

## Appendix B

### SEM/EDS Data for Test-1 Day-15 Fiberglass and Filtrate

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Test-1 Day-15 samples that were examined on December 7, 2004, include (1) filter papers for a 10-ml water sample cooled before filtration, (2) a 1-L hot-filtered water sample, (3) a 100-ml water sample filtered directly from the sample tap, and fiberglass from both the (4) high-flow and (5) low-flow sample locations in the tank. Images and EDS spectra are provided for most of these samples; however, semiquantitative compositions were not available during this laboratory session.

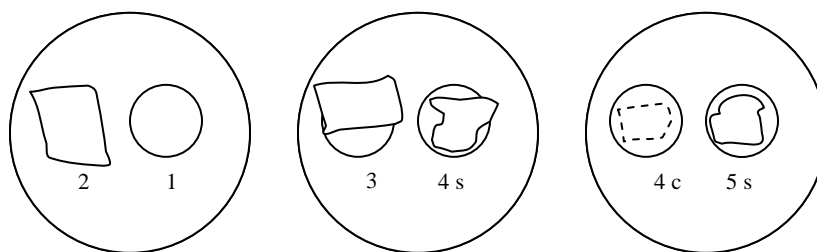
Note that four integers are used to identify the SEM images. The first integer indicates the subsample number, and the next three integers indicate the sequential examinations that were performed (e.g., 1001). Four characters (x-xyz) are used to identify the EDS graphs. The first character indicates the subsample number, and the third and fourth characters indicate the sequential examinations. The first and the third characters are separated by a hyphen: for example, 1-1 and 2-10.

The accompanying transcribed laboratory log (next page) documents the file-naming convention established by the SEM operator during the sample examination. The first entry identifies the unique sample types that were provided for examination, and the sketches of sample placement (originally hand drawn by the operator) provided a spatial reference for panning the electron beam. A sample cassette (large outer circle) is capable of holding four to six sample posts (small circles) to which the sample items (irregular fragments) are attached.

## Transcribed Laboratory Log

### Day-15 Samples

Sample	#1	10-ml cooled sample (filter)
	#2	1-L hot filtered (filter)
	#3	100-ml in-line (filter)
	#4s	High-flow fiberglass (surface)
	#4c	High-flow fiberglass (in center of fiber mass)
	#5s	Low-flow fiberglass mat (surface)
	#5c	Low-flow fiberglass mat (center of fiber mass)



Orientation of sample material on sample cassettes.

### **File: Day 15, Sample #1**

Image: Day 15, #1001

EDS: 1-1 Heavy scale on thick filtrate  
1-2 Surface—on film overlaying filter

Image: Day 15, #1002

EDS: 1-3 Scale  
1-4 Film (data file not saved)  
1-5 Underlying filter paper

Image: Day 15, #1003                      on edge of scale showing fibers protruding from scale

Image: Day 15, #1004                      110×                      on scale  
Day 15, #1005                      1500×                      edge of scale in image above  
EDS: 1-6 smooth part of scale

Image: Day 15, #1005a                      10,000×                      on surface                      (image not saved)

Operating conditions: 15 kV 1 nA 60 s EDS Aperture 2

**File: Day 15, Sample #2**

Image:	Day 15, #2006	40× on scale
	Day 15, #2007	270× close-up as image above
EDS:	2-7	on blocky crystals ( $\text{CaCO}_3$ ?)
	2-8	filtrate surface
	2-9	scale on filtrate surface
Image:	Day 15, #2008	40× on surface
	Day 15, #2009	BSE on the same surface
	Day 15, #2010	BSE close-up 200x
EDS:	2-10	Bright particles in image #2010
	2-11	Filtrate
Image:	Day 15, #2011	2000× on surface (SEI)
	Day 15, #2012	10,000× on surface (SEI)

**File: Day 15, Sample #3**

Image:	Day 15, #3014	40× on scale and filter
EDS:	3-12	scale on filter
	3-13	film on filter
Image:	Day 15, #3015	500× BSE on scale
	Day 15, #3016	2000× SEI close-up
	Day 15, #3017	10,000× on scale
EDS:	3-14	on globular particles in image 3017
Image:	Day 15, #3018	10,000× on edge of a lone scale piece
	Day 15, #3019	same as the above using longer scan
	Day 15, #3020	800× on a lone scale piece
	Day 15, #3021	40× on a lone scale piece
EDS:	3-15	side of a lone scale piece

