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DEPARTMENT OF MATERIALS CHEMISTRY

Non-Metallic Minerals Section

EVALUATION OF ATLAS FIBRE AZ-8

Asbestos Services
Report No. AS 403-77

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for

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U.S.A.

Attention: Mr. Irving F. Moore
President

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1. INTRODUCTION

A meeting between Mr. I. F. Moore, President of Atlas Asbestos, and Dr. R. A. Kuntze, was held on January 7, 1977 at Coalinga, California, to discuss some of the properties of Atlas Asbestos fibres. Specifically, Mr. I. F. Moore was concerned with the possibility of recovering a longer fibre than presently produced by Atlas Asbestos for the floor tile industry, i.e. a fibre in the order of a QAMA grade 7R, 7M or 7D as opposed to 7T.

As a result of this meeting, a sample of Atlas AZ-8 (corresponding to an 8 mesh screen oversize) was sent to ORF for a preliminary evaluation. ORF was also requested to make suggestions as to the possible uses of such a product, i.e. as filter aid, for plastic reinforcement, etc.

2. INITIAL OBSERVATIONS

In contrast to conventional chrysotile asbestos fibre, the sample of Atlas AZ-8 consists of flake-like particles resembling small pieces of tissue paper, rather than fibre bundles (see Fig. 1a). These flakes appear to be composed of tightly matted chrysotile fibres that are not easily separated by the mechanical means normally used to fiberize conventional asbestos. Because of this characteristic, it is difficult to establish the length and diameter distributions of the individual fibres, i.e. to assign a grade classification. In fact, the resistance of the flakes to fiberizing or dispersing presented the greatest difficulties for the attempts to determine the properties of this material.

3. DRY FIBERIZATION EXPERIMENTS

The usual procedure of evaluating crude samples of asbestos fibre consists of applying mechanical action under dry conditions for increasing length of time. This is intended to separate or open the crude fibre bundles which is necessary in practice for most applications. After each time interval, i.e. at each opening stage, a wet classifier test (Bauer-McNett or T&N Classifier) is carried out. In doing so, an attempt is made to establish the approximate grade of the fibre sample, in addition to characterizing the sample in terms of response to mechanical action.

As shown in Table I, tests on Atlas AZ-8 produce data that indicate an approximate grade of 4T to 5R. However, microscopic examination also showed that mechanical action resulted in smaller flakes but did not accomplish the separation of these flakes into individual fibre bundles or fibres.

At this stage of the program, it became obvious that an effective method of fiberizing had to be found prior to continuing with the evaluation of the sample.

4. WET FIBERIZING EXPERIMENTS

After a number of trial experiments, it appeared that opening in a wet medium was the most suitable method from an experimental point of view. Although wet opening is not a practical pre-treatment for fibre intended for plastic reinforcement, it may be an acceptable method for asbestos-cement fibre which are wet-treated in some cases, e.g. hydropulper.

As shown in Table II, wet opening has a much greater effect on fiberizing AZ-8, requiring only seconds instead of minutes. Again, as the fibre is opened, its grade decreases from 4J to 7M. It should be stressed that this may be only an apparent effect since grades are based on classifier data usually obtained with a fibrous material. In contrast, AZ-8 consists of flakes even after considerable fiberization (see Figs. 1a and 1b).

5. ASBESTOS-CEMENT REINFORCEMENT

An attempt was made to correlate the assignment of an approximate grade with the reinforcing value of the AZ-8 fibre in asbestos-cement. However, it was found that without fiberization, it was impossible to prepare acceptable asbestos-cement specimens. The fibre flakes did not disperse well in the cement slurry and consequently the resulting specimens were not homogeneous.

Considerably better results were obtained after dry or wet opening of the fibre. The results shown in Table III indicate that after dry opening,

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a reinforcing value equivalent to that of a 6D is obtained, although the Bauer-McNett classification indicates a 5R+ grade. The reverse is found for wet opened fibre which produces a reinforcing value equivalent to that of a 4D, in spite of a 5R grading by Bauer-McNett classification.

6. PLASTIC REINFORCEMENT

Two attempts were made to evaluate the reinforcing characteristic of AZ-8 in plastics such as High Density Polyethylene (HDP). The first attempt, using unopened fibre was largely unsuccessful because the relatively large flakes did not separate and disperse in the plastic even after 30 minutes' mixing by roller mill.

In the second attempt, fibre was used that had been dry opened for 5 minutes. The size of the flakes was greatly reduced and the fibre dispersed quite well after only 20 minutes' mixing. Hence, it is believed that AZ-8 fibre would be suitable for plastic reinforcement, provided some pre-treatment is used and mixing is carried out using equipment with a higher shear force such as the Banbury Mixer.

