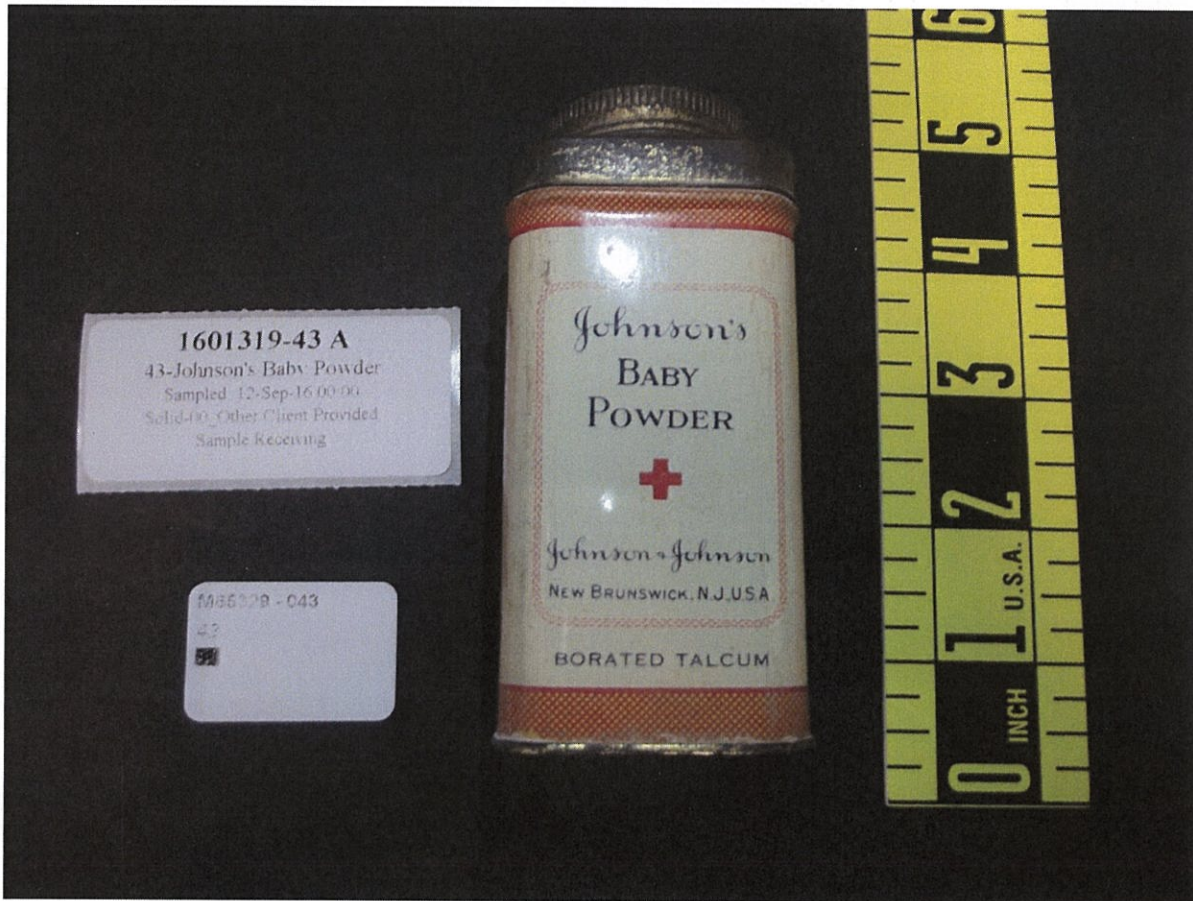


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**ANALYSIS REPORT**  
**MAS Project # 14-1683**  
**Johnson's Baby Powder Sample Set**  
**4/28/2017**



Prepared For: The Lanier Law Firm  
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MAS, LLC



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## **PROJECT SUMMARY**

This report includes the preliminary results of analysis for eleven samples of Johnson's Baby Powder. The samples were delivered to Materials Analytical Services, LLC from Lanier and Kazan Law Firms over a period of seven months from August 1, 2016 through March 8, 2017. Samples were assigned MAS laboratory identification numbers and are listed below in the Description of Samples section. A sub-sample from each bottle was examined by transmission electron microscopy (TEM), selected area electron diffraction (SAED), and energy dispersive x-ray spectroscopy (EDXA) for the presence of fibrous amphiboles.

## **DESCRIPTION OF SAMPLES**

<b><u>MAS No.</u></b>	<b><u>Description</u></b>
M65205-001	Johnson's Baby Powder.
M65208-001	Johnson's Baby Powder.
M65228-001	Johnson's Baby Powder.
M65329-013	15 oz. bottle Johnson's Baby Powder.
M65329-041	4.5 oz. can Johnson's Baby Powder.
M65329-043	Johnson's Baby Powder.
M66173-001	Johnson's Baby Powder.
M66173-002	Johnson's Baby Powder.
M66173-003	10.0 oz. bottle Johnson's Baby Powder.
M66352-001	9 oz. bottle Johnson's Baby Powder.
M66352-002	1.5 oz. bottle Johnson's Baby Powder.

\*See Figures 1-7 for photos of individual Johnson's Baby Powder Product.





## **PREPARATION AND ANALYSIS**

The samples were removed from the package as received, labeled with the MAS tracking numbers, and prepped for TEM Analysis. Characterization of asbestiform structures in each sample was done using a Jeol-1200EX 100 kV transmission electron microscope (TEM) equipped with a Noran energy dispersive x-ray (EDXA) analysis system. All asbestiform fibrous structures were analyzed by morphology, Energy dispersive x-ray (EDXA), selected area electron diffraction (SAED), and sized by both length and width. Only identified amphibole structures that were greater than 0.5  $\mu\text{m}$  in length and met the EPA Level II definition of either a fiber or bundle (parallel sides) with at least a 5 to 1 aspect ratio were counted. At the same time the samples were prepared, a laboratory blank sample was also prepared and analyzed using the same procedures.

## **RESULTS**

The TEM analysis of the eleven Johnson's Baby Powder samples showed that 8 of the 11 samples contained amphibole structures. Sample M65205-001 had 101 amphibole structures identified as tremolite. The tremolite concentration is 15,100,000 structures per gram of material (Table 1). The size range of tremolite was between 2  $\mu\text{m}$  to 18  $\mu\text{m}$  with an average aspect ratio (length to width) of 11.1 to 1 (Table 2).

Sample M65208-001 had 10 amphibole structures identified as tremolite. The tremolite concentration is 376,000 structures per gram of material (Table 1). The size range of tremolite was between 3.2  $\mu\text{m}$  to 13.5  $\mu\text{m}$  with an average aspect ratio (length to width) of 10.4 to 1 (Table 3).

Sample M65228-001 had 5 amphibole structures; 4 were identified as tremolite, 1 was identified as richterite. The tremolite concentration is 356,000 structures per gram of material (Table 1). The size range of tremolite was between 3.0  $\mu\text{m}$  to 8.0  $\mu\text{m}$  with an average aspect ratio (length to width) of 7.9 to 1 (Table 4).

Sample M65329-041 had 18 amphibole structures identified as tremolite. The tremolite concentration is 1,390,000 structures per gram of material (Table 1). The size range of tremolite was between 2.35  $\mu\text{m}$  to 11.35  $\mu\text{m}$  with an average aspect ratio (length to width) of 11.1 to 1 (Table 5).



Sample M65329-043 had 12 amphibole structures identified as tremolite. The tremolite concentration is 1,090,000 structures per gram of material (Table 1). The size range of tremolite was between 2.2  $\mu\text{m}$  to 36  $\mu\text{m}$  with an average aspect ratio (length to width) of 9.0 to 1 (Table 6).

Sample M66173-002 had 10 amphibole structures identified as tremolite. The tremolite concentration is 334,000 structures per gram of material (Table 1). The size range of tremolite was between 2.0  $\mu\text{m}$  to 24.8  $\mu\text{m}$  with an average aspect ratio (length to width) of 7.9 to 1 (Table 7).

Sample M66173-003 had 74 amphibole structures identified as tremolite. The tremolite concentration is 4,120,000 structures per gram of material (Table 1). The size range of tremolite was between 1.5  $\mu\text{m}$  to 20.2  $\mu\text{m}$  with an average aspect ratio (length to width) of 11.7 to 1 (Table 8).

Sample M66352-002 had 1 amphibole fiber identified as tremolite. The tremolite concentration is 17,200 structures per gram of material (Table 1). The aspect ratio (length to width) is 8.8 to 1 (Table 9).



