PLAINTIFF'S EXHIBIT
UC-424

Research & Development Department
Mining & Metals Division
P.O.Box 579, Niagara Falls, N. Y.
April 7, 1972

M E M O R A N D U M

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SUBJECT: Experimental Results - Airborne Asbestos - Part II

Introduction

The need for data on the concentration of airborne asbestos during certain operations was discussed in the author's earlier memorandum (February 29, 1972, "Experimental Results - Airborne Asbestos"). In that memorandum experimental procedures, results, and conclusions were presented. This memorandum is a continuation of that earlier work.

Samples taken in Florida and at the American Biltrite Company in Trenton, New Jersey will be discussed. The development of a new method for the determination of airborne asbestos by relating the airborne Mg content to asbestos fiber count was continued. The effect of variable Mg concentration in the reagents and in blank millipore filters on the accuracy and precision of the proposed method is discussed.

Magnesium Determination - Alternate Method for Asbestos Determination

A. Blanks

The airborne asbestos collected on a millipore filter (MF) can be determined by either the fiber counting technique or by determining the Mg concentration. Because the amount of asbestos (and therefore Mg) collected on the MF is low, the effect of the concentration of Mg in the reagents and in the blank MF may be significant. The Mg concentration in the reagents was determined by taking 1.0 ml. $HClO_4$, 4.0 ml. HNO_3, and 1.0 ml. HF to dryness. This "residue" was then taken up with 0.25 ml. HCl and 0.25 ml. $LaCl_3$ solution (50 mg. La/ml.), diluted to 25 ml. and the Mg concentration determined by atomic absorption spectroscopy (AAS). The data, presented in Table I, show that the average Mg concentration in the reagents (reagent blank) is 0.57 μg Mg $\pm$ 0.09. The $\pm$ value is the standard deviation which indicates that 95% of the experimental reagent blank values will lie between 0.39 and 0.75 μg Mg.

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The concentration of Mg in the MF (filter blank) was determined by wet-ashing either a 47 mm. diameter MF (AAWP 04700) or a 25 mm. diameter MF (AAWP 02500) in the same volume of reagents discussed above. The Mg concentration was then determined by AAS. The data, presented in Table I, show that the 47 mm. diameter MF contains 1.46 ± 0.30 μg Mg and the 25 mm. diameter MF contains 0.64 ± 0.3 μg Mg. The standard deviations indicate that 95% of the 47 mm. MF contain between 0.86 and 2.06 μg Mg and 95% of the 25 mm. MF contain between 0.34 and 0.94 μg Mg. Attempts to relate the MF weight to Mg concentration were unsuccessful. Analyses of two lots of 25 mm. MF show the Mg concentration to be fairly consistent. For the 47 mm. diameter paper, the Mg content varied considerably for the two lots studied but appeared to be fairly consistent within a lot. Magnesium determinations of a few filters in a lot would establish the Mg content of the lot and probably reduce the standard deviation to ± 0.15 μg Mg. This would mean, considering both filter and reagent blanks, that at the 95% confidence level the Mg variability would be ± 0.48 μg Mg. For the dumping experiments conducted at Niagara, we found that ~2 μg Mg corresponded to 1 fiber/cc. This means that we may be able to distinguish ± 0.25 fibers/cc. using the Mg method under ideal conditions. Ideal conditions mean that no extraneous airborne Mg-containing dust other than that present in the asbestos can be present and that a meaningful relationship between fiber count and Mg concentration can be established.

B. Samples

Air samples were collected during the week of January 31, 1972 in four small Florida companies and on March 1, 1972 at the American Biltrite Company in Trenton, N. J. The fiber counts of the samples were determined by Mr. Paul McDaniel's group using the microscopic procedure. The concentration of Mg was also determined by atomic absorption spectroscopy (AAS). These results are presented in Table II. The dust counts are also presented in Table II for completeness.

A plot of the fiber count (fibers/cc.) vs. the Mg concentration (μg Mg/liter) is presented in Figure 1 for the Florida samples and Figure 2 for the American Biltrite samples. No correlation exists between fiber count and Mg concentration for the Biltrite samples and many of the Florida samples. A reasonable correlation did exist for the Niagara dumping and sanding experiments reported in the February 29, 1972 memorandum. The correlation curve from the Niagara experiments is drawn on the figures; no Niagara data points are plotted on the figures, however.

