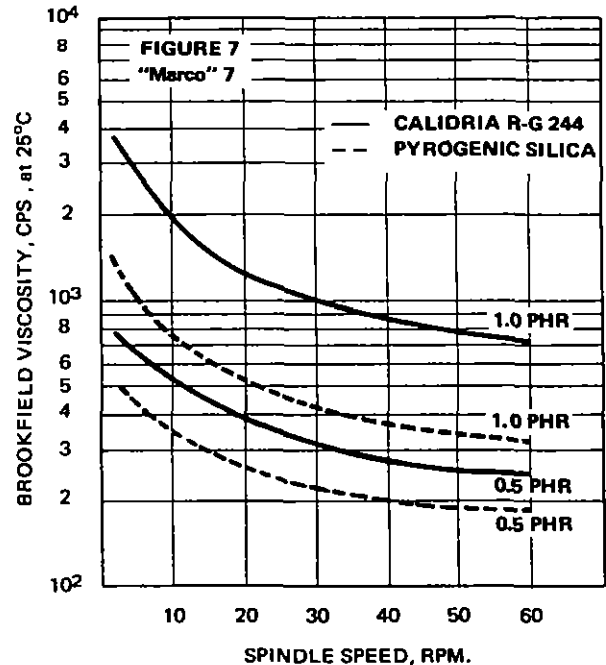
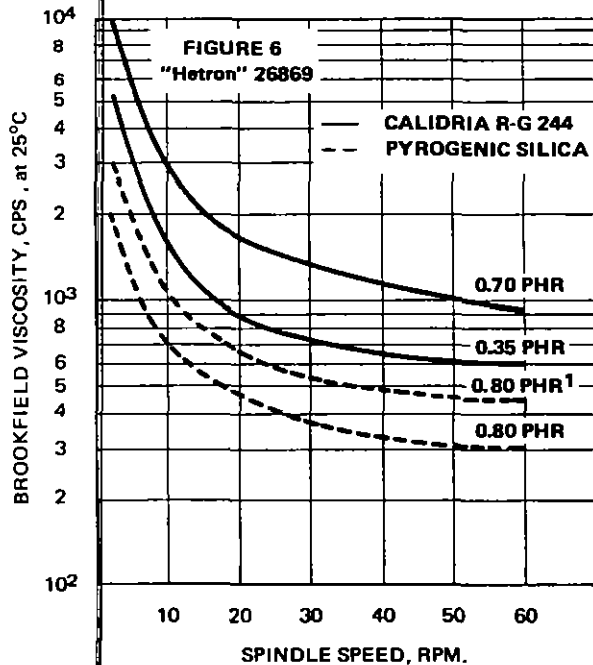
COMPARATIVE PERFORMANCE CHARACTERISTICS OF CALIDRIA R-G 244/POLYESTER RESIN SYSTEMS

CALIDRIA R-G 244 ASBESTOS VS. PYROGENIC SILICA

A comparison of the relative performances of CALIDRIA R-G 244 Asbestos and pyrogenic silica is shown in Figures 6 through 9. The thickeners were incorporated with a high shear "Homo-Mixer", for 3 minutes, at 5000 rpm. Four polyester resins, ranging from high to medium low performance (see Figure

1, page 4), were selected for this comparative evaluation. In all resins, the performance of CALIDRIA R-G 244 Asbestos was superior to pyrogenic silica for promoting viscosity and thixotropy. In addition, significant economic advantages became apparent.

FIGURES 6 AND 7
COMPARISON OF RELATIVE PERFORMANCES OF CALIDRIA R-G 244 AND PYROGENIC SILICA WITH "Hetron" 26869 AND "Marco" 7