**Table 1. Sample Information and Analysis Results for Johnson Baby Powder.**

<b>Date of Analysis</b>	<b>Sample ID</b>	<b>Sample Description</b>	<b>Tremolite Concentration Fibers/g</b>
2/21/2017 – 2/22/2017	M65205-001	White – fine grained homogeneous powder	15,100,000
3/07/2017 – 3/10/2017	M65208-001	White – fine grained homogeneous powder	376,000
2/24/2017 – 3/03/2017	M65228-001	White – fine grained homogeneous powder	356,000*
4/10/2017	M65329-013	White – fine grained homogeneous powder	NDA**
2/14/2017 – 2/15/2017	M65329-041	White – fine grained homogeneous powder	1,390,000
2/16/2017 – 2/18/2017	M65329-043	White – fine grained homogeneous powder	1,090,000
3/27/2017	M66173-001	White – fine grained homogeneous powder	NDA
3/30/2017 – 4/03/2017	M66173-002	White – fine grained homogeneous powder	334,000
4/3/2017 – 4/06/2017	M66173-003	White – fine grained homogeneous powder	4,120,000
4/24/2017	M66352-001	White – fine grained homogeneous powder	NDA
4/25/2017	M66352-002	White – fine grained homogeneous powder	17,200

\*Tremolite concentration. Richterite not included.

\*\*NDA: No Fibrous Structures Detected.





**Table 2. TEM Fiber Data for Johnson's Baby Powder - M65205-001.**

<b>Str. #</b>	<b>Length (<math>\mu\text{m}</math>)</b>	<b>Width (<math>\mu\text{m}</math>)</b>	<b>Aspect Ratio</b>	<b>Asbestos Type</b>
-001	2	0.2	10	Tremolite
-002	3	0.3	10	Tremolite
-003	3.5	0.2	17.5	Tremolite
-004	7.5	0.6	12.5	Tremolite
-005	4	0.2	20	Tremolite
-006	2.4	0.3	8.0	Tremolite
-007	3	0.4	7.5	Tremolite
-008	5.7	0.9	6.3	Tremolite
-009	4.6	0.6	7.7	Tremolite
-010	2	0.2	10	Tremolite
-011	6	0.7	8.6	Tremolite
-012	5.8	0.4	14.5	Tremolite
-013	11.5	0.9	12.8	Tremolite
-014	10	0.8	12.5	Tremolite
-015	10.3	0.4	25.8	Tremolite
-016	4	0.8	5.0	Tremolite
-017	2.6	0.2	13	Tremolite
-018	5	0.3	16.7	Tremolite
-019	7.5	1.5	5	Tremolite
-020	6	0.3	20	Tremolite
-021	10	1	10	Tremolite
-022	7	0.7	10	Tremolite
-023	6.5	0.8	8.1	Tremolite
-024	4	0.7	5.7	Tremolite
-025	12	0.9	13.3	Tremolite
-026	7	0.3	23.3	Tremolite
-027	2	0.3	6.7	Tremolite
-028	5.8	0.7	8.3	Tremolite
-029	4	0.3	13.3	Tremolite
-030	7	0.6	11.7	Tremolite
-031	10	0.9	11.1	Tremolite
-032	9	0.8	11.3	Tremolite
-033	4	0.5	8.0	Tremolite
-034	8	0.7	11.4	Tremolite
-035	5	0.3	16.7	Tremolite
-036	3	0.4	7.5	Tremolite
-037	14	0.6	23.3	Tremolite
-038	10	0.9	11.1	Tremolite
-039	4	0.4	10	Tremolite



Str. #	Length (µm)	Width (µm)	Aspect Ratio	Asbestos Type
-040	8	1	8.0	Tremolite
-041	4	0.7	5.7	Tremolite
-042	9	0.8	11.3	Tremolite
-043	5	0.7	7.1	Tremolite
-044	7	0.4	17.5	Tremolite
-045	6	0.8	7.5	Tremolite
-046	8	0.7	11.4	Tremolite
-047	6.5	0.3	21.7	Tremolite
-048	7	0.3	23.3	Tremolite
-049	16	0.9	17.8	Tremolite
-050	4.3	0.3	14.3	Tremolite
-051	6	0.8	7.5	Tremolite
-052	4	0.6	6.7	Tremolite
-053	4.5	0.7	6.4	Tremolite
-054	7	1	7.0	Tremolite
-055	16	2	8.0	Tremolite
-056	7	0.3	23.3	Tremolite
-057	4	0.4	10.0	Tremolite
-058	4	0.3	13.3	Tremolite
-059	8	0.9	8.9	Tremolite
-060	8	1	8.0	Tremolite
-061	2	0.4	5.0	Tremolite
-062	3.7	0.4	9.3	Tremolite
-063	8	0.5	16.0	Tremolite
-064	6	0.7	8.6	Tremolite
-065	6	0.2	30.0	Tremolite
-066	2	0.3	6.7	Tremolite
-067	14	1	14.0	Tremolite
-068	16	0.9	17.8	Tremolite
-069	3.5	0.4	8.8	Tremolite
-070	16	0.9	17.8	Tremolite
-071	9	0.8	11.3	Tremolite
-072	9	0.4	22.5	Tremolite
-073	4.5	0.5	9.0	Tremolite
-074	4.3	0.5	8.6	Tremolite
-075	4.4	0.2	22.0	Tremolite
-076	4	0.6	6.7	Tremolite
-077	18	2	9.0	Tremolite
-078	2.4	0.2	12.0	Tremolite
-079	2.2	0.3	7.3	Tremolite
-080	6.3	0.2	31.5	Tremolite
-081	4.6	0.4	11.5	Tremolite
-082	11	1	11.0	Tremolite





Str. #	Length (µm)	Width (µm)	Aspect Ratio	Asbestos Type
-083	4	0.2	20.0	Tremolite
-084	5	0.7	7.1	Tremolite
-085	8.5	0.6	14.2	Tremolite
-086	4.5	0.5	9.0	Tremolite
-087	7	0.5	14.0	Tremolite
-088	7	0.6	11.7	Tremolite
-089	4	0.5	8.0	Tremolite
-090	3	0.7	4.3	Tremolite
-091	4	0.5	8.0	Tremolite
-092	2.4	0.3	8.0	Tremolite
-093	4	0.2	20.0	Tremolite
-094	5	0.6	8.3	Tremolite
-095	5.3	0.7	7.6	Tremolite
-096	6	1	6.0	Tremolite
-097	3.8	0.3	12.7	Tremolite
-098	7	0.7	10.0	Tremolite
-099	4.5	0.3	15.0	Tremolite
-100	2	0.2	10.0	Tremolite
-101	12	0.7	17.1	Tremolite

**Average Aspect Ratio: 11.1**

**Table 3. TEM Fiber Data for Johnson's Baby Powder - M65208-001**

Str. #	Length (µm)	Width (µm)	Aspect Ratio	Asbestos Type
-001	4.2	1	4.2	Tremolite
-002	5	0.6	8.3	Tremolite
-003	13.5	0.4	33.8	Tremolite
-004	4.3	0.9	4.8	Tremolite
-005	5	0.7	7.1	Tremolite
-006	4.7	0.9	5.2	Tremolite
-007	11.7	1.5	7.8	Tremolite
-008	3.2	0.45	7.1	Tremolite
-009	9	1.2	7.5	Tremolite
-010	8.1	0.45	18.0	Tremolite

**Average Aspect Ratio: 10.4**



**Table 4. TEM Fiber Data for Johnson's Baby Powder - M65228-001.**

<b>Str. #</b>	<b>Length (<math>\mu\text{m}</math>)</b>	<b>Width (<math>\mu\text{m}</math>)</b>	<b>Aspect Ratio</b>	<b>Asbestos Type</b>
-001	4.5	0.6	7.5	Tremolite
-002	8	1.5	5.3	Tremolite
-003	6.8	0.45	15.1	Tremolite
-004	4.5	0.9	5.0	Tremolite
-005	3	0.45	6.7	Tremolite

**Average Aspect Ratio: 7.9**

**Table 5. TEM Fiber Data for Johnson's Baby Powder - M65329-041.**

<b>Str. #</b>	<b>Length (<math>\mu\text{m}</math>)</b>	<b>Width (<math>\mu\text{m}</math>)</b>	<b>Aspect Ratio</b>	<b>Asbestos Type</b>
-001	4.2	0.44	9.5	Tremolite
-002	9.66	2.1	4.6	Tremolite
-003	4.25	0.4	10.6	Tremolite
-004	2.65	0.2	13.3	Tremolite
-005	9.45	0.94	10.1	Tremolite
-006	7.35	0.36	20.4	Tremolite
-007	5.04	0.42	12.0	Tremolite
-008	4.7	0.3	15.7	Tremolite
-009	2.62	0.41	6.4	Tremolite
-010	3.15	0.15	21.0	Tremolite
-011	4.35	0.86	5.1	Tremolite
-012	2.35	0.3	7.8	Tremolite
-013	4.55	0.28	16.3	Tremolite
-014	4.15	0.37	11.2	Tremolite
-015	2.73	0.44	6.2	Tremolite
-016	4.25	0.45	9.4	Tremolite
-017	4	0.5	8.0	Tremolite
-018	11.35	0.95	11.9	Tremolite

