UNION CARBIDE

PLAINTIFF'S EXHIBIT
UC-1050

Calidria

Resin-Grade 144 Asbestos

- **Effective, low-cost thickening agent and thixotrope for epoxy resin systems**

- **Imparts excellent viscosity control to resin systems (coatings, adhesives, sealants, caulks, mastics)**

KMX 02079

HARRISONS & CROSFIELD (PACIFIC)
5758 SHELLMOUND STREET
EMERYVILLE, CALIFORNIA 94608

Calidria Resin-Grade 144 Asbestos

. . . a highly purified fiber product that is an effective, low-cost thickening agent and thixotrope for epoxy resin systems. By means of a special refining technique developed by UNION CARBIDE, CALIDRIA Resin-Grade 144 Asbestos is made completely grit-free and non-abrasive—this latter characteristic makes it especially valuable in spray application.

Other desirable features of CALIDRIA Resin-Grade 144 Asbestos include:

- Disperses easily in liquid resin or hardener with a "Cowles" Dissolver or similar mixers
- Overmixing will not destroy the thixotropy of the resin-asbestos mixture
- Epoxy systems containing CALIDRIA Resin-Grade 144 Asbestos have excellent aging characteristics
- Reduced dust
- Unlike other thixotropes, it is effective with amine hardeners
- CALIDRIA Resin-Grade 144 Asbestos is substantially lower in cost than commonly used refined silicas or modified clays
- No amine salts are necessary for viscosity build-up or thixotropic stabilization (with the exception of the low-viscosity, cycloaliphatic epoxides)

Typical physical properties

Specific Gravity	2.45
Moisture Content, % by wt.	2.0, maximum
Surface Area, sq. meters per gram	60, appr.
Reflectance, G. E. Brightness	72-76
Nature of Surface Charge	Electropositive (cationic)
pH in Water	9.5
Bulking Value, gallons per 100 lb.	4.8
Oil Absorption (DOP), pounds per 100 lb.	120-140
Refractive Index, n_D 25° C.	1.54-1.56
Wet Bulk Density in Water, ml.	
as received, 20 g. per liter; 3-hr. settling	700
after dispersion, 2 g. per liter; 1-hr. settling	900-1,000
Dry Bulk Density, lb. per cubic foot	4
Shipping Density, lb. per cubic foot	12-14
Standard Package Weight, lb.	35
% Magnetite	0.6
Screen Size, Typical; % plus 325 mesh	Nil
Fiber Diameter, microns	0.025
Length/Diameter, microns	200 avg. (1000 maximum)

IMPORTANT: This information is not to be taken as a warranty or representation for which we assume legal responsibility nor as permission or recommendation to practice any patented invention without a license. It is offered solely for your consideration, investigation, and verification.