**File: Day 15, Sample #4s**

Image:	Day 15, #4022	43× on surface of fiberglass
	Day 15, #4023	230× on gelatinous film
EDS:	4-16	on cracked gelatinous materials
Image:	Day 15, #4024	370× on film with particles
EDS:	4-17	on particle on gelatinous film in image 4024
Image:	Day 15, #4025	120× on rough gelatinous surface
EDS:	4-18	on rough film
Image:	Day 15, #4026	40× on surface
	Day 15, #4027	140× close-up (was charging; changed to lower beam current)
EDS:	4-19	on bright particles (bright in BSE = high-Z material)

Image: Day 15, #4028	370× BSE close-up (bright in BSE)
Day 15, #4029	40× on fractured film
Day 15, #4030	130× close-up
EDS: 4-20	on fractured film
Image: Day 15, #4031	950× close-up
Day 15, #4032	1900× close-up
Day 15, #4033	17,000× close-up
EDS: 4-21	precipitate on fiberglass
Image: Day 15, #4034	65×
Day 15, #4035	270× close-up
Day 15, #4036	1400× close-up
Day 15, #4037	2500× close-up
Day 15, #4038	10,000× close-up
Day 15, #4039	2200× close-up
Day 15, #4040	10,000× close-up
EDS: 4-22	crust
4-23	particles on fiberglass
4-24	thin film

**File: Day 15, Sample #4C**

Image: Day 15, #4c041	43×
Day 15, #4c042	140×
Day 15, #4c043	750×
Day 15, #4c044	4300×
EDS: 4C-25	sphere
4C-26	particle on fiberglass
4C-27	fiberglass
Image: Day 15, #4c045	43×
EDS: 4C-28	large piece
Image: Day 15, #4c046	750×
Day 15, #4c047	6000×

**File: Day 15, Sample #5s**

Image: Day 15, #5048	45×
Day 15, #5049	250×
EDS: 5-29	particle on fiberglass
5-30	large piece
5-31	crust
5-32	film
Image: Day 15, #5050	950× zoom in on particle
Day 15, #5051	7000× zoom in on particle

Day 15, #5052	1300× large piece
Day 15, #5053	1800× crust
Day 15, #5054	50× new area
Day 15, #5055	270× close-up
Day 15, #5056	600× close-up

**File: Day 15, Sample #5C**

Image: Day 15, #5c057	40× on fiberglass
Day 15, #5c058	500× same area
Day 15, #5c059	1000× different area
Day 15, #5c060	3000× deposits on fiber
Day 15, #5c061	10,000× close-up of deposits
EDS: 5c-33	deposits on fiber in image 5c061 (Br peak may be mislabeled)

Image: Day 15, #5c062	40× same area
Day 15, #5c063	500× close-up
Day 15, #5c064	3000× close-up of particles
EDS: 5c-34	pile of particles left side of image 5c064

Image: Day 15, #5c065	300× new area
EDS: 5c-35	deposits on fiberglass in image 5c065

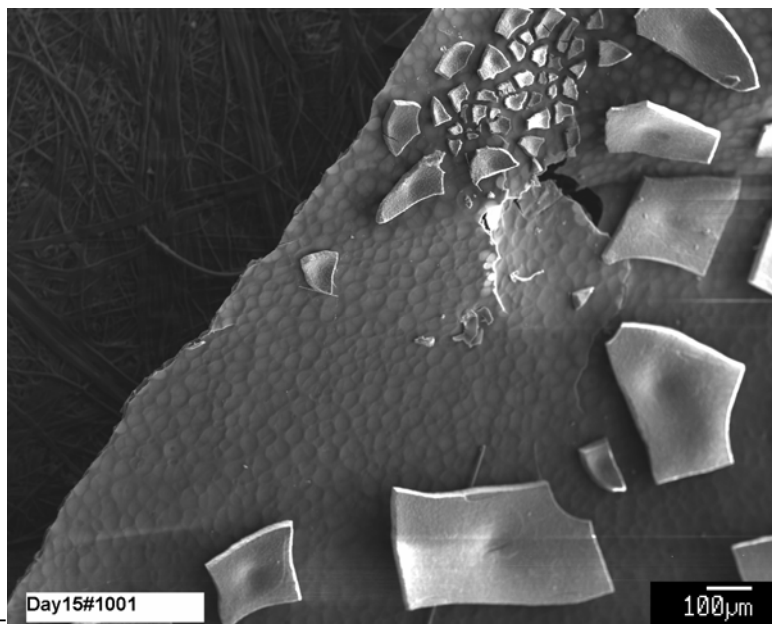


Figure B-1. Day-15, sample #1 SEM image (#1001) for the heavy scale on the thick filtrate.

