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Cadria ASBESTOS

THE DISCOVERY COMPANY

UNION CARBIDE CORPORATION • MINING & METALS DIVISION • P.O. BOX 579 • NIAGARA FALLS, N. Y. 14302 • TEL: 716-278-3376

September 4, 1974

PLAINTIFF'S EXHIBIT
UC-575

Mr. R. Favero
Plant Manager
Georgia-Pacific Corporation
Marietta, GA 30060

Dear Mr. Favero:

Enclosed is the report of our findings on the air samples collected at your plant on August 7, 1974. We believe the report to be self-explanatory, however, if you have any questions or wish to discuss the results further, please do not hesitate to contact either Jack Walsh at our Atlanta, Georgia sales office or me at the above address.

We look forward to serving you.

Very truly yours,

E. J. Kleber
Customer Service Representative

EJK:cjb
Enclosure

CC: Mr. J. E. Walsh

AIRBORNE FIBER COUNTS

for

Georgia-Pacific Corporation
Marietta, Georgia

September 4, 1974

Samples Collected By: J. E. Walsh
Union Carbide Corporation

Samples Analyzed By: E. J. Kleber
Union Carbide Corporation

Union Carbide Corporation
Mining and Metals Division
Niagara Falls, New York

OBJECTIVES

Monitor airborne asbestos fiber at Georgia-Pacific Corporation, Marietta, Georgia, a manufacturer of joint cements.

OPERATION MONITORED

Air samples were collected August 7, 1974 during the makeup of two batches of ready-mix tape joint cement. Personal breathing zone samples were collected from the operator (Larry James) during the addition of asbestos and other dry ingredients.

EQUIPMENT AND PROCEDURE

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.93a, using the Bayer, Zummalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type) calibrated to 2 liters per minute were used to collect personal breathing zone samples on millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Vicker's phase contrast microscope utilizing a Porton reticle for sizing and field definition.

TEST RESULTS

Reported as fibers greater than 5 microns in length per cubic centimeter of air sampled. A fiber is defined as a material having an aspect ratio greater than 3:1.

SUMMARY OF FIBER COUNTS

Sample No.	Sampling Time	Description	Fibers/cc >5μ
I-41	5 min.	Personal - Operator (Larry James) during addition of 212 pounds Canadian 7RF9 and 87.5 pounds "Calidria" Asbestos SG-210.	15.7
J-15	7 min.	Personal - Operator during addition of all other dry ingredients in batch.	3.1
H-17	7 min.	Personal - Same description as I-41 on next batch.	20.9
I-17	4 min.	Personal - Same description as J-15 on next batch.	5.8

BUSINESS CONFIDENTIAL

PROJECT REPORT

VOLTAGE STABILIZATION OF POLYETHYLENE
II. BENEFICIAL EFFECTS OF CALIDRIA ASBESTOS USED AS FILLER

AUTHORS: R. M. Eichhorn

SUPERVISOR: R. L. Boysen

DATE: July 28, 1977

PROJECT NO.: 223N14

FILE NO.: 5594

SUMMARY

It has been found that UCC Calidria Asbestos, a proprietary material, has very useful properties for inhibiting the initiation and growth of trees in ethylene polymers and copolymers. In fact it may be one of the best voltage stabilizers against wet and dry treeing which will be developed in our voltage stabilization program. Unfortunately, asbestos is recognized and listed as a known carcinogen and the OSHA Standard (CFR 29, 1910.1001) specifies exposure limits for workers, and detailed survey procedures for airborne concentration. Therefore commercial use of asbestos would require at least periodic checking of our processing areas and some parts of our customers' plants. These problems of toxicity and required surveying have, at least for the present, outweighed the technical advantages of using Calidria in electrical insulating polyolefins. This was a marketing decision.

While the statements above are true, the UCC Mining & Metals Division maintains that Calidria, distinguished from other asbestos, is offered in a form which is not dangerous if reasonable precautions are observed. They have collected considerable information and data to show that hazardous levels need not be reached in commercial operations such as conveying, mixing, banburying, even chopping and regrinding of Calidria/resin composites.