The lack of correlation for Florida samples 7, 8, 16, and 20 is particularly extreme and interesting. Samples 7, 8, and 16 are viewed in the microscope as typical asbestos fibers and therefore a lack of correlation cannot be explained by the possible counting of nonasbestos (non Mg-containing) fibers. Perhaps the RG-244 dumped in Experiments 7, 8, and 16 is a very narrow fiber, and even though it can be counted as an asbestos fiber it contributes little Mg compared to the asbestos employed in the Niagara experiments. In fact, each asbestos grade may produce a different correlation curve. Sample 20 contains an exceptionally high concentration of Mg. This Mg impurity probably came from a spraying operation being conducted in the vicinity of the No. 20 sampling position.

The American Biltrite samples show little correlation, especially Sample No. 5. The asbestos employed in the American Biltrite experiments was Phillips-Carey and could partially explain lack of correlation with the Niagara experiments. Sample No. 5, however, is still quite unexplainable.

The results of this memorandum indicate that the atomic absorption technique has the required sensitivity and precision to be used as an alternate asbestos method. The lack of correlation between fiber count and Mg concentration, however, makes the proposed method unreliable at this time. More data may establish a correlation for different asbestos types and eventually develop into a usable technique.

M. A. Peters

MAP:rvg
Attach.

TABLE I

Determination of Mg in Reagents and Millipore Filters

Experimental Conditions:

1 ml. $HClO_4$
4 ml. HNO_3
1 ml. HF
0.25 ml. $LaCl_3$ Solution (50 mg./ml. La)
0.25 ml. HCl
Dilute to 25 ml.

	Mg Concentration, μg. Mg		
	Millipore Filter Blank*		
Filter Diameter:	47 mm.	25 mm.	Reagents Blank
	1.43 μg. Mg	0.97 μg. Mg	0.49 μg. Mg
	1.23	1.33	0.49
	1.49	0.46	0.65
	1.47	0.64	0.46
	1.18	0.33	0.75
	1.03 } Lot 1	0.44 } Lot 1	0.56
	1.22	0.69	0.59
	1.72	0.32	Avg. = 0.57 $\pm$ .09 μg. Mg
	1.98 } Lot 2	0.56 } Lot 2	
	1.82	0.64	
Avg.	1.46 $\pm$ 0.3 μg. Mg	0.64 $\pm$ 0.3 μg. Mg	

*Corrected for reagent blanks.

TABLE II

Determination of Airborne Asbestos in Various Florida Plants & at the American Biltrite Co.

Air Volume = 18 to 28 Liters
Air Sampling Rate = 1.8 L/Min.

Sample No.	Sample Description	μg. Mg on 47 mm. Diameter MF (Corrected for Reagent Filter Blank)	μg. Mg/ Liter Air Sampled x 10^3	Fiber* Count Fibers /cc.	Dust** MPPCF
	Marco Polyester Plant, Bartow, Florida				
1	Breathing level at resin mix tank,	0.18	12.9	0.2	7.0
2	no operation in progress	0.18	12.9	0.3	6.4
3		0	0	0.2	6.7
4	Breathing zone of operator dumping	0.48	34	1.3	28.4
5	10 bags of Aerosil 200 into resin	1.0	71	1.0	38.6
6	mix tank	0.32	11	0.6	24.2
7	Breathing zone of operator dumping	0.88	32	4.4	13.7
8	23 bags of RG-244 into resin mix	3.60	129	11.5	16.6
9	tank	0.48	18	1.4	10.2
10	Breathing level at resin mix tank about 25 min. after RG-244 dump	0.18	6.4	1.4	9.3
	Palomino Products, Winter Haven, Fla.				
11	Breathing level near operator	0.26	9.3	1.4	12.4
12	spraying shower stalls with Marco	0.2	0.7	1.3	11.8
13	GR-12179 resin (containing ~0.5% RG-244	0.18	6.4	1.0	15.9
14	and 0.5% Aerosil 200) and chopped fiber	0.18	6.4	1.2	14.0
15	glass strand	0.10	3.6	1.0	12.4
	Alpha Chemical Co., Kathleen, Florida				
16	Breathing zone of operator dumping 5 bags of RG-244	0	0	2.8	9.6
17	Breathing zone of operator dumping 5 bags of Cab-o-sil	3.68	132	1.2	12.1
	Irwin Yacht, St. Petersburg, Florida				
18	Breathing level of operator spraying	0.46	16.4	1.1	19.1
19	inside of boat hull with a filled	1.66	59.3	0.9	22.3
20	polyester resin (~0.4-0.5% of each	14.34	512	0.8	12.4
21	RG-244 & Cab-o-sil) and chopped fiber	0.94	33.4	1.2	17.5
22	glass strand	0.18	6.4	1.3	10.8
23	Breathing level near operator	2.72	96	3.0	High
24	doing edge-grinding outdoors on	3.04	107	2.3	"
25	boat sections	2.64	93	2.1	"
	American Biltrite Co., Trenton, N.J.***				
5	Inside box car during manual handling of bags of asbestos (Phillips-Carey T7S3)	.1	3.6	21.09	-
6	Beside operator on platform at Banbury (line 1, operating→)	3.64	134.8	1.28	-
2	Bkg. on platform for line 2 blender (no loading of asbestos)	3.75	208	0.54	-
4	Platform for line 2 blender while loading 18 bags of Phillips-Carey T7S3	2.79	155	2.03	-
1	Aisleway between Banbury lines 1 and 3	0.5	18.9	0.75	-
7	Aisle back of No. 2 mill	1.37	76	1.41	-
3	At tile cut-out machine	0.29	16	1.11	-