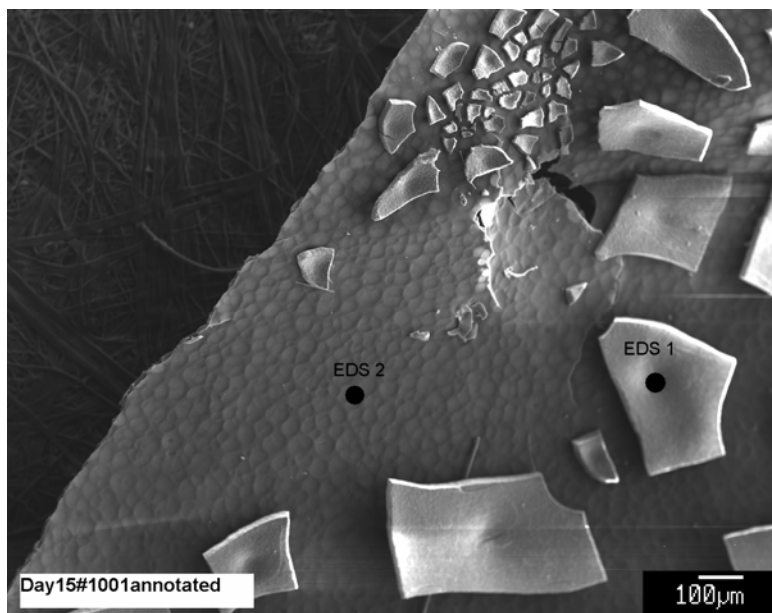
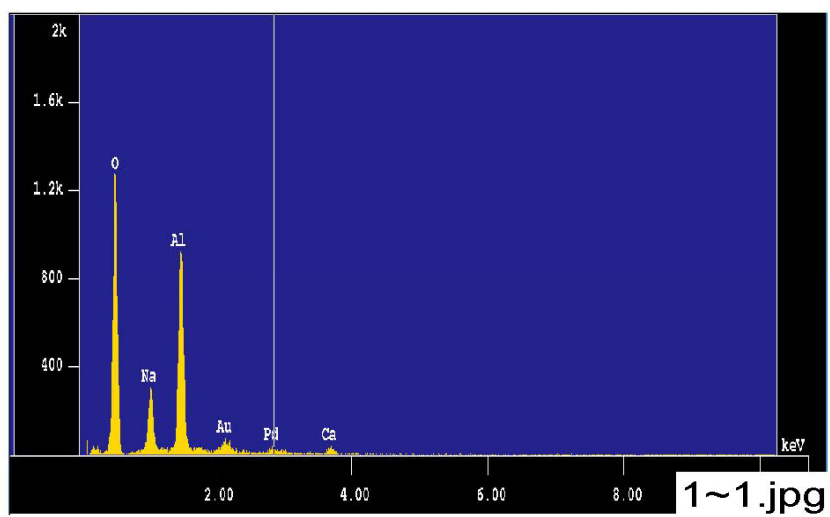
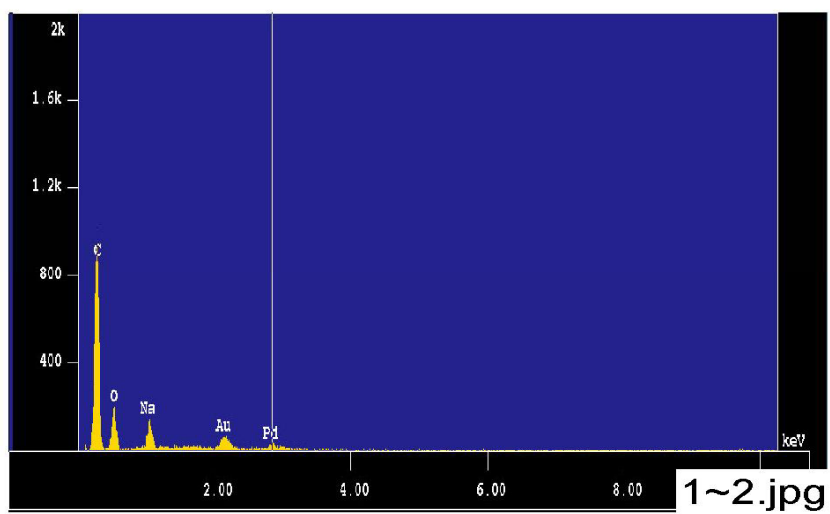