This report was prepared to summarize the data obtained in a preliminary laboratory evaluation of Calidria in comparison with other minerals in case our business decision should be changed and for use in possible patent applications.

Research and Development Department
Chemicals and Plastics
Union Carbide Corporation
Bound Brook, New Jersey

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INTRODUCTION

It is now well known that organic dielectrics, when exposed to very high, prolonged and strongly divergent electric fields sometimes fail by a mechanism called "treeing." There are several kinds of treeing which have been described in terms of the structure and appearance of the trees, the magnitude of gradients which tend to initiate their growth, and the ambient conditions which prevail during the initiation and growth. (1) Briefly, there are two major kinds of treeing; electrical treeing in which permanent hollow channels result from material degradation and decompostion during partial discharge, and water treeing in which microscopic water channels penetrate the insulation parallel to the electric field vector. Both kinds of trees require high and divergent electrical stress; water trees, as the name implies, require a wet environment. However water trees grow at a lower stress than do electrical trees and disappear when voltage is removed and the channeled water drains away or evaporates.

Since the potential damage to direct buried URD type cables by treeing was reported in 1971, (2) this electrical phenomenon, which is not new, has received much attention. Cable makers have developed new constructions and material suppliers new formulations to increase the resistance against treeing. In addition to the inclusion of certain stable organic materials to increase the electrical stress required to initiate a tree and decrease the rate at which trees grow after initiation (3, 4, 5, 6, 7, 8), certain finely divided mineral dielectrics have been used as fillers or additives for the same purposes. (9, 10, 11, 12, 13) Primary among the minerals have been surface treated clay and mica. These materials have proved to be of some help against electrical treeing. During an evaluation of these additives, and some others, it was discovered that Calidria Asbestos confers significantly greater treeing resistance to polymers containing ethylene than any of the other materials tested. In addition to increasing the resistance to both electrical and water treeing, the incorporation of Calidria Asbestos increases the dielectric breakdown strength as measured with the conventional ASTM D-149 test. This is not true of the other mineral fillers.

DISCUSSION

Material and Testing

Calidria Asbestos is a domestic (US) chrysotile asbestos which by a UCC proprietary wet process has been highly purified and liberated into individual fibres having diameters of 250-300 Å and lengths of 2-5 μ. (14) The aspect ratio is therefore in the range 65-200. Calidria asbestos is commercially available as 1/8" diameter pellets which can be readily handled and processed with minimum dust generation. A surface treated grade of Calidria is offered which has

been developed to provide easier dispersion in thermoplastic resins. The result is significant improvement in mechanical reinforcement and thermal stability in polyolefin and polyvinyl chloride composites. The electrical differences between polyethylene samples containing surface treated and standard Calidria are not measurable except for loss factor. The samples containing the treated filler showed some heating when tested at high stress under water.

The test used to measure the resistance of dielectric materials to electrical treeing is a modification of the original tests by Kitchin and Pratt (15) and by McMahon and Perkins (16). It is called the double needle voltage life test (8).

The water tree tests reported here were made with the equipment and method of Ashcraft (17) which are similar to those described earlier by Nitta (18).

Incorporation of some mineral fillers into an organic polymeric dielectric material decreases the rate at which trees, both electrical trees and water trees, grow under the action of an electric stress. Whether this effect results from an increase in the compressive strength due to mechanical reinforcement, the elimination of easy direct electrical paths between electrodes, or some other material change, is not known. It has been observed that different mineral fillers affect the resistance to treeing in different degrees, and that Calidria Asbestos is most effective.

Electrical Treeing

The data in Table I show the resistance to electrical treeing conferred upon an ethylene homopolymer by various mineral fillers including Calidria.

The effect of filler on treeing resistance is concentration dependent. This is shown in Tables I and II.

The effectiveness of Calidria as a filler in resisting the growth of electrical trees is not limited to polyethylene but also includes copolymers and terpolymers of ethylene. For example consider the data presented in Table III for ethyl acrylate and vinyl acetate copolymers with ethylene.