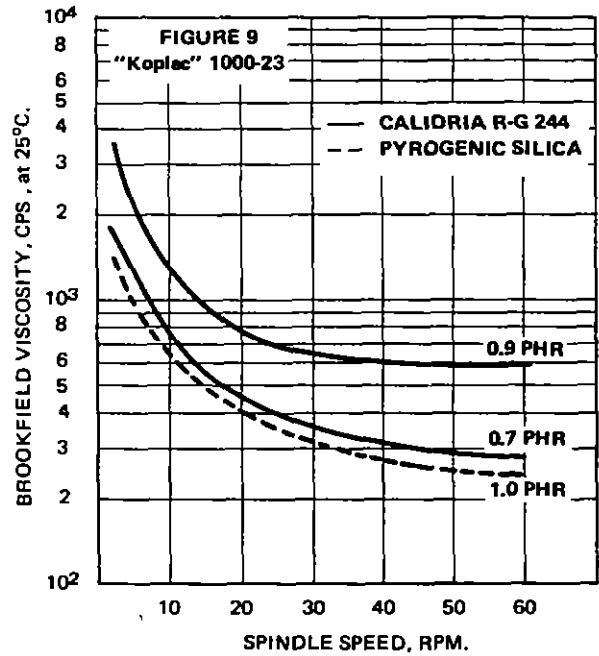
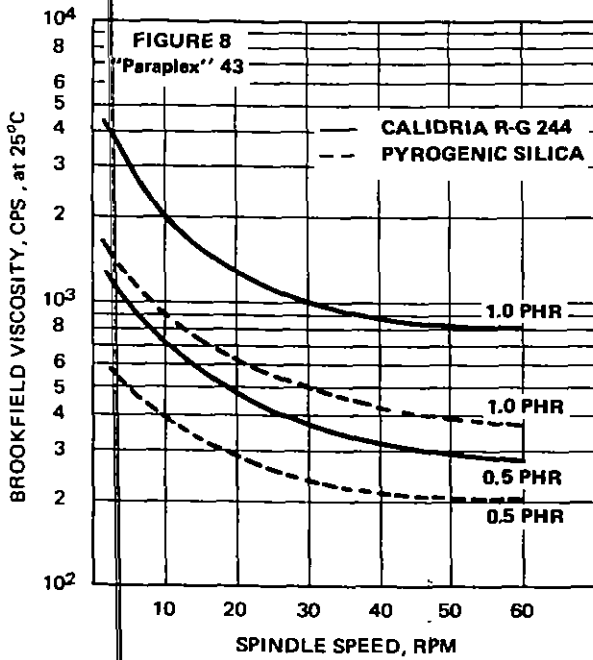


NOTE
Polyester resins were initially adjusted to a Brookfield viscosity of 100 cps. with styrene.
Mixing "Homo-Mixer" at 5000 rpm. for 3 minutes.

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COMPARATIVE PERFORMANCE CHARACTERISTICS OF CALIDRIA R-G 244/POLYESTER RESIN SYSTEMS

FIGURES 8 AND 9
COMPARISON OF RELATIVE PERFORMANCES OF CALIDRIA R-G 244
AND PYROGENIC SILICA WITH "Paraplex" 43 AND "Koplac" 1000-23



NOTE.
Polyester resins were initially adjusted to a Brookfield viscosity of 100 cps. with styrene.
Mixing "Homo-Mixer" at 5000 rpm. for 3 minutes.