**Average Aspect Ratio: 11.1**



**Table 6. TEM Fiber Data for Johnson's Baby Powder - M65329-043.**

<b>Str. #</b>	<b>Length (<math>\mu\text{m}</math>)</b>	<b>Width (<math>\mu\text{m}</math>)</b>	<b>Aspect Ratio</b>	<b>Asbestos Type</b>
-001	3.2	0.4	8.0	Tremolite
-002	5	0.9	5.6	Tremolite
-003	2.9	0.5	5.8	Tremolite
-004	2.5	0.22	11.4	Tremolite
-005	3.2	0.25	12.8	Tremolite
-006	2.9	0.22	13.2	Tremolite
-007	25.7	4	6.4	Tremolite
-008	36	6	6.0	Tremolite
-009	2.2	0.22	10.0	Tremolite
-010	7.3	1.4	5.2	Tremolite
-011	18	1.5	12.0	Tremolite
-012	6	0.5	12.0	Tremolite

**Average Aspect Ratio: 9.0**

**Table 7. TEM Fiber Data for Johnson's Baby Powder - M66173-002.**

<b>Str. #</b>	<b>Length (<math>\mu\text{m}</math>)</b>	<b>Width (<math>\mu\text{m}</math>)</b>	<b>Aspect Ratio</b>	<b>Asbestos Type</b>
-001	24.8	4.3	5.8	Tremolite
-002	2.7	0.5	5.4	Tremolite
-003	4.3	0.6	7.2	Tremolite
-004	2	0.22	9.1	Tremolite
-005	2.8	0.22	12.7	Tremolite
-006	4.5	0.4	11.3	Tremolite
-007	2.9	0.45	6.4	Tremolite
-008	2.2	0.22	10.0	Tremolite
-009	5	0.8	6.3	Tremolite
-010	13	2.5	5.2	Tremolite

**Average Aspect Ratio: 7.9**





**Table 8. TEM Fiber Data for Johnson's Baby Powder - M66173-003.**

<b>Str. #</b>	<b>Length (<math>\mu\text{m}</math>)</b>	<b>Width (<math>\mu\text{m}</math>)</b>	<b>Aspect Ratio</b>	<b>Asbestos Type</b>
-001	6.4	0.22	29.1	Tremolite
-002	13.9	1	13.9	Tremolite
-003	7.2	0.9	8.0	Tremolite
-004	2.2	0.22	10.0	Tremolite
-005	2.7	0.22	12.3	Tremolite
-006	4.1	0.45	9.1	Tremolite
-007	6.8	1	6.8	Tremolite
-008	10	1	10.0	Tremolite
-009	1.8	0.25	7.2	Tremolite
-010	2	0.2	10.0	Tremolite
-011	13	1.8	7.2	Tremolite
-012	7.2	1.1	6.5	Tremolite
-013	5.7	0.25	22.8	Tremolite
-014	1.8	0.22	8.2	Tremolite
-015	6.2	0.45	13.8	Tremolite
-016	2.2	0.22	10.0	Tremolite
-017	2.2	0.22	10.0	Tremolite
-018	2.9	0.22	13.2	Tremolite
-019	2.7	0.22	12.3	Tremolite
-020	2.7	0.45	6.0	Tremolite
-021	7	0.6	11.7	Tremolite
-022	2.7	0.3	9.0	Tremolite
-023	6.8	0.2	34.0	Tremolite
-024	4	0.7	5.7	Tremolite
-025	4.5	0.4	11.3	Tremolite
-026	2	0.4	5.0	Tremolite
-027	5.4	0.7	7.7	Tremolite
-028	7.1	1.1	6.5	Tremolite
-029	2.4	0.22	10.9	Tremolite
-030	19	2	9.5	Tremolite
-031	7.6	0.4	19.0	Tremolite
-032	9	1.8	5.0	Tremolite
-033	12.2	0.7	17.4	Tremolite
-034	13	0.7	18.6	Tremolite
-035	2	0.4	5.0	Tremolite
-036	3.2	0.3	10.7	Tremolite
-037	3.9	0.22	17.7	Tremolite
-038	4	0.6	6.7	Tremolite
-039	5.8	0.45	12.9	Tremolite



Str. #	Length (µm)	Width (µm)	Aspect Ratio	Asbestos Type
-040	5.5	0.25	22.0	Tremolite
-041	5.4	0.4	13.5	Tremolite
-042	9	0.7	12.9	Tremolite
-043	2.6	0.4	6.5	Tremolite
-044	11.2	1.5	7.5	Tremolite
-045	4.5	0.22	20.5	Tremolite
-046	2.2	0.22	10.0	Tremolite
-047	20.2	2.6	7.8	Tremolite
-048	4.3	0.6	7.2	Tremolite
-049	2.4	0.45	5.3	Tremolite
-050	11.2	0.4	28.0	Tremolite
-051	12.2	0.5	24.4	Tremolite
-052	15	2	7.5	Tremolite
-053	5.5	0.6	9.2	Tremolite
-054	2.7	0.2	13.5	Tremolite
-055	8.2	0.8	10.3	Tremolite
-056	3.2	0.22	14.5	Tremolite
-057	3.7	0.45	8.2	Tremolite
-058	9	1.3	6.9	Tremolite
-059	20.2	3	6.7	Tremolite
-060	1.5	0.2	7.5	Tremolite
-061	4.1	0.4	10.3	Tremolite
-062	4.5	0.7	6.4	Tremolite
-063	3.9	0.22	17.7	Tremolite
-064	5.1	0.25	20.4	Tremolite
-065	9	1.5	6.0	Tremolite
-066	3.5	0.25	14.0	Tremolite
-067	7.8	0.6	13.0	Tremolite
-068	3.5	0.6	5.8	Tremolite
-069	2.4	0.45	5.3	Tremolite
-070	4.9	0.22	22.3	Tremolite
-071	2.9	0.45	6.4	Tremolite
-072	3.2	0.22	14.5	Tremolite
-073	3.5	0.4	8.8	Tremolite
-074	4.7	0.3	15.7	Tremolite

**Average Aspect Ratio: 11.7**



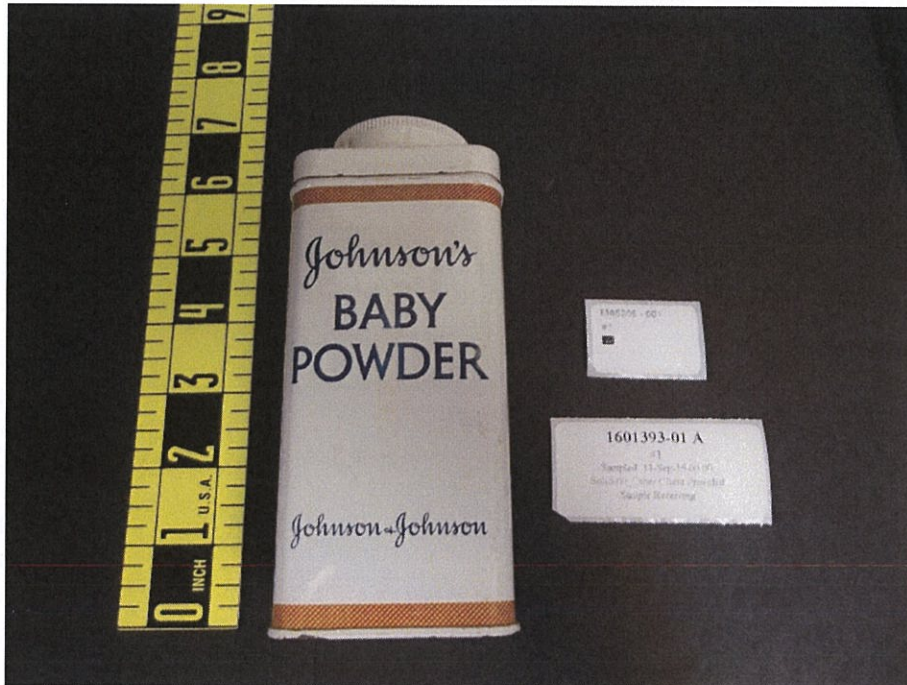
**Table 9. TEM Fiber Data for Johnson and Johnson Baby Powder - M66352-002.**