Figure B-2. Day-15, sample #1 SEM image (#1001 annotated) annotating the EDS locations.





**Figure B-3.** Day-15, sample #1 counting spectrum (EDS 1-1) for the heavy scale on the thick filtrate (see Figure B-2).



**Figure B-4.** Day-15, sample #1 counting spectrum (EDS 1-2) for the surface on the film overlaying the filter (see Figure B-2).

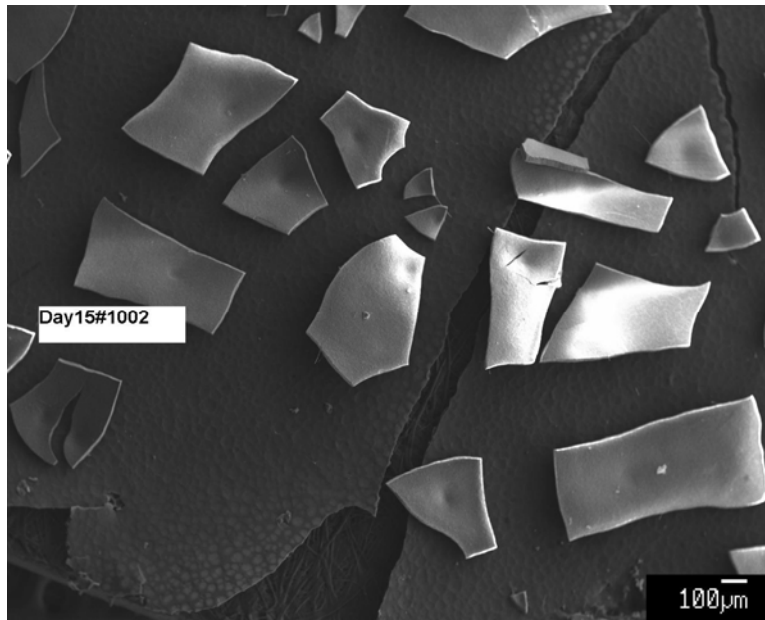


Figure B-5. Day-15, sample #1 SEM image (#1002) of filtrate scale.