7. CONCLUSIONS

The results of this preliminary examination show that Atlas AZ-8 has unusual properties because of its flake-like composition and the resistance of these flakes to "fiberization". The flakes seem to consist of individual fibres that are matted and bonded together. Hence, for all practical purposes the flakes act like long fibres. This hypothesis may explain the relatively high strength contribution of AZ-8 when tested in asbestos-cement. In this connection, it is appropriate to state that the reinforcing value of AZ-8, under certain conditions, is "equivalent to that of a specific QAMA grade asbestos", such as 6D, 5R or even 4D. However, it would not be advisable to generally assign a grade designation to AZ-8 because it responds differently to tests that are designed to evaluate conventional chrysotile asbestos, i.e. fibrous material.

If a proper pre-treatment method is used, AZ-8 may have a very high asbestos-cement reinforcing value. Even after a relatively ineffective pre-treatment, AZ-8 appears to have a reinforcing value comparable to that of a 6D.

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For the use of AZ-8 as a reinforcing agent for plastics, a proper pre-treatment is absolutely necessary to obtain satisfactory dispersion. Again, if this is done, the behaviour of the material should be comparable to that of asbestos with a relatively long fibre distribution, e.g. 6D to 5R.

Because of the flake-like appearance of AZ-8 and its relatively poor filtration characteristics observed during asbestos-cement tests, it is doubtful that this material can be used as filter aid.

RAK:pmt

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TABLE I

BAUER-McNETT AND T&N CLASSIFIER RESULTS FOR DRY OPENED* ATLAS ASBESTOS AZ-8 FIBRE

T&N Classifier

Sample	Opening Time (min)	T&N Classifier (%) +7	+14	+25	+50	+200	-200	Approx. Grade
a	0	23.8	67.8	1.1	0.4	1.3	5.6	-
b	2	5.4	16.9	18.3	25.8	20.5	13.1	4T
c	3	0.1	5.8	17.6	31.8	28.0	16.7	5R
d	4	0.3	4.1	12.5	31.4	33.0	18.7	5R**
e	5	0.7	3.7	9.5	29.9	35.9	20.3	6D**

**Low in -200 mesh in comparison with conventional grades

Bauer-McNett

Sample	Opening Time (min)	Bauer-McNett (%) +4	+14	Acc. +14	+35	+200	-200	Approx. Grade
a	0	19.4	65.3	84.7	2.6	2.2	10.5	-
b	2	5.5	27.9	33.4	14.3	34.8	17.5	4T
e	5	6.8	16.4	23.4	21.1	31.1	24.7	5R+

*Waring Blendor

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TABLE II

BAUER-McNETT RESULTS FOR THE WET OPENED* ATLAS ASBESTOS FIBRE

Sample	Opening Time (sec)	Bauer-McNett (%)						Approx. Grade
		+4	+14	Acc. +14	+35	+200	-200	
1	0	19.4	65.3	84.7	2.6	2.2	10.5	-
2	15	7.9	43.3	51.2	12.8	11.7	24.3	4J
3	30	1.1	15.6	16.7	17.1	28.6	37.6	5R
4	45	0.0	3.1	3.1	9.8	33.7	53.4	6D
5	60	0.2	3.3	3.5	9.4	33.5	53.6	6D
6	90	0.1	0.1	0.2	1.1	23.9	74.6	7M

*2.0 g samples in 150 ml H_2O

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TABLE III

A/C RESULTS FOR ATLAS ASBESTOS AZ-8 FIBRE

Sample	Opening	Filtration Rate (ml/sec)	Water Retention (%)	Density (g/cm^3)	Breaking Load (lb)	Modulus of Rupture (kg/cm^2) MR_T	Modulus of Rupture (kg/cm^2) MR_A	Approx. Grade
1	Dry, 2 minutes in Waring Blendor	5.2	18.2	1.60	178.0	292	292	6D
2	Dry, 5 minutes in Waring Blendor	5.3	19.0	1.63	187.5	314	304	6D
3	Wet, (lime-gypsum water) 30 seconds in Waring Blendor	3.1	15.7	1.75	304.0	593	490	4D

Union Carbide trial exhibit UC-255: R. A. Kuntze (Ontario Research Foundation) to I. F. Moore, Atlas Asbestos Com...
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Figure 1b