<b>Str. #</b>	<b>Length (<math>\mu\text{m}</math>)</b>	<b>Width (<math>\mu\text{m}</math>)</b>	<b>Aspect Ratio</b>	<b>Asbestos Type</b>
-001	11.5	1.3	8.8	Tremolite

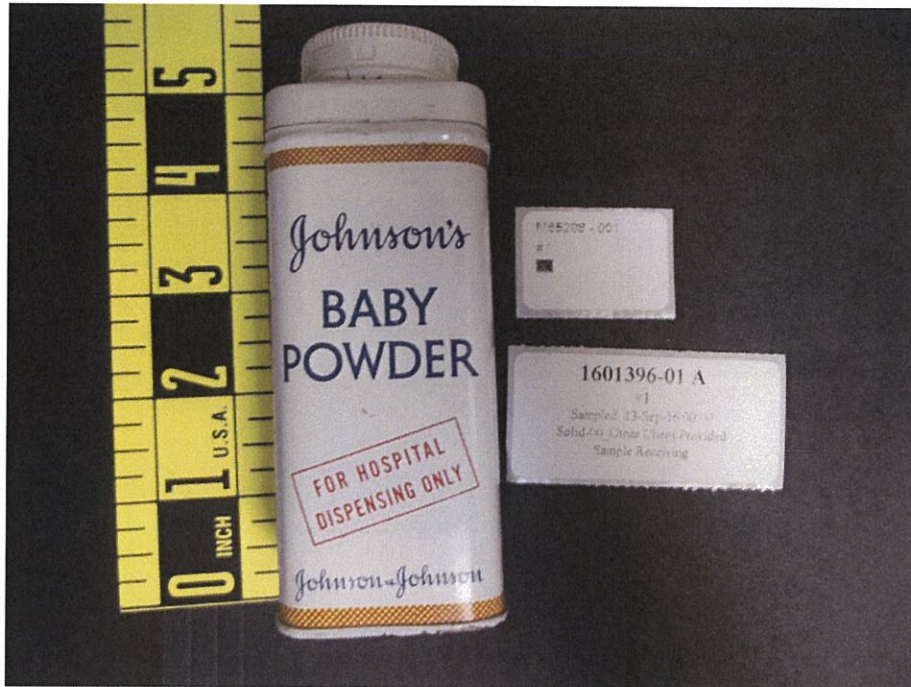
**Average aspect Ratio: 8.8**



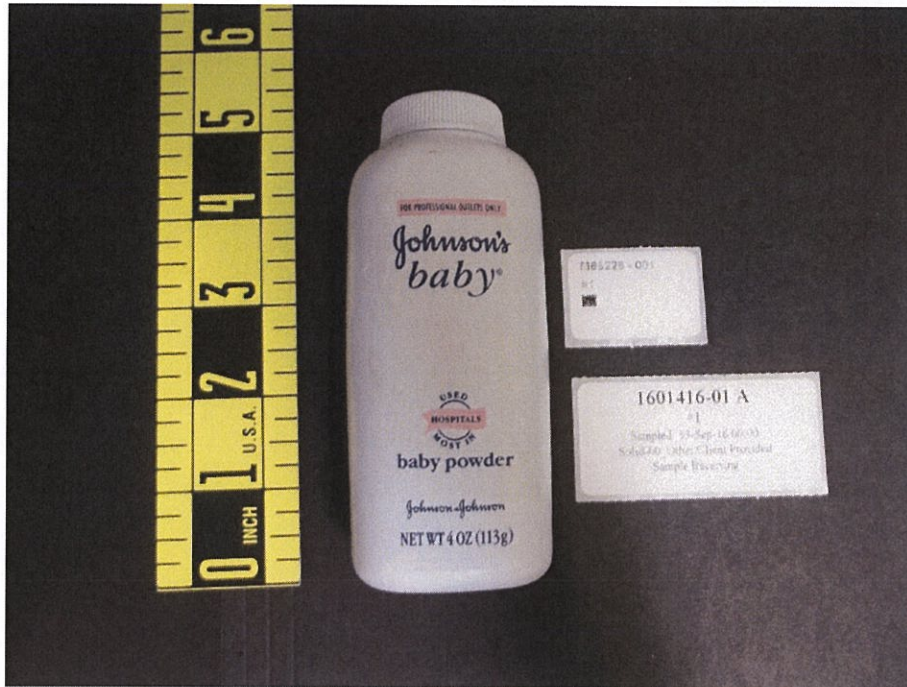
REPRESENTATIVE SAMPLES AS RECEIVED



**Figure 1.** Sample M65205-001 Johnson's Baby Powder.



**Figure 2.** Sample M65208-001 Johnson's Baby Powder.

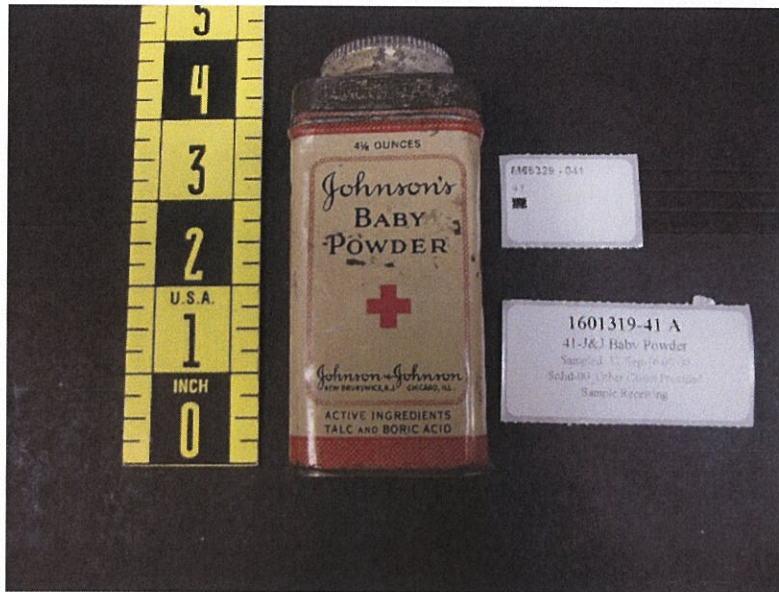


