UC 149-2

UNION CARBIDE

INTERNAL CORRESPONDENCE

PLAINTIFF'S EXHIBIT UC-384

MINING AND METALS DIVISION • P. O. BOX 579, NIAGARA FALLS, NEW YORK 14302

To (Name) Mr. F. G. Bertics
Division
Location New York, NY

Date March 8, 1971
Originating Dept. CALIDRIA Asbestos-Marketing
Answering letter date

Copy to Mr. R. E. Byrne
Mr. J. W. Rawlings
Dr. H. B. Rhodes

Subject CALIDRIA Asbestos for Latex Paint

Per our telecon enclosed is a copy of our technical information sheet on the Subject.

It is obviously based on preliminary information and laboratory formulations. We are not in a position to proceed in a "normal" marketing manner; i.e., X years of R&D, thousands of dollars investment and positive confirmation of data. You know the background on this.

We must go with what we have and hope that the concept is appealing enough to encourage paint companies to proceed on their own. Apparently Desoto is intrigued, at least up to now.

As you know, the C&A regional sales offices have been awaiting our "splash". I'm not sure how interested they will be in this little "tinkle", but we would plan to pursue the market introduction through them. I think we would start with a copy of the attached and a cover letter to the regional sales managers, explaining our lack of data but asking them to proceed to appropriate accounts.

Please let me have your comments at your earliest convenience.

John L. Myers

/cv
Enclosure

RECEIVED
MAR 1971

UNION CARBIDE
THE DISCOVERY COMPANY

Calidria ASBESTOS

RESEARCH AND DEVELOPMENT DEPARTMENT

UNION CARBIDE CORPORATION

4625 ROYAL AVE., P. O. BOX 579, NIAGARA FALLS, NEW YORK 14302

CALIDRIA ASBESTOS

COATINGS GRADE

For Latex Paint Systems

INTRODUCTION

CALIDRIA Asbestos-Coatings Grade (CG) can be added to latex paint systems at a level of at least 30 lb./100 gallons to provide cost-performance advantages to the paint manufacturer. CG asbestos provides increased opacity, improved rheological properties, and lower raw material cost in interior latex formulations. The colloidal chrysotile fibrils of CG asbestos provide both pigment extension and flow control because of their inherent cationic surface charge in aqueous suspensions.

Figure I illustrates the Zeta potential of chrysotile suspensions as a function of pH. Within the pH range of typical latex formulations, the Zeta potential of chrysotile is strongly positive which affords a dispersion aid for the anionic pigments utilized. The resulting physico-chemical union of asbestos and pigment does not only aid in pigment dispersion, but also prevents re-agglomeration of pigment particles during drying of the paint film. Increased opacity of the paint film results from a combination of these two effects.

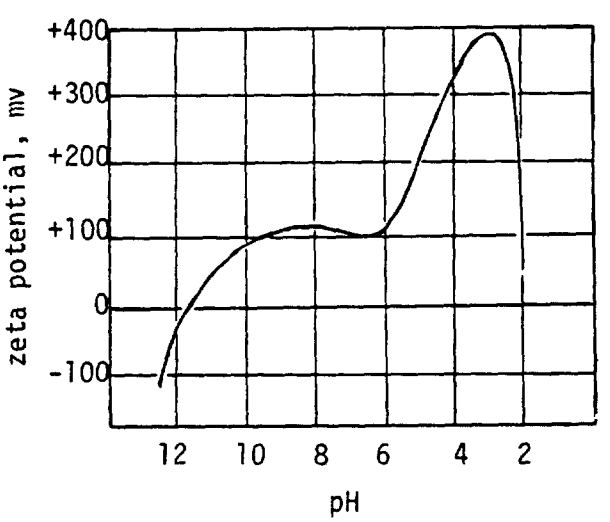

FIGURE I - Zeta Potentials of Chrysotile as a Function of pH in 10^{-5} Molar Potassium Chloride Solutions

Improved rheological properties of the latex paint system also result from the incorporation of CG asbestos. The relationship of apparent viscosity of chrysotile slurries to pH is shown in Figure II