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Typical applications

Figure 1 THICKENING EFFICIENCY IN LIQUID EPOXY RESINS

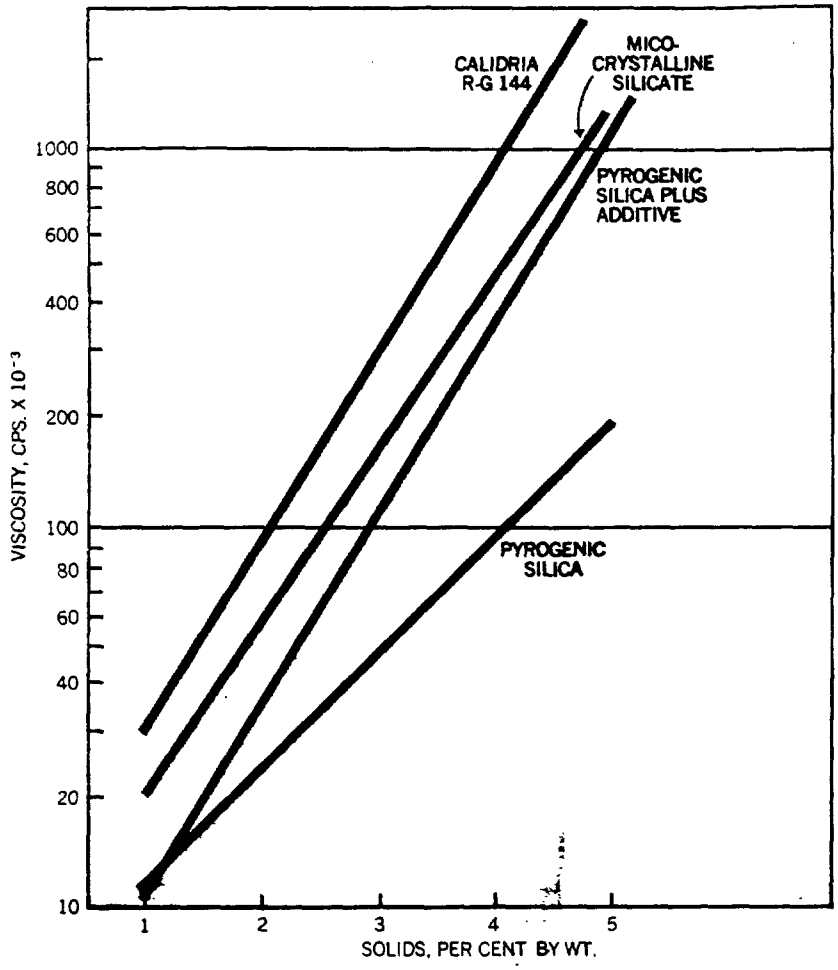
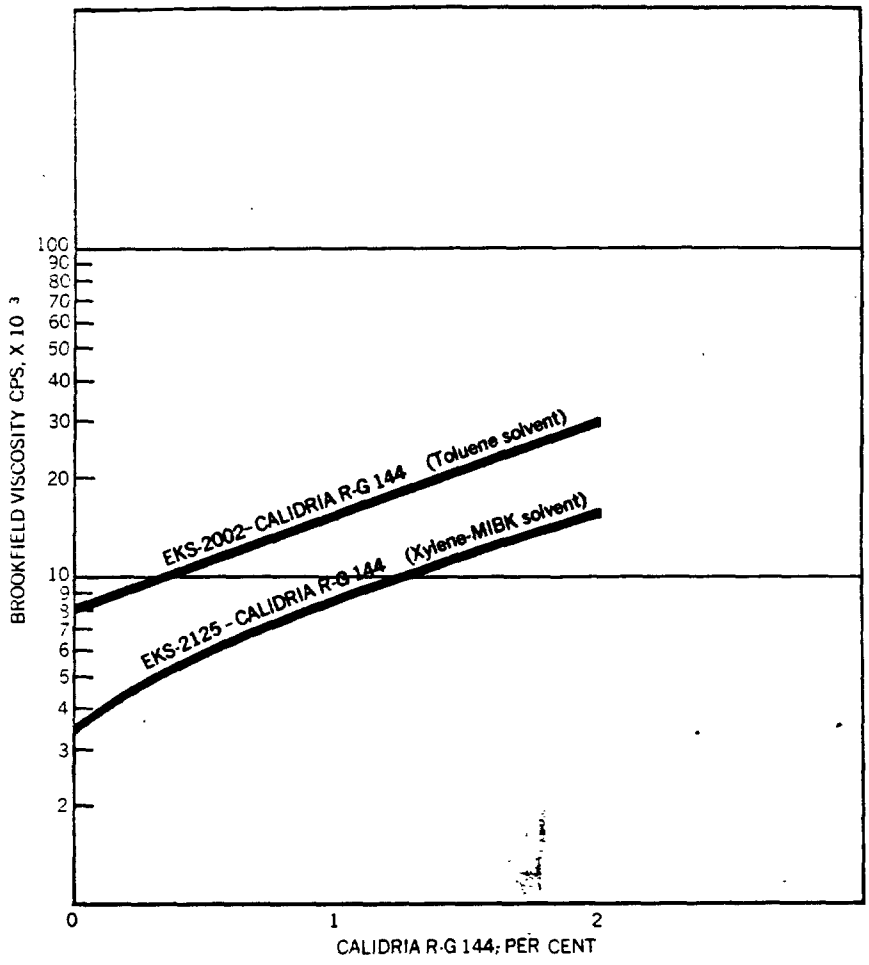


Figure 1 illustrates the effective, low-cost thickening and viscosity control properties of CALIDRIA Resin-Grade 144 Asbestos in epoxy resin systems. It compares relative differences in viscosity of BAKELITE Epoxy Resin ERL-2774 solutions containing equivalent concentrations of CALIDRIA R-G 144 Asbestos, micro-crystalline silicate, and pyrogenic silica.

Figure 2 illustrates the ability of CALIDRIA R-G 144 Asbestos to control viscosity in two different solvent-epoxy systems used in many epoxy coatings and paints.