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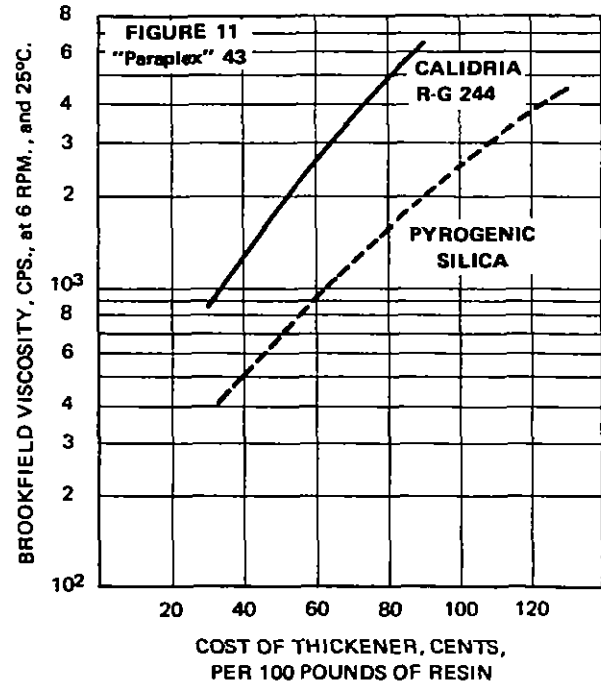
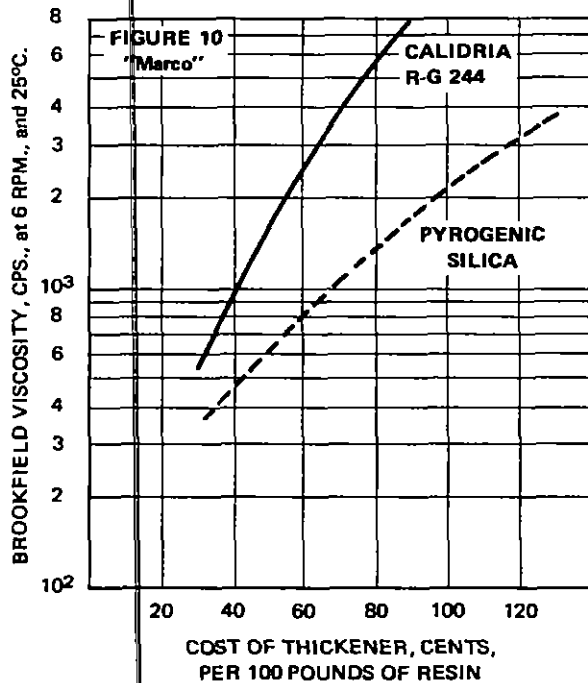
COMPARATIVE PERFORMANCE CHARACTERISTICS OF CALIDRIA R-G 244/POLYESTER RESIN SYSTEMS

VISCOSITY VS. COST

Figures 10 and 11 compare the viscosities obtained at 6 rpm., on various additive concentrations vs. the relative cost of the thickeners per 100 pounds of the polyester base resins. From these comparative tests and the relative thixotropic properties shown in

Figure 16, page 11, it can be concluded that CALIDRIA Resin-Grade 244 Asbestos will provide, on the average, viscosities equivalent to pyrogenic silica, at approximately one-half the cost.

FIGURES 10 AND 11
COMPARISON OF VISCOSITIES VS. RELATIVE COST OF THICKENERS



SHEAR EFFECTS ON RHEOLOGICAL PROPERTIES

The effects of shear on the rheological properties of CALIDRIA R-G 244 Asbestos and pyrogenic silica in polyesters are shown in Figures 12 to 15. "Paraplex" 43 and "Marco" resins, considered to be typical of most polyester systems, were selected for these tests. Although results obtained with laboratory equipment cannot be assumed to predict optimum conditions for production facilities,

these data do indicate that pyrogenic silica is more shear dependent than CALIDRIA R-G 244. On this basis, it can be concluded that pyrogenic silica requires relatively higher levels of energy to develop optimum rheological properties, in polymer suspensions, equivalent to those obtainable with CALIDRIA R-G 244 Asbestos.

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COMPARATIVE PERFORMANCE CHARACTERISTICS OF CALIDRIA R-G 244/POLYESTER RESIN SYSTEMS