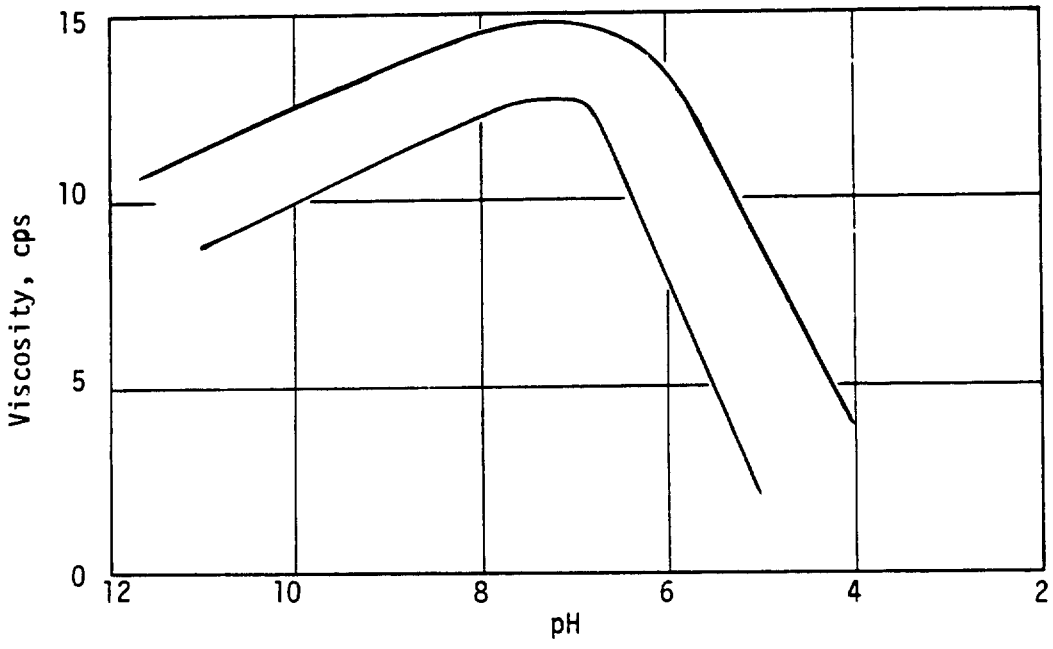

FIGURE II - APPARENT VISCOSITY OF ONE WEIGHT PER CENT SUSPENSION OF ASBESTOS IN WATER AS A FUNCTION OF PH (Shear rate, 1000 sec^{-1}; Temp. 23-25°C)

Below pH 6 the asbestos is dispersed while above pH 10 it is essentially flocculated. Neither condition is desirable in a paint system, but in the normal pH range of latex paint systems, between pH 6 and pH 10, the asbestos suspension is gelled. It exhibits high viscosity, yield point and plastic flow. CG asbestos provides partial replacement of organic thickeners because of its viscosity contribution and an improved rheology which results in less spatter with roller application.

PRODUCT CHARACTERISTICS

CALIDRIA Asbestos-Coatings Grade is a highly purified, colloidal chrysotile product which is characterized by narrow particle size distribution, low alkalinity and high brightness. It is available in three product forms:

CG-40
CG-100
CG-144

CG-40 is a pre-wet product at 40% solids in water. CG-100 is a dry, pelletized product, and CG-144 is a dry, ground material. Typical physical properties of the three products are as follows:

	CG-40	CG-100	CG-144
Specific Gravity	2.45	2.45	2.45
Moisture, wt. %	60	2	2
Surface Area, $m^2/g.$	60	60	60
G. E. Reflectance	74	74	74
Water Demand (dry basis), wt. %	425	425	425
pH (1% water slurry)	9.5	9.5	9.5
Bulking Value (dry basis), gal./100#	4.8	4.8	4.8
Oil Absorption (dry basis), #/100#	130	130	130
Refractive Index, n_d 25°C	1.54-1.56	1.54-1.56	1.54-1.56
Magnetite, wt. %	0.6	0.6	0.6
Fiber Diam., microns	0.025	0.025	0.025
L/D	200	200	200
Shipping Density, $\#/ft.^3$	56	40	17

LATEX PAINT FORMULATIONS

Physical property tests comparing a typical paint formulation with one containing CG asbestos are shown in Table I. Test methods used are described in the Appendix. They show that CG asbestos provides a 15% increase in viscosity allowing for a partial replacement of organic thickener. It is interesting to note that both paints gave six to seven Hegmann readings. The asbestos fibrils do not decrease the grinds obtainable. Tables II and III are the "typical" and asbestos-containing formulations used.