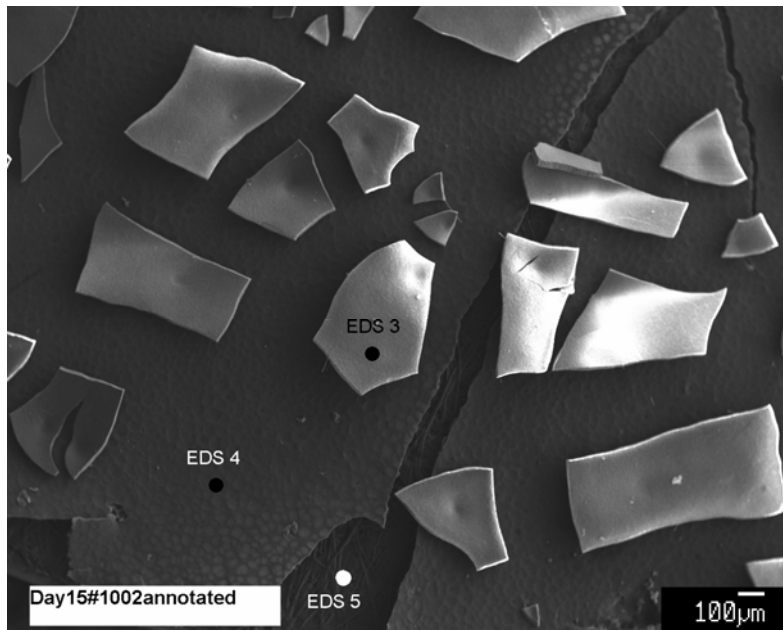
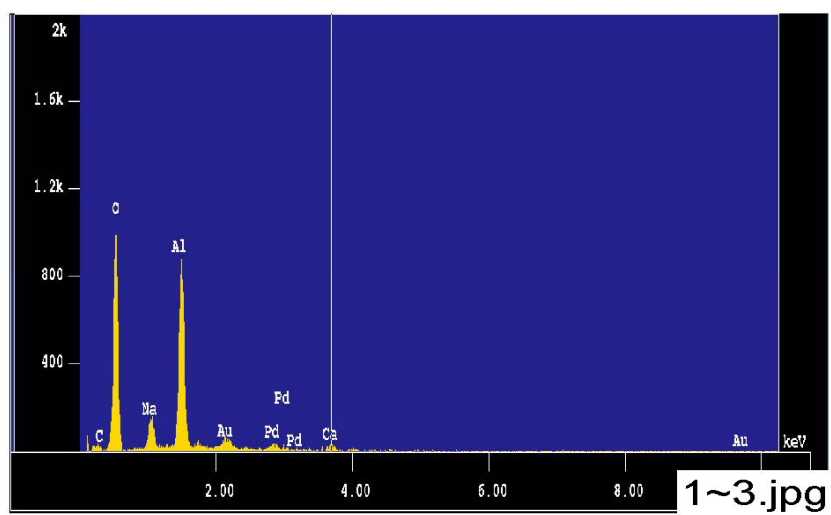
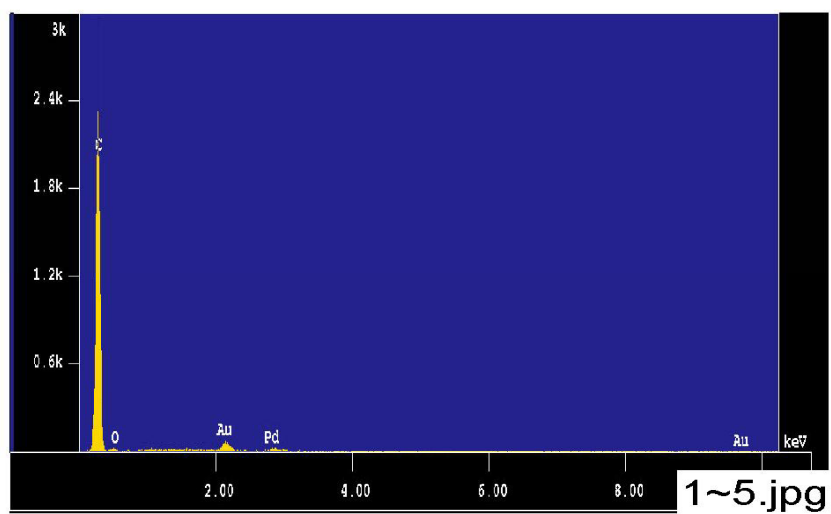


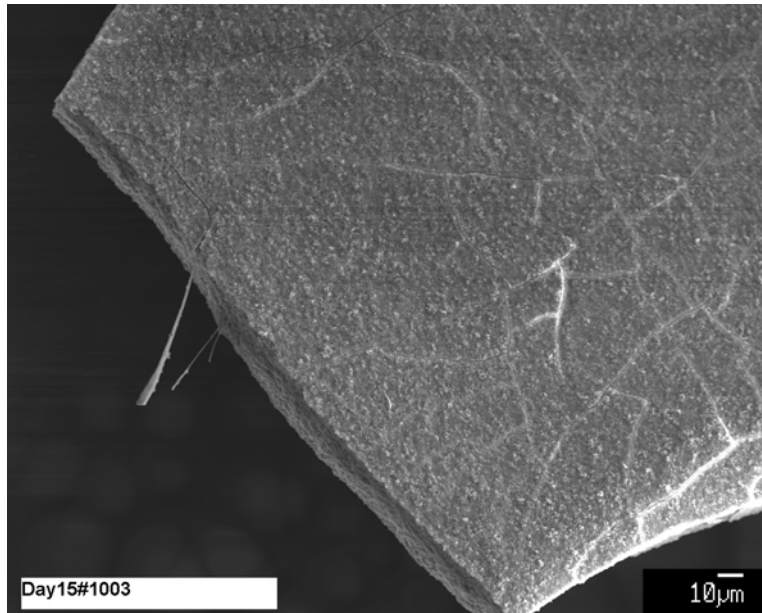
Figure B-6. Day-15, sample #1 SEM image (#1002 annotated) annotating the EDS locations.