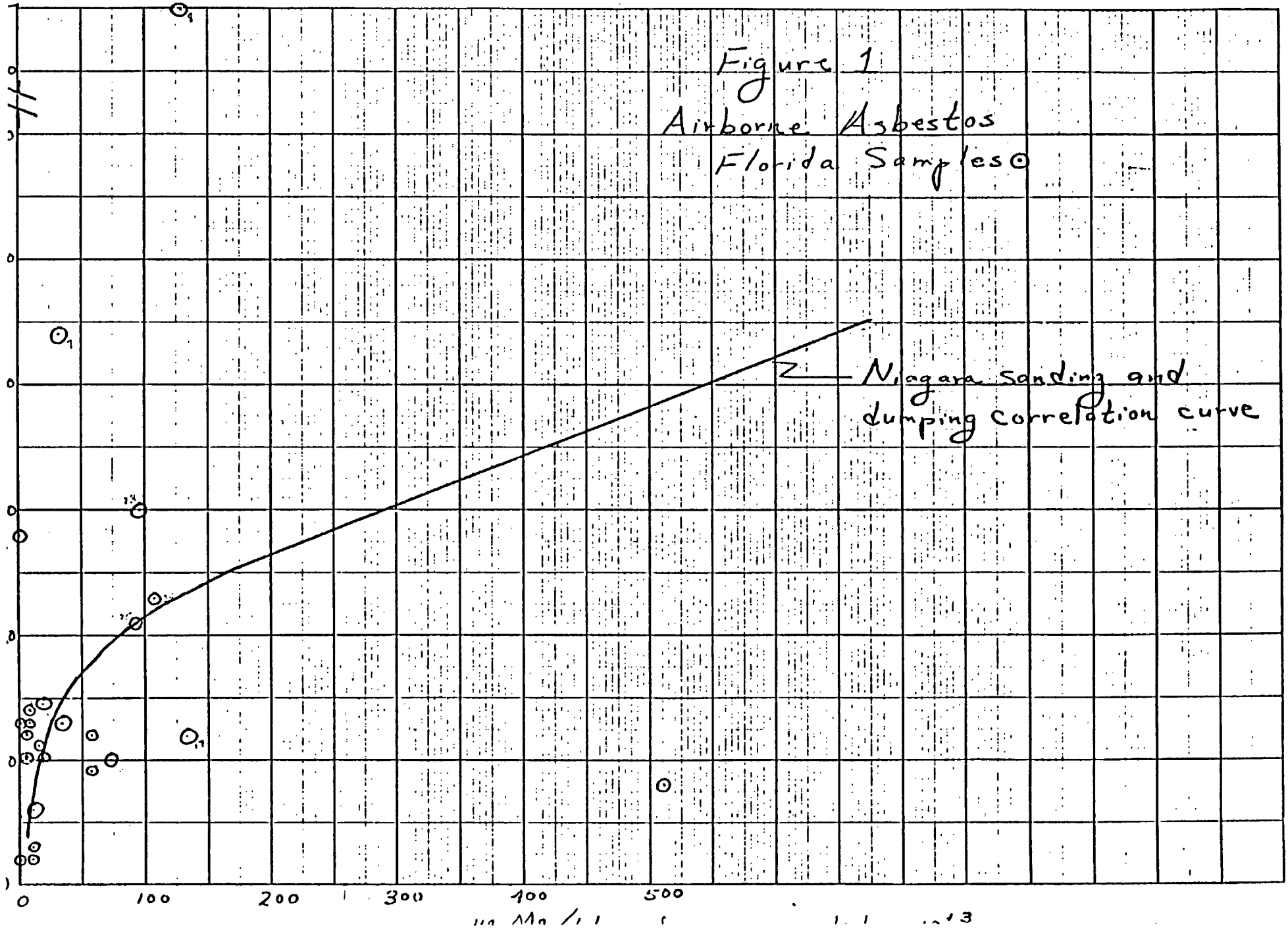
*Only fibers > 5μ in length are counted

**MPPCF - Millions of particles per cubic foot of air

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