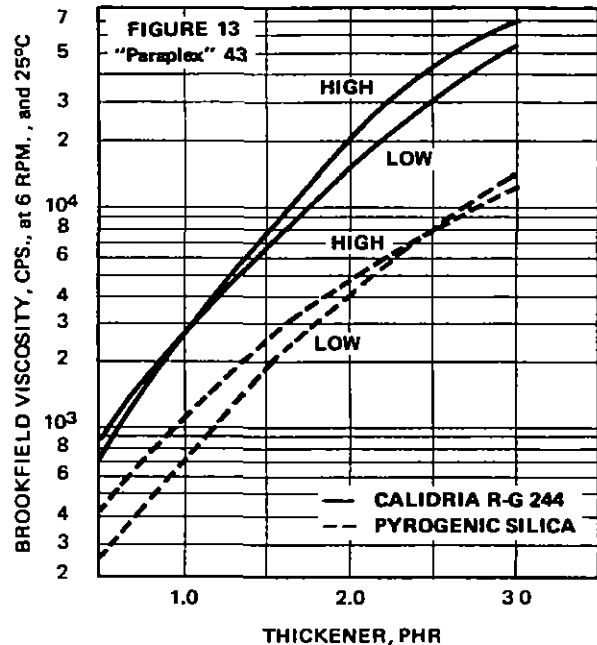
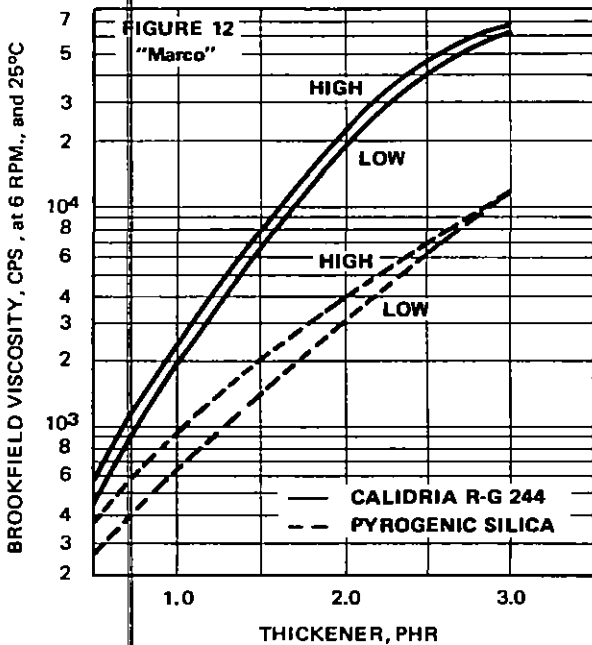
HIGH AND LOW SHEAR MIXING VS. SOLIDS CONTENT

The viscosity vs solids content experimental results shown in Figures 12 and 13 below were obtained with both high and low shear mixing equipment, using the following

standard testing conditions The initial viscosity of each of the polyester base resins was adjusted to 100 cps. with styrene.

	High-Shear "Homo-Mixer"	Low-Shear "Lightnin'" Mixer
Mixing Time, minutes	3	3
Mixing Blades and Size	4 - 2-inch diameter	6 (paddle) - 2-inch diameter
Mixing Speed, rpm.	5000	1600 (tip speed 800 to 900 rpm)

FIGURES 12 AND 13
VISCOSITY VS. THICKENER CONCENTRATION
RELATIVE EFFECT OF HIGH AND LOW SHEAR MIXING



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COMPARATIVE PERFORMANCE CHARACTERISTICS OF CALIDRIA R-G 244/POLYESTER RESIN SYSTEMS

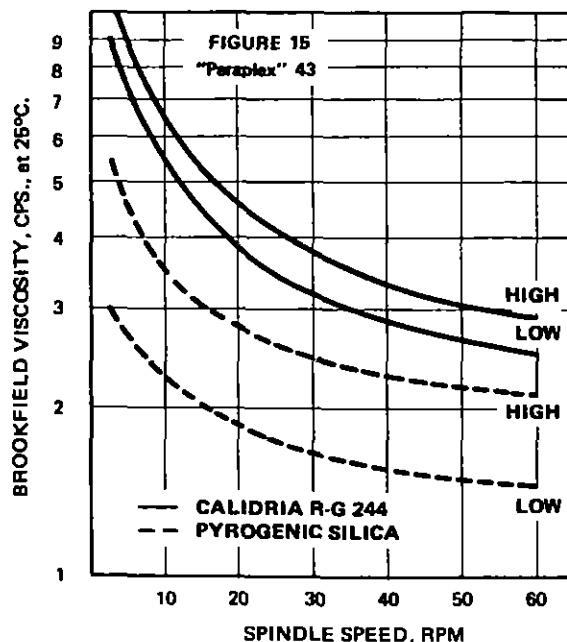
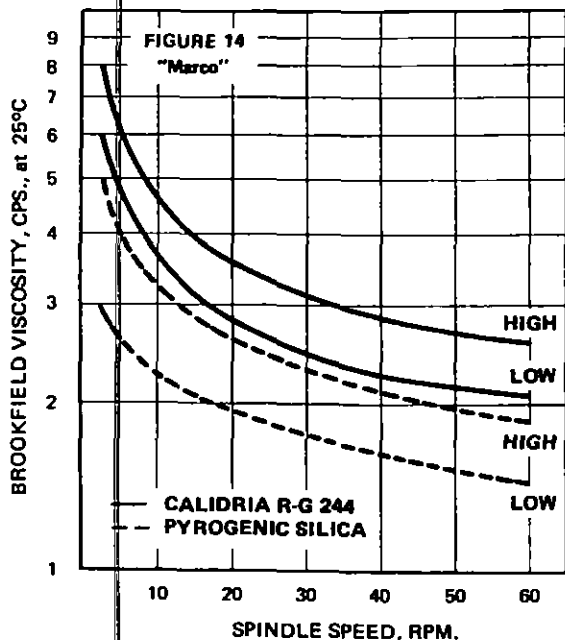
VISCOSITY VS. SHEAR RATE