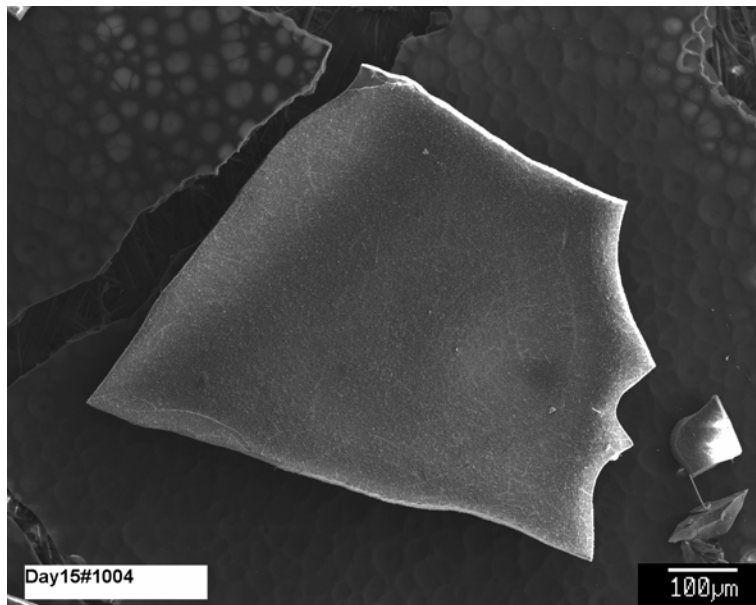
**Figure B-7. Day-15, sample #1 counting spectrum (EDS 1-3) for the scale at location EDS 3, as shown in Figure B-6.**



**Figure B-8. Day-15, sample #1 counting spectrum (EDS 1-5) for the underlying filter paper, as shown in Figure B-6.**



**Figure B-9. Day-15, sample #1 SEM image (#1003) showing fibers protruding from the edge of scale.**



**Figure B-10. Day-15, sample #1 SEM image (#1004) showing the scale magnified 110 times.**

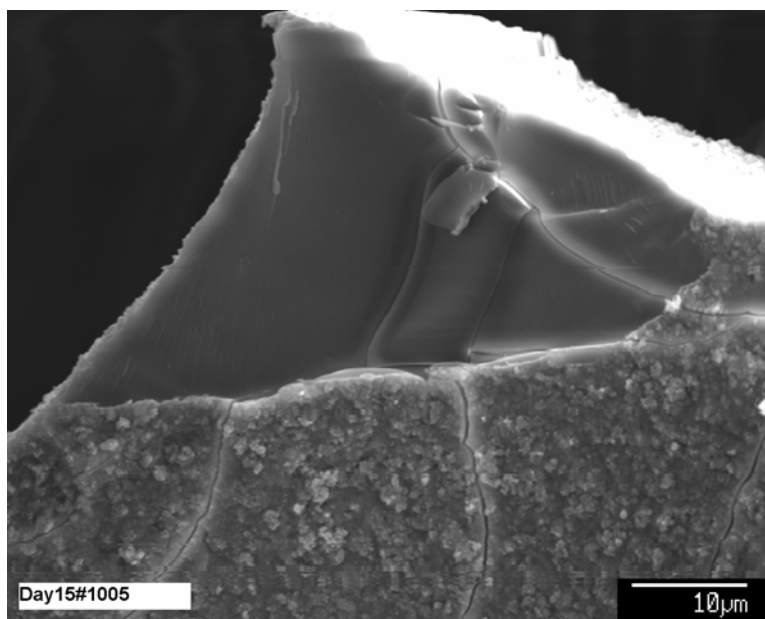


Figure B-11. Day-15, sample #1 SEM image (#1005) showing the edge of the scale magnified 1500 times.