TABLE I

DOUBLE NEEDLE VOLTAGE LIFE OF

POLYETHYLENE CONTAINING VARIOUS FILLERS

		15 kV (hours)	17.5 kV (hours)
DFD-6005	(Control)	30	20
DFD-6005 +	5% Calidria	42	--
	5% Talc	--	--
	5% Wollastonite	35	21
	5% Translink 37	--	20
+	10% Calidria	>500	30
	10% Talc	32	--
	10% Mica	40	--
	10% Chalk	>130	--
	10% Wollastonite	20	--
	10% Translink 37	--	20
+	20% Calidria	--	>300
	20% Wollastonite	21	17
	20% Translink 37	--	15

TABLE II

EFFECT OF FILLER CONCENTRATION

ON RESISTANCE TO ELECTRICAL TREEING

		15 kV (hours)	17.5 kV (hours)
DFD-6005	(Control)	30	20
DFD-6005 +	0.5% Calidria	28	--
	2% Calidria	26	--
	5% Calidria	40	--
	10% Calidria	>500	30
	20% Calidria	--	>300

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TABLE III

EFFECTIVENESS OF CALIDRIA IN COPOLYMERS OF ETHYLENE

		15 kV (hours)	17.5 kV (hours)
DFDA-0585 (EEA)	Control	25	--
	+ 5% Calidria	25	--
	+ 10% Calidria	>170	63
DXM-228 (EVA)	Control	--	10
	+ 5% Calidria	--	11
	+ 10% Calidria	--	100

Water Treeing

Water trees are different in appearance and behavior from electrical trees. They grow without the accompaniment of electrical partial discharge and they do not destroy or decompose material thereby leaving behind an empty channel. They grow slowly and at a lower voltage than electrical trees when the dielectric material, especially at the stress concentration which initiates growth, contains moisture. However at higher voltages, even in the presence of moisture, not water trees but electrical trees will grow.

A successful needle type test which measures the lifetime of wet specimens has not been reported. The most useful test seems to be one in which the size of a water tree after exposure for a fixed time to a constant voltage stress, with controlled geometry, and under water is measured. (17) Acceleration of the test is provided by moderate overstresses and high frequency AC voltage. The extent of water tree growth after 24 hours at 5 kV in 0.01 N NaCl(aq) solution is presented in Table IV. The trees grow at the tips of conical depressions with tip radius about 5 μ. The depressions are about 3 mm deep and 3 mm diameter at the large end. The results show the superiority of Calidria very clearly.

TABLE IV

SIZE OF WATER TREES AFTER 24 HOURS GROWTH

DFD-6005	Control	27μ
DFD-6005 +	20% Translink 37	25
	20% Wollastonite	20
	20% Calidria	0

Conventional Breakdown Strength Tests

One problem with the use of mineral fillers in organic dielectrics has been that while increasing both mechanical strength and the resistance to growth of electrical trees, the electrical impulse strength has been seriously decreased. Although impulse voltage tests have not been carried out in this study, the results of AC breakdown tests with flat electrodes are shown in Table V.

TABLE V

DIELECTRIC BREAKDOWN STRENGTH MEASURED BY ASTM D-149

Materials	Breakdown Strength (v/mil)
DFD-6005 (Control)	500
DFD-6005 + 5% Translink 37	390
10% Translink 37	440
20% Translink 37	460
DFD-6005 + 10% Calidria Asbestos	580
20% Calidria Asbestos	586

The D-149 test was carried out on nominal 125 mil thick specimens with correction to that exact value, with 2 inch diameter flat steel electrodes relieved to 1/4 inch radius at the periphery, and with a constant 500 v/sec rate of voltage rise. Since the filler used commercially in the dielectrics with low impulse ratings is Translink 37, and Translink 37 reduces the AC strength as shown in Table V, there may be some hope that Calidria will not suffer this limitation as a stabilizer.

CONCLUSIONS

The data presented suggest that ethylene polymers and copolymers can be effectively stabilized against the initiation and growth to failure of electrical and water trees. Further detailed evaluation would be required to determine the commercial feasibility of such a formulation.

R. M. Eichhorn

RME/smk

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REFERENCES

(1) R. M. Eichhorn, IEEE TRANS EI 12 No. 1, 2 (1977).