Figure 2 VISCOSITY CHARACTERISTICS OF *CALIDRIA* R-G 144 IN BAKELITE® EPOXY SOLUTIONS



Resin and amine hardener evaluation

METHOD OF INCORPORATING THE THIXOTROPE:

In preparing the test samples used in determining data for Tables 1, 2 and 3, the thixotrope—CALIDRIA Resin-Grade 144 Asbestos—was added to the liquid resin or hardener at 25°C. and dispersed in a "Cowles" Dissolver at 2400 rpm. for 5 minutes.

VISCOSITY MEASUREMENTS:

Viscosities of the prepared test samples were measured on a Brookfield Model RVF Viscometer at 2 and 20 rpm.

Table 1 shows performance data of bisphenol based resins, BAKELITE ERL-2774 and ERL-2795, with up to 4 PHR. of CALIDRIA Resin-Grade 144 Asbestos. Vertical drawdown was excellent, and even higher asbestos loading should result in even higher vertical draw-down.

Table 1 THICKENING OF BISPHENOL-BASED RESINS WITH *CALIDRIA* RESIN-GRADE 144 ASBESTOS

Ingredient	Parts by Weight											
BAKELITE ERL-2774	100			100			100			100		
CALIDRIA Resin-Grade 144 Asbestos	1			2			3			4		
Brookfield RVF Viscosity, cps. X 10^{-3}	RPM.		Thixotropic Index (T. I.) (a)	RPM.		Thixotropic Index (T. I.)	RPM.		Thixotropic Index (T. I.)	RPM.		Thixotropic Index (T. I.)
	2	20		2	20		2	20		2	20	
24 hours	34	22	1.5	137	39	3.5	250	53	4.7	464	87	5.3
7 days	32	20	1.6	132	36	3.6	244	54	4.5	430	76	5.7
30 days	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	480	94	5.1
Vertical Drawdown, mil (c)												
Room Temperature	(b)			(b)			(b)			125		
45 days	(b)			(b)			(b)			125		

Ingredient	Parts by Weight											
BAKELITE ERL-2795	100			100			100			100		
CALIDRIA Resin-Grade 144 Asbestos	1			2			3			4		
Brookfield RVF Viscosity, cps. X 10^{-3}	RPM.		Thixotropic Index (T. I.)	RPM.		Thixotropic Index (T. I.)	RPM.		Thixotropic Index (T. I.)	RPM.		Thixotropic Index (T. I.)
	2	20		2	20		2	20		2	20	
24 hours	18	3.8	4.7	38	6.3	6.0	70	11	6.4	91	13	6.9
7 days	16	3.7	4.3	35	6.8	5.1	68	12	5.5	122	22	5.5
30 days	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	125	25	5.0
Vertical Drawdown, mil (c)												
Room Temperature	(b)			(b)			(b)			80		
45 days	(b)			(b)			(b)			70		

(a) Thixotropic Index (T. I.) = $\frac{\text{viscosity at 2 rpm.}}{\text{viscosity at 20 rpm.}}$

(b) Not run.

(c) Vertical Drawdown: A 2-inch wide drawdown was made on a horizontal sandblasted steel panel. The panel was immediately raised to a vertical position and any sag noted. If no sag occurred in 10 minutes, the procedure was repeated and the thickness increased until sagging occurred.

Table 2 presents data that show the effectiveness of CALIDRIA Resin-Grade 144 Asbestos as a thickener of several types of BAKELITE Amine Hardeners. Generally, other thickeners are not effective with amine hardeners.

Table 2 THICKENING OF AMINE HARDENERS WITH *CALIDRIA* RESIN-GRADE 144 ASBESTOS

Formulation	Parts by Wt.			Parts by Wt.			Parts by Wt.		
	BAKELITE ZZL-0814.....100 CALIDRIA Resin-Grade 144 Asbestos.....4			BAKELITE ZZL-0820.....100 CALIDRIA Resin-Grade 144 Asbestos.....4			BAKELITE ZZL-0854.....100 CALIDRIA Resin-Grade 144 Asbestos.....4		
Brookfield RVF Viscosity, cps. X 10^{-3}	RPM.		Thixotropic Index (T. I.)	RPM.		Thixotropic Index (T. I.)	RPM.		Thixotropic Index (T. I.)
	2	20		2	20		2	20	
24 hours	187	36	5.3	67	32	2.1	102	23	4.5
7 days	172	34	5.1	66	32	2.1	104	23	4.6
30 days	177	34	5.2	67	35	1.9	104	24	4.4
Vertical Drawdown	**Mil**			**Mil**			**Mil**		
Room Temperature (R. T.)	70			40			40		
50°C.	20			—			—		
80°C.	—			40			40		
30 days at R. T.	70			40			40		
30 days at 80°C.	—			40			40		

Table 3 shows the thickening of a low-viscosity, cycloaliphatic epoxide, BAKELITE ERL-4221, with CALIDRIA Resin-Grade 144 Asbestos and "Armac" C, a long chain aliphatic amine salt. BAKELITE ERL-4221 is the exception that requires an amine salt to be used with CALIDRIA Resin-Grade 144 Asbestos for viscosity build-up or thixotropic stabilization.