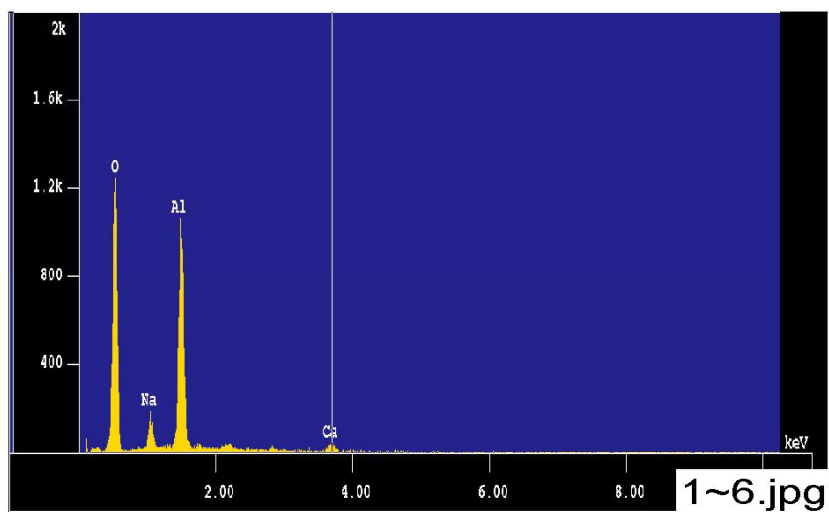
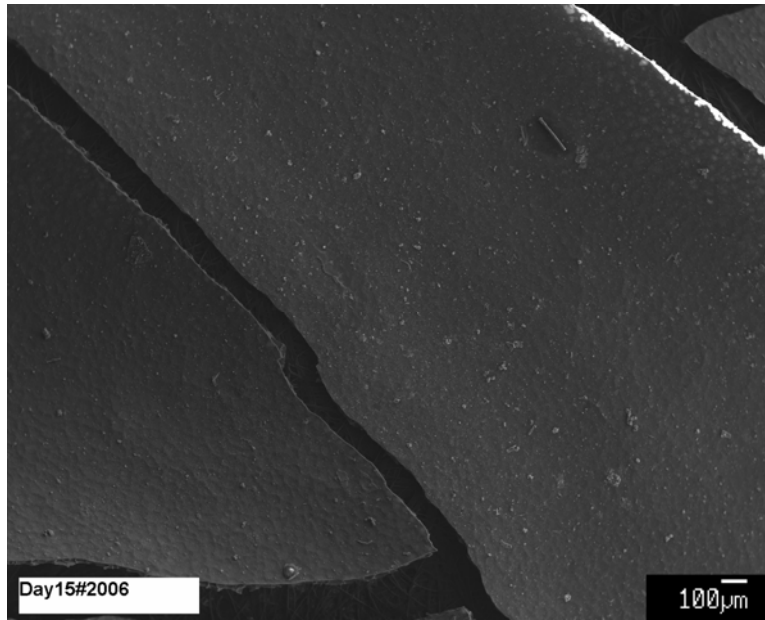
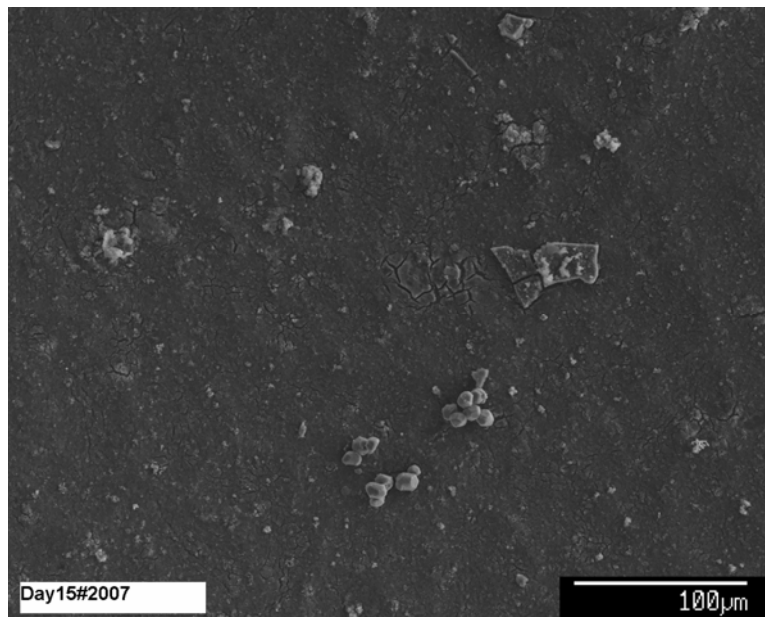


Figure B-12. Day-15, sample #1 counting spectrum (EDS 1-6) for the surface of the smooth part of the scale, as shown in Figure B-11.