(2) W. Vahlstrom, paper presented at IEEE Conference on Underground Distribution, Detroit, Michigan, September 1971.

(3) Simplex Wire & Cable Company, U. S. Patents.

(4) R. M. Eichhorn, IEEE (PES) 1972 Underground Transmission Conference, published as 72-CHO 608-0-PWR (sup.) (1973), p. 282.

(5) T. Hayami, Y. Yamada, 1972 Annual Report, Conference Electrical Insulation and Dielectric Phenomena, Nat. Acad. Sci., Wash., D. C., p. 239.

(6) M. Morita, M. Hanai, H. Shimanuki, 1973 Annual Report, Conference Electrical Insulation and Dielectric Phenomena, Nat. Acad. Sci., Wash., D. C., p. 299.

(7) H. Kato, N. Maekawa, S. Inoue, H. Fujita, 1974 Annual Report, Conference Electrical Insulation and Dielectric Phenomena, Nat. Acad. Sci., Wash., D. C., p. 229.

(8) A. Ashcraft, R. M. Eichhorn, R. G. Shaw, IEEE Conference Proceedings, 1976 Int'l Symp. on Electrical Insulation, Montreal, Canada (1976).

(9) M. Olyphant, INSULATION, Feb., Mar., Apr. (1963).

(10) B. T. MacKenzie, M. Prober, R. C. Lever, 1972 Annual Report, Conference Electrical Insulation and Dielectric Phenomena, Nat. Acad. Sci., Wash., D. C., p. 232.

(11) E. H. Reynolds, ibid., p. 463.

(12) O. Kind, L. Schiweck, 1969 Annual Report, Conference Electrical Insulation and Dielectric Phenomena, Nat. Acad. Sci., Wash., D. C., p. 128.

(13) G. Loffelmacher, ELECKTROTECHNISCHE Z., A96 (1975), p. 152.

(14) F. H. Ancker, R. G. Azrak, M. D. Bertolucci, PLASTICS ENGINEERING, July (1974), p. 32.

(15) D. W. Kitchin, O. S. Pratt, TRANS AIEE (PAS) 77 (1958), p. 180.

(16) E. J. McMahon, J. R. Perkins, TRANS AIEE (PAS) 83 (1964), p. 1253.

(17) A. Ashcraft, paper No. 13 section 3A, World Electrotechnical Congress, Moscow, USSR, June 1977.

(18) Y. Nitta, IEEE TRANS EI 9 No. 3 (1974), p. 109.

b) Inform plant IH and medical departments of the intermittent use of tetraisopropyl titanate so that they may prepare a toxicity writeup on it and obtain its current MSDS to replace the information currently available to the operating personnel in the control room copy of the SOP.

General

1.4 Asbestos Exposures

Operations personnel were generally unaware of the presence of asbestos-containing insulation in the unit. The maintenance insulators reported to the Team that asbestos insulation was still present in the area and then showed the Team exposed insulation on surplus equipment and around the EBS that they believed to contain asbestos. The Team is concerned about asbestos exposures during insulation removal activities and from exposed insulation fibers observed by the Team in the area. The current limit for exposure of asbestos is soon being reduced by a factor of 4 or 10, which increases the concern for protecting personnel from overexposure to asbestos fibers.

Union Carbide trial exhibit UC-575: E. J. Kleber to R. Favero (Georgia-Pacific) Sending Airborne Asbestos Fiber C... Published by AsbestosClaims.Law
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Recommendation

Consideration should be given to testing the insulation that is believed to contain asbestos to confirm that it does. Operations personnel should be informed of the presence of asbestos-containing insulation in their workplace. Consider providing to operations staff a session discussion on the health hazards associated with inhalation of asbestos fibers or the asbestos hazards training program which the insulators have completed and that other maintenance craftspersons will be beginning soon. Consideration should be given to removal from the unit of surplus equipment having asbestos-containing insulation to reduce the potential for asbestos exposure and also to covering exposed asbestos-containing insulation, where feasible. The Team endorses the current practice to monitor area concentrations as well as personnel exposures for asbestos during major removal operations involving asbestos insulation because this will indicate whether other personnel besides insulators are being overexposed.

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