**Figure 3.** Sample M65228-001 Johnson's Baby Powder.

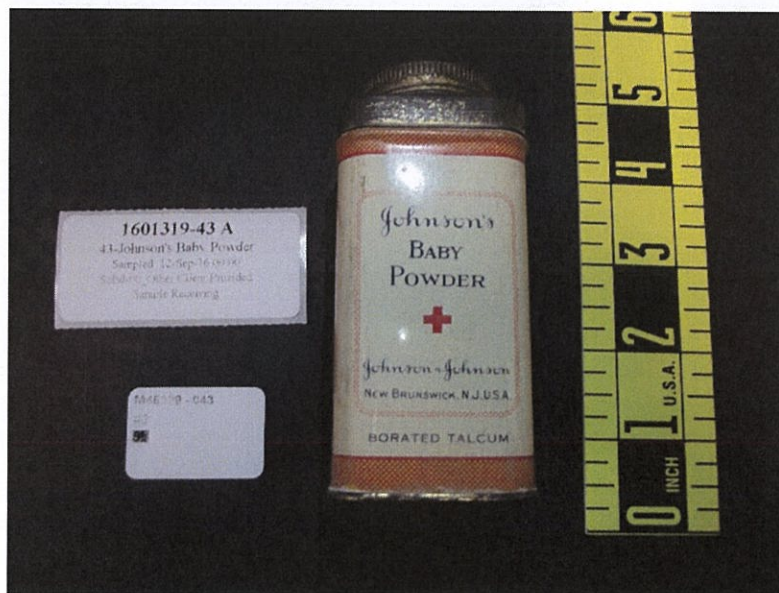




**Figure 4.** Sample M66329-013 Johnson's Baby Powder.

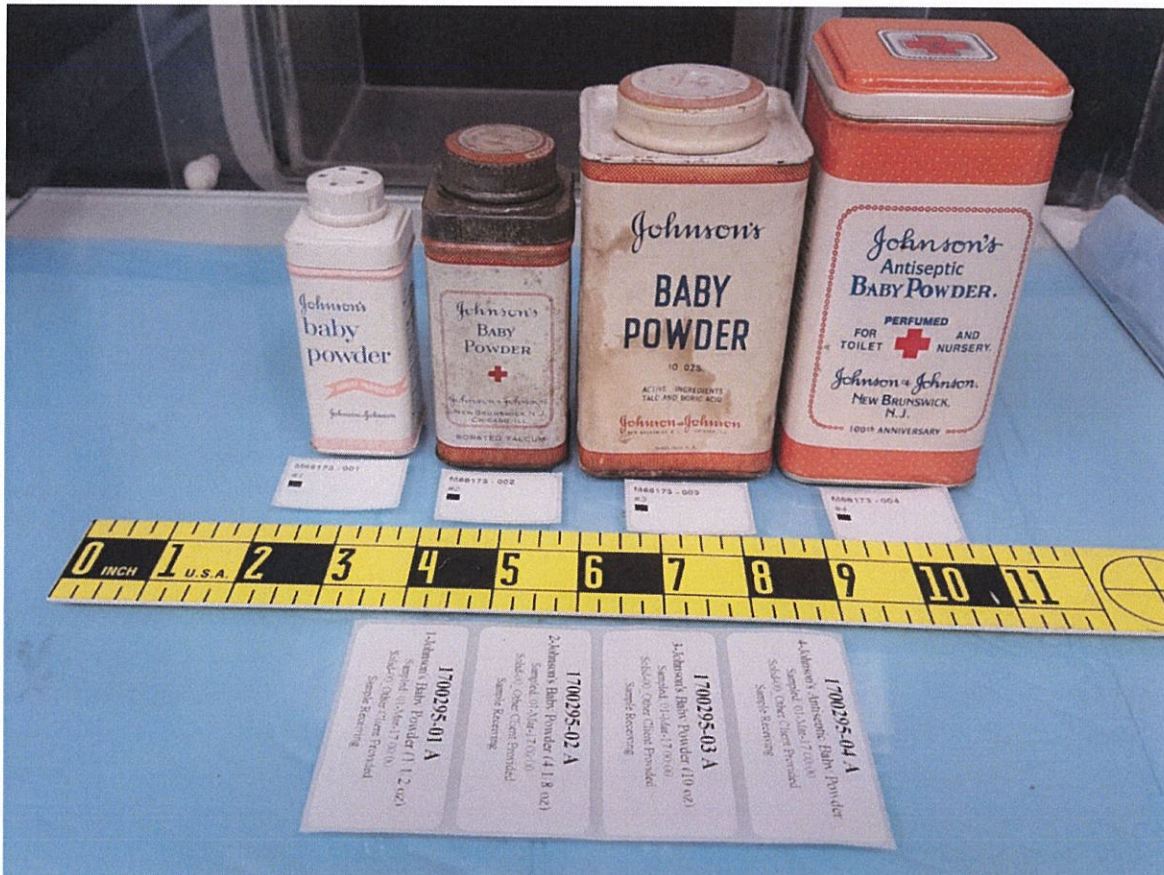


**Figure 5a.** Sample M65329-041 Johnson's Baby Powder.



**Figure 5b.** Sample M65329-043 Johnson's Baby Powder.





**Figure 6.** Samples M66173-001, M66173-002, and M66173-003 Johnson's Baby Powder.  
 Note: M66173-004 container was empty.



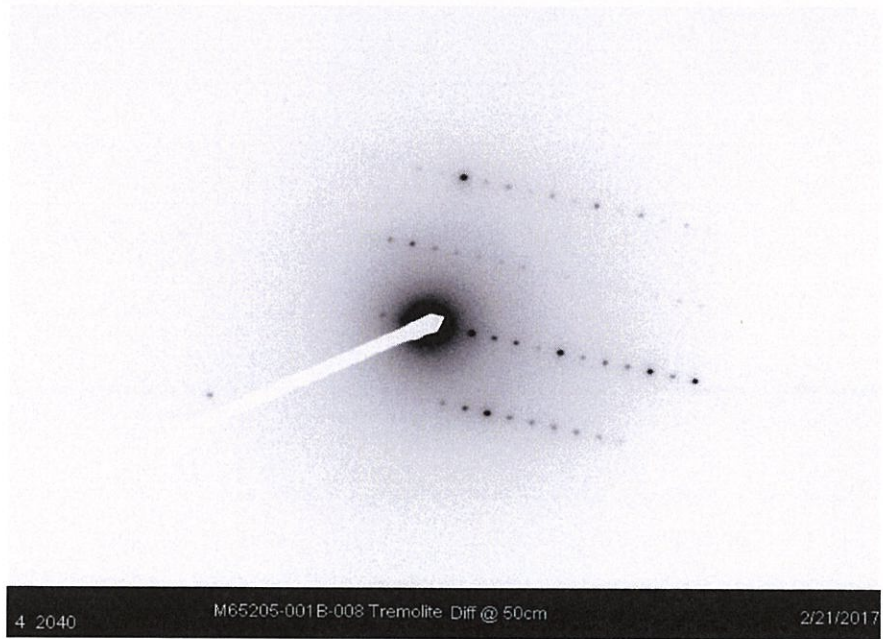
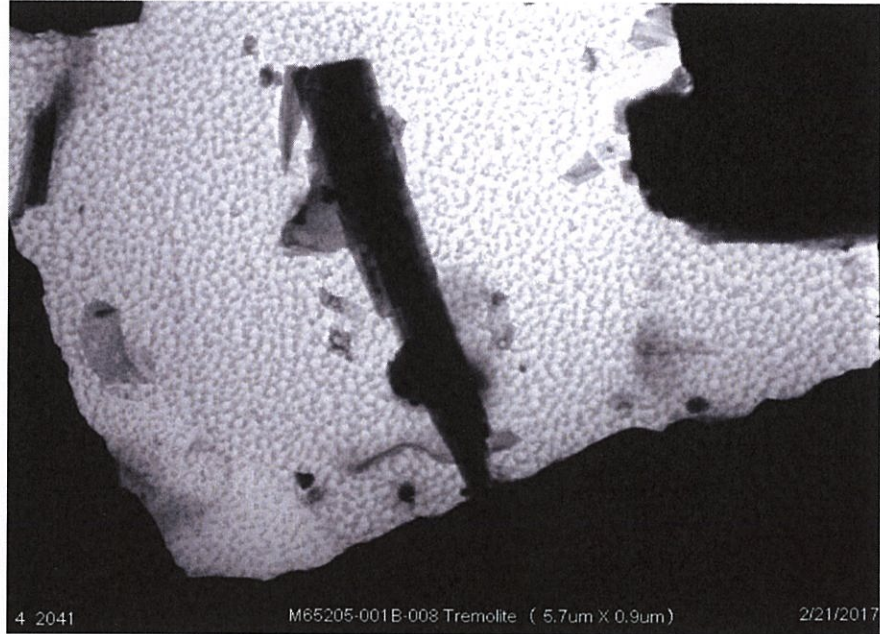