Viscosities determined at 25°C., over a range of spindle speeds, from 2 to 60 rpm, on "Marco" and "Paraplex" 43 polyesters, containing 0.5 PHR of the thickeners, indicate that CALIDRIA R-G 244 Asbestos, again, maintains a relatively higher degree of thickening efficiency than pyrogenic silica, Figures

14 and 15.

It is evident from these results that pyrogenic silica is more shear dependent than CALIDRIA R-G 244 Asbestos and requires higher levels of energy to develop satisfactory rheological properties for polymer suspensions

FIGURES 14 AND 15
VISCOSITIES AT VARIOUS SHEAR RATES
VS. EFFECT OF HIGH AND LOW SHEAR MIXING
OF POLYESTERS CONTAINING 0.5 PHR OF THICKENERS



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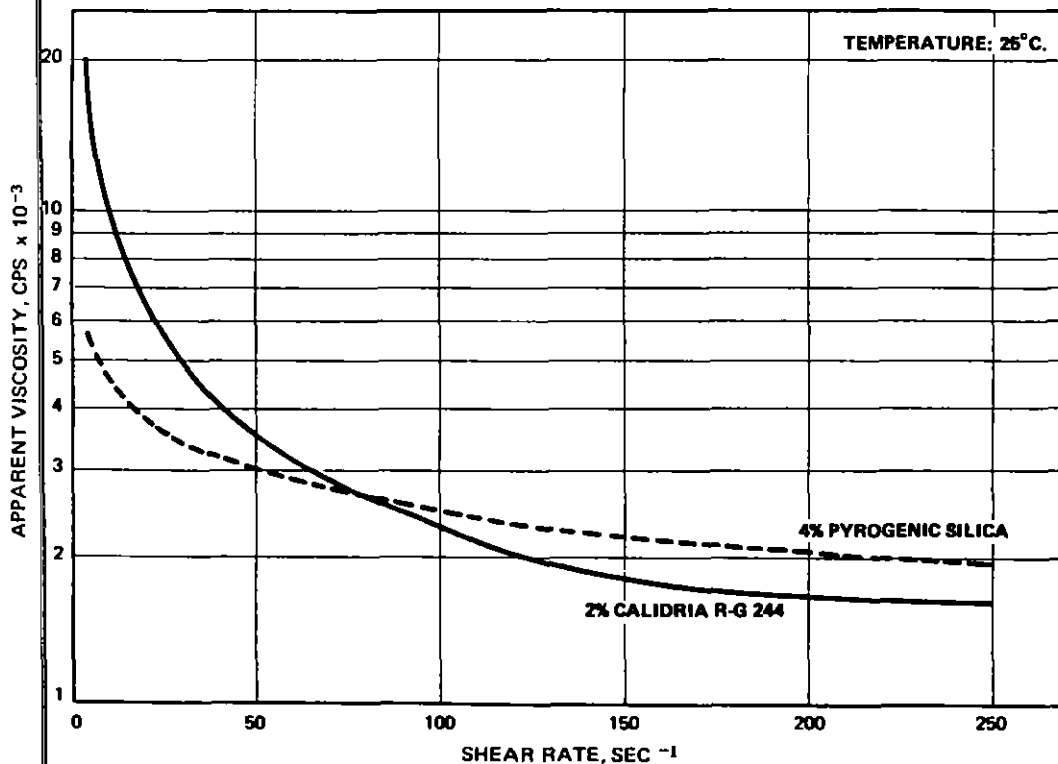
COMPARATIVE PERFORMANCE CHARACTERISTICS OF CALIDRIA R-G 244/POLYESTER RESIN SYSTEMS