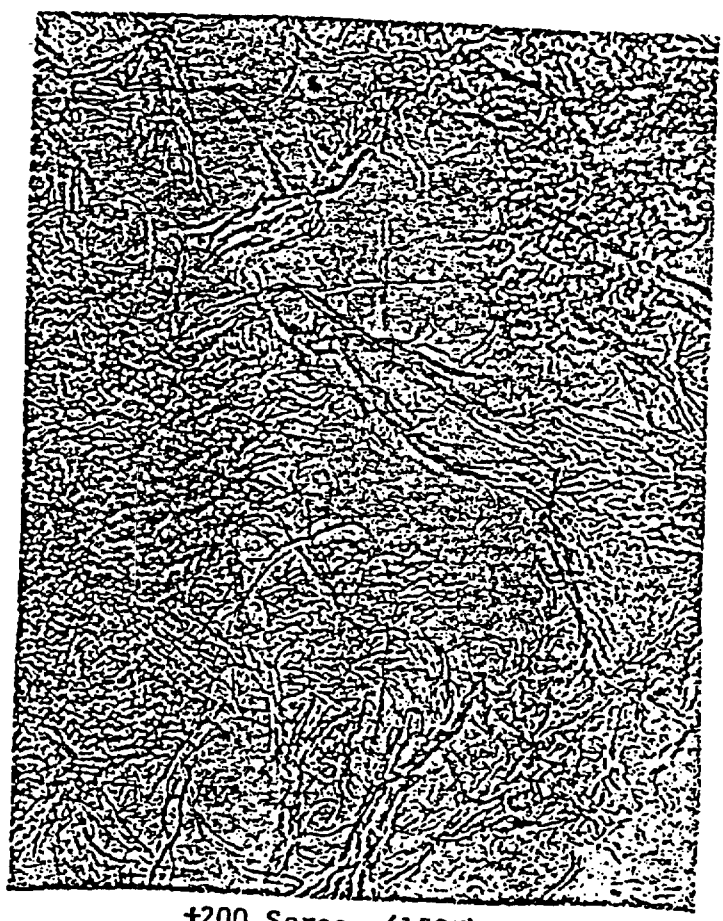
+35 Screen (25X)



+35 Screen (150X)



+200 Screen (25X)

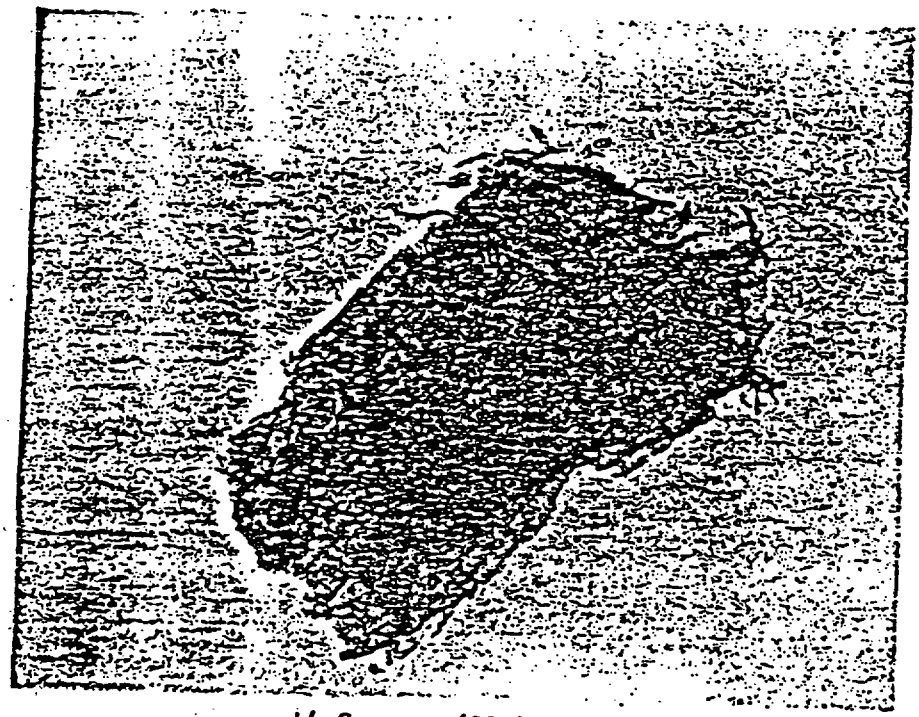


+200 Screen (150X)

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Bauer-McNett Fractions of Atlas AZ-8 Fibre Wet Opened in Waring Blendor

Figure 1a



+4 Screen (25X)



+14 Screen (25X)