**Figure 7a.** Sample M66352-001 Johnson's Baby Powder



**Figure 7b.** Sample M66352-002 Johnson's Baby Powder

**REPRESENTATIVE TEM SAMPLE ANALYSIS DATA**

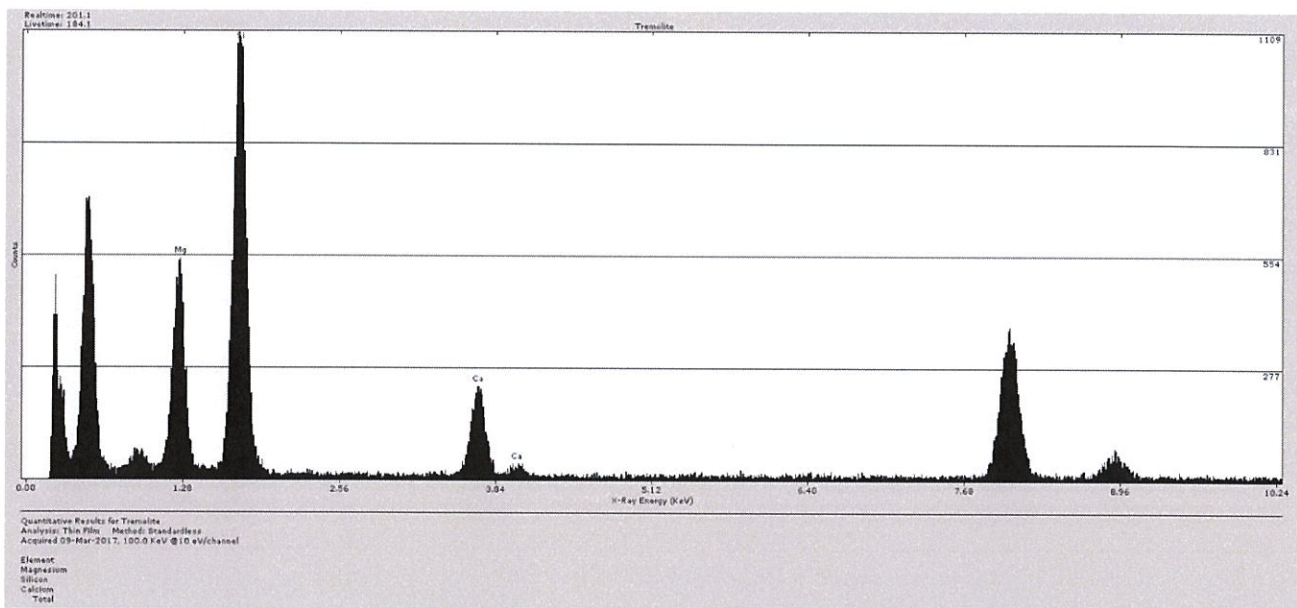


**Figure 8.** TEM image of a tremolite fiber and diffraction pattern in M65205-001.

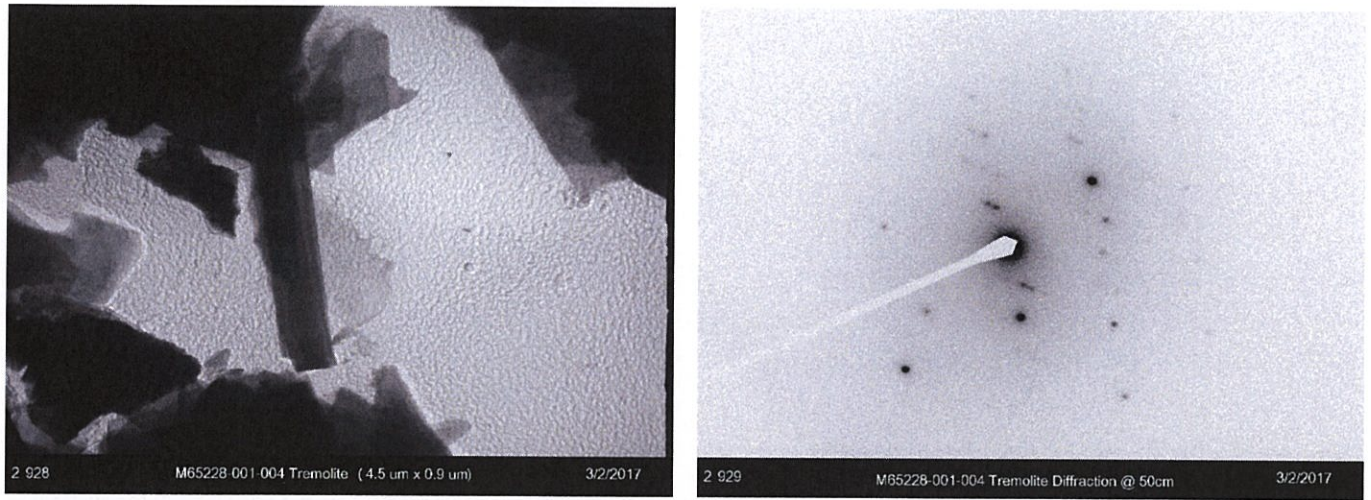




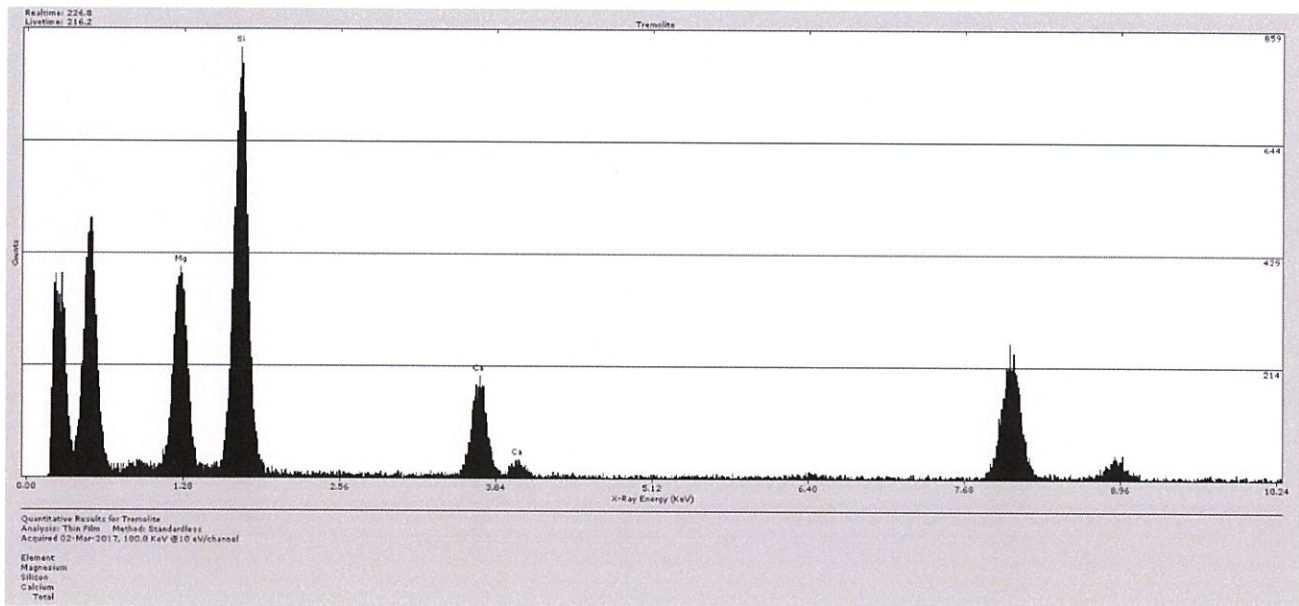
**Figure 9a.** TEM Image of a tremolite bundle and diffraction pattern in sample M65208-001