Both paints have equivalent reflectances of 91.5 but the asbestos formulation yielded a contrast ratio of 0.987 compared to 0.962 for the standard. From the Kubelka-Munk Sx values, a 16% improvement can be attributed to the CG asbestos. More efficient utilization of titanium dioxide and a slight increase in film porosity is responsible for opacity increase.

Comparison of the application characteristics shows the CALIDRIA formulation to be superior. It was judged better in framing, lapping, and burnish resistance while the standard was slightly superior in touch up. Significantly less spatter occurred on roller applications of the CALIDRIA formulation.

The CALIDRIA formulation, Table II, contains 31.5 lb. of asbestos which was offset by reducing the amount of calcium carbonate by an equivalent volume. Both paints are 56.3 PVC. An asbestos pre-slurry was prepared as shown in Table IV as the preferred procedure for asbestos addition. Acceptable paints have been prepared directly from CG-40, CG-100, and CG-144, however.

TABLE I

PAINT TEST RESULTS

Physical Properties	CALIDRIA Asbestos Formulation	Standard Formulation
Total Solids (%)	54.83	54.05
PVC (%)	56.3	56.3
Viscosity (KU)	95	82
Viscosity (cps)*	3350	2120
Freeze-thaw, cycles passed	Failed 1st	1
pH	7.85	7.85
Hegmann Reading	6-7	6-7
Paint Film Properties		
Reflectance	91.5	91.5
Contrast Ratio	.978	.962
Wet Hide	.966	.955
Contrast Ratio (Dry-Wet)	.012	.007
Enamel Holdout (60^{o} Gloss)		
(1) Room Temperature	40	45.5
(2) $37^{o}F$	40	45
Scrub - 1-1/2 hour @ $60^{o}C$		
(1) Initial Wear (cycles)	300	300
(2) Total Cycles	1130	1130
(3) Per cent Wear	40	35
Scrub - 7 Day Air Dry, 10% Ajax		
(1) Initial Wear (cycles)	350	350
(2) Total Cycles	1550	1550
(3) Per cent Wear	65	60
Application Properties		
(1% Phthalo Blue)		
Foaming	Good	Good
Framing	Good	Fair
Lapping	Good	Fair-Good
Touch-up	Good	Excellent
Leveling, visual	Good	Good
Sheen Uniformity	Good	Good
Burnish Resistance	Good	Fair
Wet Crock Resistance	Poor	Poor
Water Spot Resistance	Fair	Fair
Roll Spatter	Slight	Moderate
Color Properties		
Development	Good	Excellent
Acceptance	Good	Fair
Float	None	None

*Model LVT, Number 4 spindle at 60 rpm.

TABLE II

INTERIOR FORMULATION WITH CG ASBESTOS

Ingredients	Pounds	Gallons
Water	269.0	32.3
Cellosize QP-4400	5.0	0.4
Tergitol NPX	3.0	0.3
Tamol 850	4.0	0.4
W.P. Lecithin	1.0	0.1
Ethylene Glycol	20.0	2.2
Butyl Carbitol Acetate	12.0	1.5
Phenyl Mercuric Acetate-30	0.5	-
Colloid 60	1.0	0.1
Ti-Pure R-911	250.0	7.5
ASP-170	75.0	3.5
Duramite	125.0	5.5
*CALIDRIA Asbestos CG Slurry (20.3% Solids)	155.0	16.4
Water	30.0	3.6
Colloid 60	1.0	0.1
UCAR-360	243.0	27.0
	1194.5	100.9

Physical Properties

PVC = 56.3
Total Solids = 52.6
Wt./Gallon = 11.8
Viscosity = 95 KU
pH = 7.85

*See Table IV

TABLE III

INTERIOR FORMULATION WITHOUT CG ASBESTOS

Ingredients	Pounds	Gallons
Water	269.0	32.3
Cellosize QP-4400	5.0	0.4
Tergitol NPX	3.0	0.3
Tamol 850	4.0	0.4
W.P. Lecithin	1.0	0.1
Ethylene Glycol	20.0	2.2
Butyl Carbitol Acetate	15.0	1.8
Phenyl Mercuric Acetate-30	0.5	-
Colloid 60	1.0	0.1
Ti-Pure R-911	250.0	7.5
ASP-170	75.0	3.5
Dolomite	155.0	6.9
Water	150.0	18.0
Aerosol OT (75%)	2.3	0.3
Colloid 60	2.0	0.3
UCAR-360	243.0	27.0
	1195.8	101.1