EFFECT OF SHEAR RATE ON THIXOTROPIC PROPERTIES

CALIDRIA R-G 244 Asbestos provides exceptional rheological characteristics to polyester resins as shown in Figure 16. As indicated, a more fluid system for better spraying and brushing performance is avail-

able at one-half the concentration using CALIDRIA R-G 244 as compared to pyrogenic silica, yet sag resistance and viscosity are higher as the shear rate is reduced.

FIGURE 16
COMPARATIVE THIXOTROPIC CHARACTERISTICS
CALIDRIA R-G 244 VS PYROGENIC SILICA



NOTE

These data were developed for a "Paraplex" 43 polyester resin (Rohm and Haas) with 10 per cent by weight of styrene added. Instrumentation was with a Haake "Rotovisco", using measuring system SV II.

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For complete information on properties, applications
and prices, or technical assistance in utilizing

Calidria **ASBESTOS**

contact the nearest UNION CARBIDE Sales Office
or CALIDRIA Asbestos Representative:

270 Park Avenue • New York, N. Y. 10017
P. O. Box K • King City, Ca. 93930

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New High Purity Asbestos

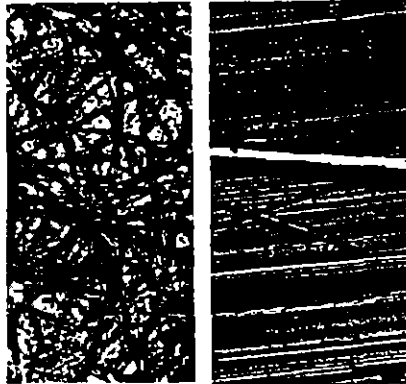
Reprinted from *PLASTICS TECHNOLOGY*, January, 1969

High purity and proprietary processing are two factors that reportedly serve to make Union Carbide's new Calidria asbestos a distinctive and versatile product. Available in three basic forms, fiber, colloidal and modified, the material can be used as a viscosity control additive, thixotrope, extender, and reinforcing agent, as well as in other more specific applications.

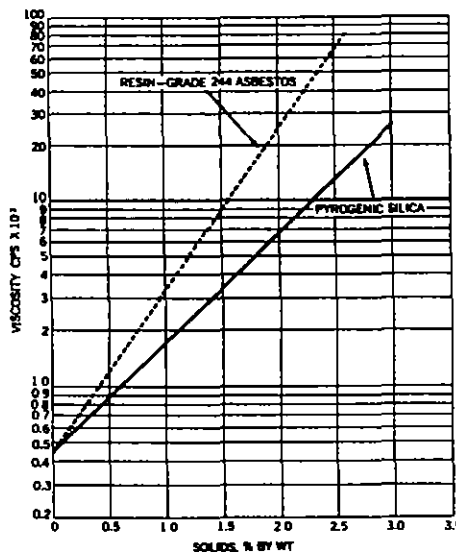
This chrysotile asbestos is obtained from a unique short-fiber deposit located in California, which is reportedly free of hard consolidated rock masses, typical of other asbestos ores. The ore features random fiber orientation, point contact and a high, 60% fiber content. In the conventional Canadian deposits, the fibrils in a bundle are all in linear contact and basically straight, a pattern which reduces the efficiency of each fibril (see photo). The advantage inherent in the chrysotile raw ore is reportedly enhanced by a proprietary "wet process" which breaks down the fiber bundles, removes rocks and other foreign contaminants, and provides 98% liberated, efficient fibrils of uniform quality. It is available in ground form or in pellets, for economy and convenience in shipping and handling. There are different grades available at different prices depending on end-use requirements.