Table 3 THICKENING OF A LOW-VISCOSITY, CYCLOALIPHATIC EPOXIDE WITH *CALIDRIA* RESIN-GRADE 144 ASBESTOS AND "Armac" C

Ingredient	Parts by Wt.
BAKELITE ERL-4221	100
CALIDRIA Resin-Grade 144 Asbestos	7
"Armac" C	5

Brookfield RVF Viscosity, cps. X 10^{-3}	RPM.		Thixotropic Index (T.I.)
	2	20	
Initial	262	42	6.3
8 Weeks at 25°C.	268	36	7.4
7 Weeks at 40°C.	243	38	6.4

Systems evaluation

BAKELITE ERL-2774/ZZL-0814

With a CALIDRIA Resin-Grade 144 Asbestos loading of 4 per cent on both resin and hardener, it was possible to hold a 70-mil thickness at room temperature. Higher loadings on the amine should result in much higher vertical drawdown.

BAKELITE ERL-2774/ZZL-0820

A 4-per cent loading of CALIDRIA Resin-Grade 144 Asbestos resulted in a 40-mil thickness that did not sag within 40 minutes at 80°C. The system was gelled at that time.

BAKELITE ERL-2774/ZZL-0854

With a 4-per cent loading of CALIDRIA Resin-Grade 144 Asbestos, it was possible to hold a 40-mil thickness at 80°C. until gelled (65 minutes).

UNION CARBIDE THE DISCOVERY COMPANY

UNION CARBIDE CORPORATION
ASBESTOS
270 PARK AVENUE, NEW YORK, N. Y. 10017

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UNION CARBIDE **CALIDRIA Resin-Grade 144**

Asbestos

F-41723B
3/69—3.5M

PRINTED IN U.S.A.

Calidria® ASBESTOS

PRICE LIST

Effective: January 2, 1971
Supersedes: January 31, 1970

RG-144

. . . a highly refined fiber used as a low-cost, efficient thixotrope and viscosity control agent in epoxy, phenolic, and similar resin compounds used in mastics, adhesives, sealants, caulks, and coatings.

NET PRICES – CENTS PER LB. – F.O.B. SHIPPING POINT					
SHIPPING POINTS	ORDERING QUANTITY Quantities more than 1,400 lb. sold only in full-pallet multiples.				
	Carload, 72,800 lb.	23,800 lb. or more	8,400 lb. to 22,400 lb.	1,400 lb. to 7,000 lb.	175 lb. to 1,365 lb.
	52 pallets	17 or more pallets	6 to 16 pallets	1 to 5 pallets	Less than 1 pallet
King City, Calif. (plant)	12.0	12.0	15.0	19.0	25.0
Torrance, Calif.	–	14.0	17.0	21.0	27.0
Atlanta, Ga. Cleveland, O. Columbus, O. Detroit, Mich. Hammond, Ind. St. Louis, Mo. Dallas, Tex. Houston, Tex.	–	15.0	18.0	22.0	29.0
Metuchen, N.J.	–	16.0	19.0	23.0	31.0

PACKAGING INFORMATION		
	One Package	35 lb.
	One Pallet	1,400 lb.
	50-ft. Carload	72,800 lb. (52 pallets)
	40-ft. Truckload	23,800 lb. (17 pallets)

KMX 02080

• Packages are sealed with polythylene overwrap.

COMBINED SHIPMENTS – Shipments of one or more pallets of any "Calidria" asbestos product may be combined with one or more pallets of any other "Calidria" product for total quantity price. Less than pallet quantities may not be combined for total quantity price.

IMPORTANT – Payment terms: Net 10th proximo. Minimum order: 175 lb. Prices apply within continental U.S.A. Union Carbide reserves the right to adjust customer's orders to comply with the standard ordering quantities specified above.

UNION CARBIDE CORPORATION • MINING AND METALS DIVISION • 270 PARK AVENUE, NEW YORK, N.Y. 10017

UNION CARBIDE

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