**Figure 9b.** EDS spectrum for a tremolite bundle in Sample M65208-001.

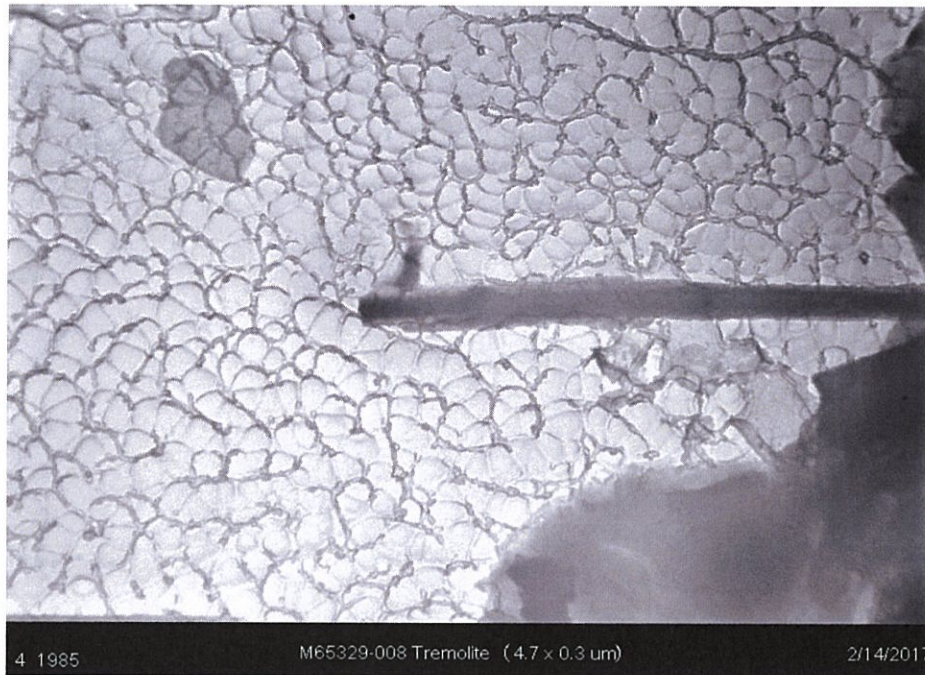


**Figure 10a.** TEM Image of a tremolite bundle and diffraction pattern in sample M65228-001.

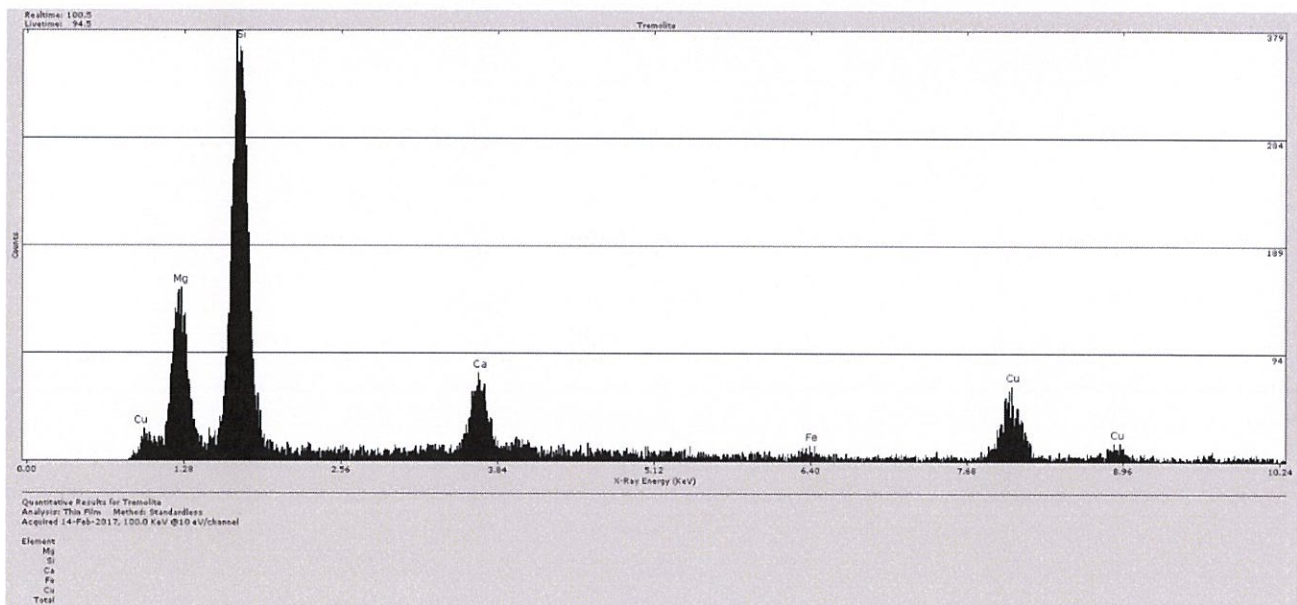


**Figure 10b.** EDS spectrum for a tremolite fiber in Sample M65228-001.

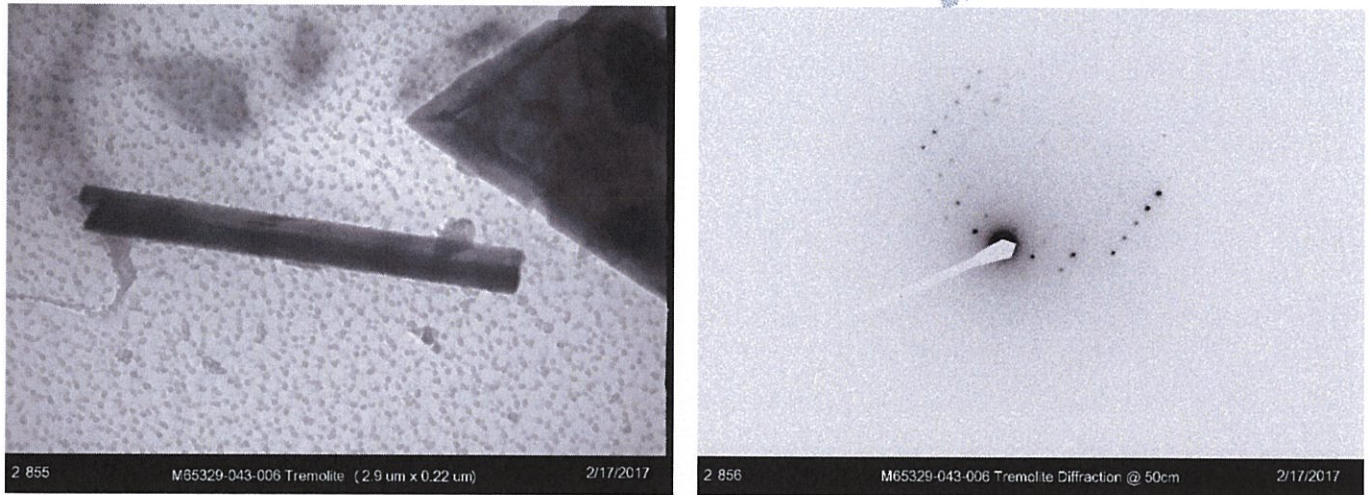




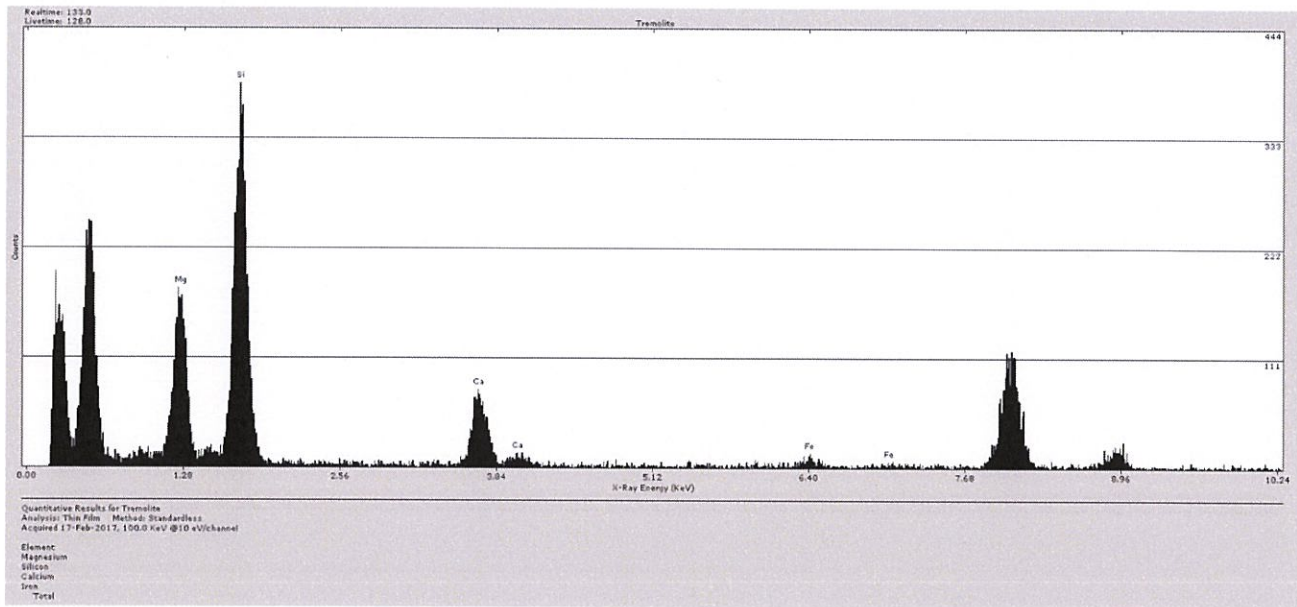
**Figure 11a.** TEM image of a tremolite fiber in Sample M65329-041-008.