Viscosity controls for polyester

Resin-grade 244, a modified grade of Calidria asbestos, is used as a thickening agent and thixotrope in polyester spray-up and hand lay-up laminating resins, in vinyl resin sealants, and in a variety of plastisols and organosols used in adhesives, coatings and mastics (see graph). It reportedly offers ease of dispersion with non-settling, stable viscosity properties. It costs 60¢/lb and is generally used in quantities of 0.25-0.50%, as compared to a typical quantity of 1% of silica. This grade will not contribute color or opacity in most systems, a characteristic that



Micrograph of typical Calidria asbestos fibers showing random orientation (left), and typical Canadian asbestos fiber showing straight bundles (right).



Thickening efficiencies of asbestos and silica in polyester resins.

makes it especially well suited for polyester gel coats.

At Fiberfab, a div of Velocidad, Inc., Santa Clara, Calif., resin grade 244 is used instead of pyrogenic silica as a thixotrope in polyester gel coats for fiber glass car bodies. One of the

most important advantages reported is improved economy. The asbestos costs about half as much as the silica and is used in smaller quantities to obtain better results. The standard 800 lb gel coat batch uses only 10 lb of R-G 244, where formerly 14 to 20 lb of silica had been used. This is said to result in a savings of over \$10 per batch. The asbestos is reportedly easier to dispense, permits more rapid wetting without fluffing up, makes spraying quicker and easier, and enhances final finish.

Viscosity controls for epoxy

Resin-grade 144 asbestos is used as a viscosity control in epoxys (see polyester chart), vinyl plastisols, asphaltic compounds, polysulfide and butyl rubber sealants, silicone and casein adhesives. Unlike other thixotropes, R-G 144 can be used effectively with amine hardeners used with epoxy systems and has a long shelf life. Because of its fibrous geometry, this grit-free and non-abrasive material provides whisker reinforcement in rigid and plasticized PVC, nylon molding materials and some other resin systems. It costs 10¢/lb, as compared to 80¢-\$1.00/lb for silica, and is generally used in quantities of 1-1½%.

R-G 144, when used as a whisker reinforcement in nylon 66, is said to improve tensile and flexural properties and heat distortion temperature. Tensile strength, for example, is more than doubled by the addition of asbestos at 20% by weight in the molding compound (tensile strength at 73 F for typical nylon 66 is 10,000 psi; reinforced it stands at 21,300). Heat distortion temp at 264 psi goes from 150 to 465 F, and flexural strength from 13,000 to 32,200 psi at 73 F.

Calidria asbestos is also available in a standard fiber grade series for use in vinyl asbestos floor tile. It reportedly provides dimensional stability and high brightness.



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TEL (408) 385-3209

Calidria ASBESTOS

RESIN-GRADE 244

A premium grade thixotrope for laminating resins, plastisols and organosols.

Shipping Point	Net Price, #/lb.		
	Truckload	Less Than Truckload to 350 Lbs.	Less Than 350 Lbs.
King City, California	60.0*	61.5	65.0
Atlanta, Georgia	64.5	66.0	69.5
Cleveland, Ohio	65.0	66.5	70.0
Columbus, Ohio	64.5	66.0	69.5
Detroit, Michigan	64.5	66.0	69.5
Hackensack, New Jersey	65.0	66.5	70.0
Hammond, Indiana	64.5	66.0	69.5
Oakland, California	61.5	63.0	66.5
Portland, Oregon	63.0	64.5	68.0
Torrance, California	61.5	63.0	66.5

* Carload quantities available from King City Plant only

Payment Terms — Net 10th Proximo
Shipping Terms — FOB Shipping Point
Minimum Order Quantity — \$25.00

Packaging Information
One Package — 10 lbs.
Pallet Wt. — 350 lbs

R-G 244 is packaged in paper bags with a sealed polyethylene overwrap.

Combined Shipments — Shipments of a pallet or more of CALIDRIA Asbestos Products are always combinable with other CALIDRIA Products of a pallet or more for total quantity price, but less than pallet quantities may not be combined for total quantity price.

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