Physical Properties

PVC	= 56.3
Total Solids	= 52.6
Wt./Gallon	= 11.8
Viscosity	= 82 KU
pH	= 7.85

TABLE IV

CALIDRIA ASBESTOS-CG SLURRY

Ingredients	Pounds	Per Cent by Weight
Water	615	59.4
Aerosol OT (75%)	4	0.4
Colloid 60	5	0.5
Butyl Carbitol Acetate	15	1.4
CALIDRIA CG Asbestos-Coatings Grade (52.0% Solids)	385	37.2
Aerosol OT (75%)	10	1.0
Colloid	1	0.1
	1035	100.0

Physical Properties

Total Solids = 20.3%
Viscosity = 290 cps

Manufacturing Procedure

Charge container with the first four ingredients. Add CG-40 slowly under moderate agitation. The presence of the Butyl Carbitol Acetate and Colloid 60 will prevent puffing due to air entrapment. The subsequent addition of Aerosol OT and Colloid 60 completes the necessary reduction of surface tension needed to accomplish a thorough wetting out of the asbestos begun by the Aerosol OT in the first step. The resultant slurry should provide a reading of 4-5 on the Hegmann scale with readings in the 6-7 range obtainable for paint grinds into which the asbestos slurry has been incorporated.

APPENDIX

TEST PROCEDURES

1. Scrub Resistance

Scrub tests were run on Gardner Straight Line Wear Tester. Test paints applied in side by side fashion on Leneta panels with a 6-mil draw down blade and permitted to dry seven days at room temperature, were then scrubbed with the designated media.

2. Stain Removal

Draw downs were made the length of the Leneta panel (6 mils wet) and allowed to dry seven days. Lipstick, wax crayon, #2 lead pencil, ball point pen, and a smudge, produced by rubbing carbon paper through a smear of lanolin (30 minutes prior to test), were applied in strips across the panel and allowed to dry thirty minutes. The number of cycles required for removal of each type stain is noted or the amount of stain remaining after 300 cycles. The wash media is 25 strokes of lava, applied to the sponge every 50 cycles.

3. Enamel Holdout - Room Temperature

A 6-mil draw down of the latex paint was cast on a 6" x 11-1/2" hide chart. Samples were cured at room temperature for one day, and a 6-mil wet film of semi-gloss enamel (Dutch Boy's Surf Green #583) was applied over the latex paint film. This enamel film was allowed to dry three days and then 60 degree gloss measurements were made.

4. Hide and Reflectance

Reflectance measurements and hiding determinations were made on side by side draw downs (6 mils wet) of the test paints on standard hide charts. Reflectance values were recorded on Photovolt's Model 610 Reflection Meter, using a green filter in the search unit.

5. Leveling

The degree of leveling was determined by preparing draw downs using the New York Production Club leveling blade. The higher the number, the better leveling; 0-10 complete scale.

6. Application Properties

Samples of the paints were tinted (1% by weight) and used to evaluate the application properties on 1' x 2' Upson board panels. In this procedure the entire panel was roll coated except for a 1-1/2"perimeter and permitted to dry several hours. A second roller coat was applied to the upper half of the panel. After the panel was thoroughly dried, the perimeter was brush coated and checked for framing, ghosting, and brushability. Examinations for foaming, dry time, spattering, and cratering were made during panel preparation. After an overnight dry, panels were checked for color and sheen uniformity, burnishing, wet crocking, water spotting, and touch-up.

7. Color Development and Acceptance

Each sample of the tinted paints was drawn down (6 mils wet) beside a common paint of the series. The draw downs were allowed to dry one minute and then "finger rubbed" for a minute. When samples were dry they were examined for a difference in depth of color (color development) and variation in color of the mulled areas (color acceptance). The mulled area was also inspected for evidence of flocculated titanium dioxide.

8. Freeze-Thaw

A three-ounce sample of each paint was cycled in the following manner: Eighteen hours @ $10^{o}F$ ($\pm 5^{o}$), then six hours at room temperature. Samples were examined visually after each cycle for coagulation, seediness, and viscosity change. Test was discontinued after five cycles.

9. Heat Stability

Paint samples were placed in an oven at $55^{o}C$ for ten days. At the end of this period paints were checked for changes in viscosity, pH, settling, odor, agglomeration and skinning.