**Figure 11b.** EDS spectrum for a tremolite fiber in Sample M65329-041-008.



**Figure 12a.** TEM Image of a tremolite fiber and diffraction pattern in sample M65329-043

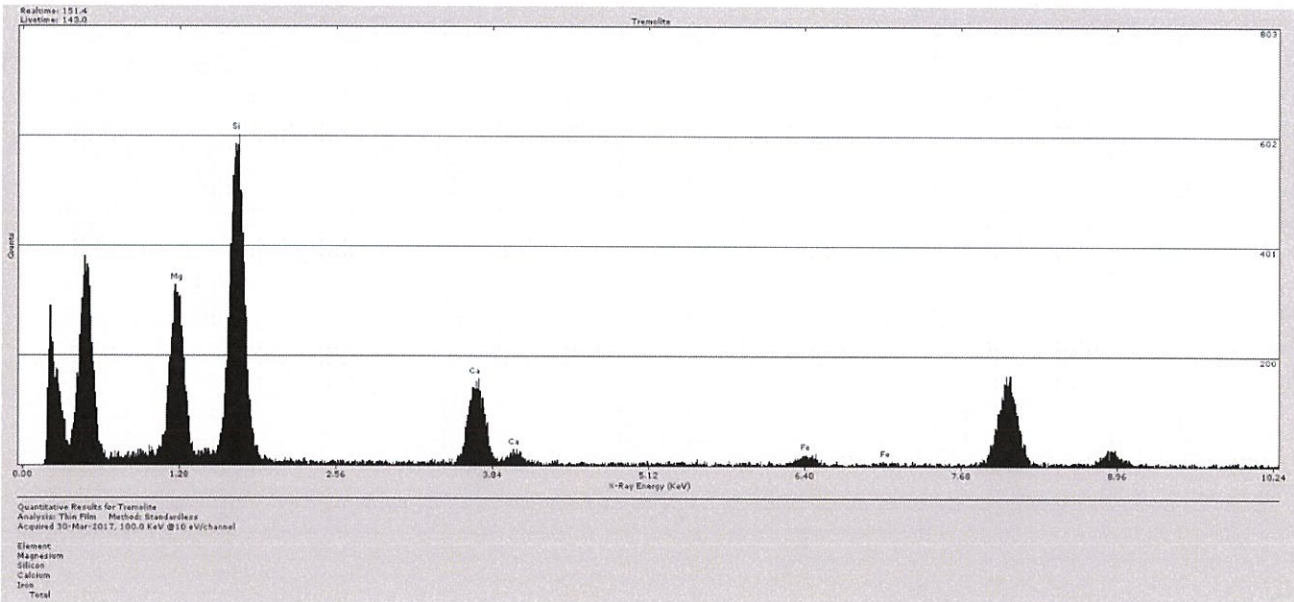


**Figure 12b.** EDS spectrum for tremolite fiber in sample M65329-043

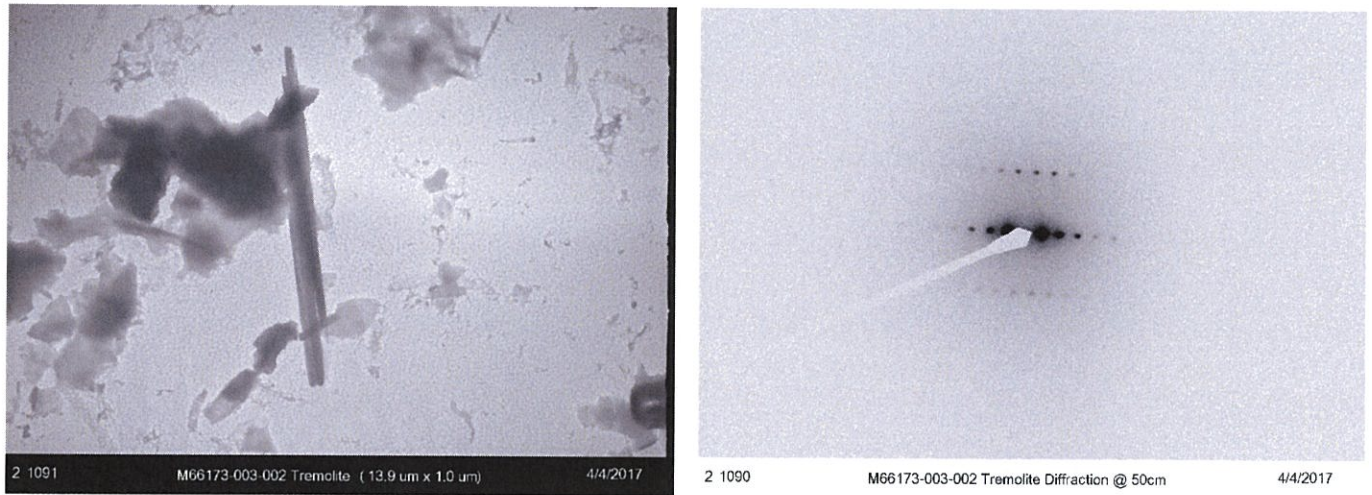




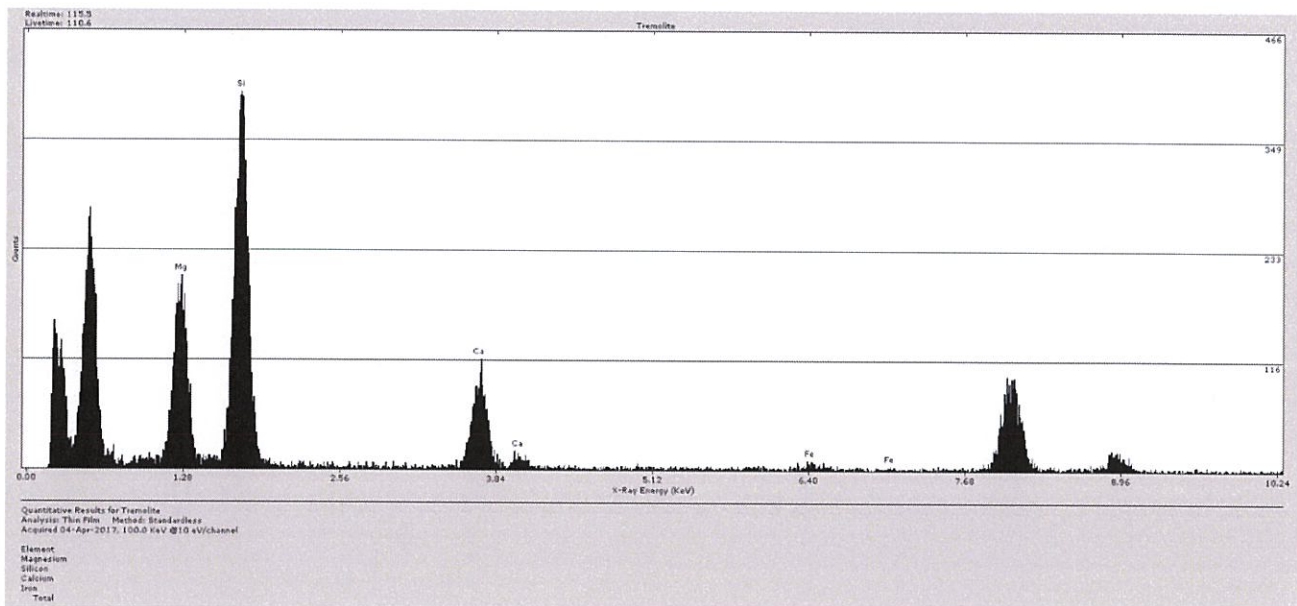
**Figure 13a.** TEM Image of a tremolite fiber and diffraction pattern in sample M66173-002.



**Figure 13b.** EDS spectrum for tremolite fiber in sample M66173-002.



**Figure 14a.** TEM Image of a tremolite fiber and diffraction pattern in sample M66173-003.

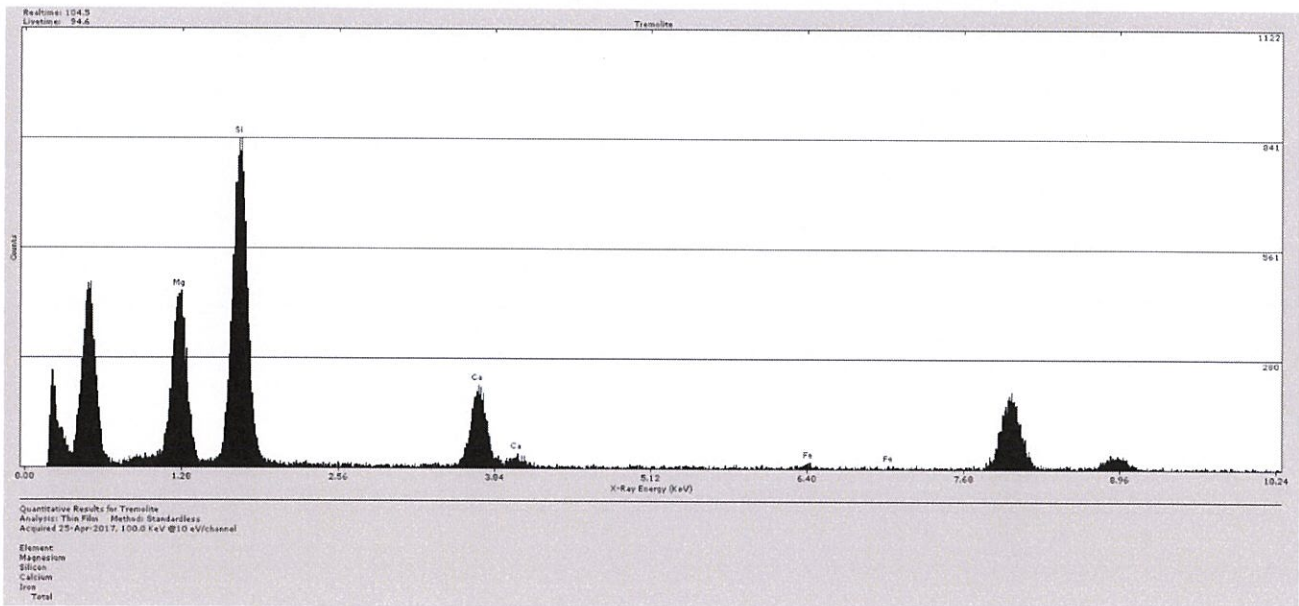


**Figure 14b.** EDS spectrum for tremolite fiber in sample M66173-003.





**Figure 15a.** TEM image of a tremolite fiber in Sample M66352-002.



**Figure 15b.** EDS spectrum for a tremolite fiber in Sample M66352-002.