**Figure B-13.** Day-15, sample #2 SEM image (#2006) for the scale magnified 40 times.



**Figure B-14.** Day-15, sample #2 SEM image (#2007) for the same scale as in Figure B-13, magnified 270 times.

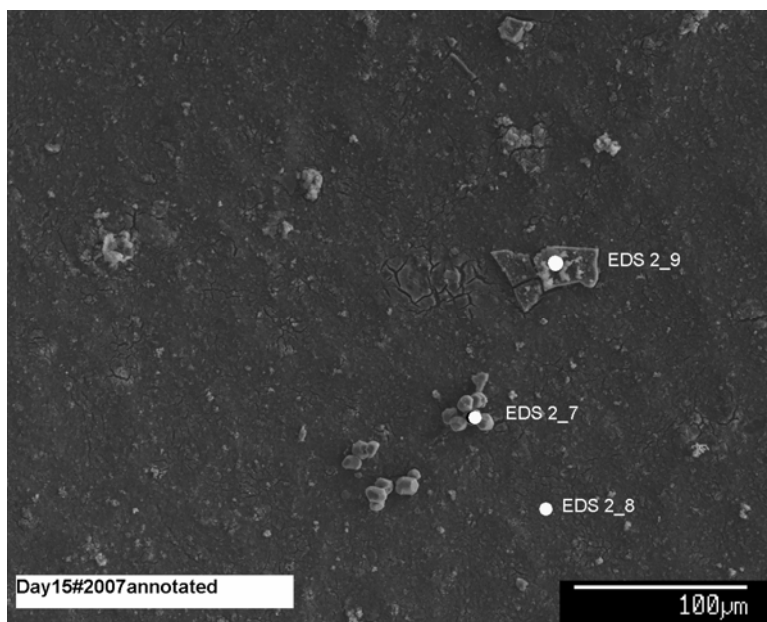


Figure B-15. Day-15, sample #2 SEM image (#2007 annotated) annotating the EDS locations.

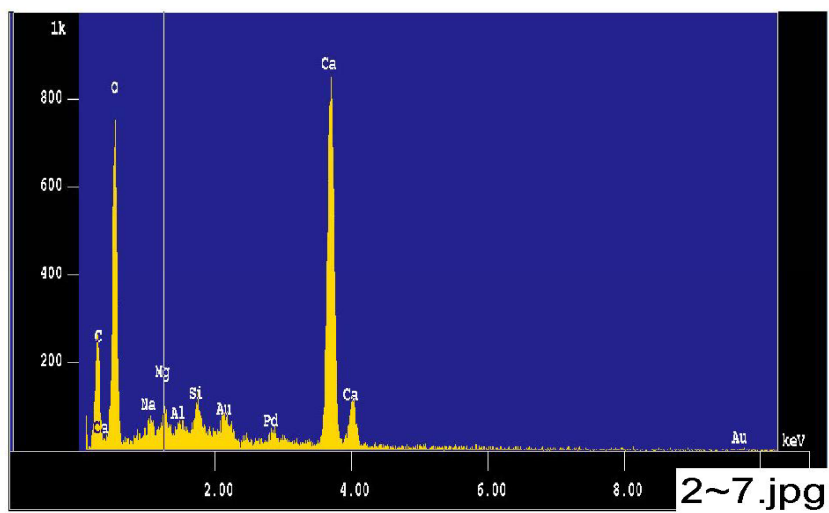


Figure B-16. Day-15, sample #2 counting spectrum (EDS 2-7) for the collection of materials (possibly  $\text{CaCO}_3$ ) on the filtrate at location EDS 2-7, as shown in Figure B-15.

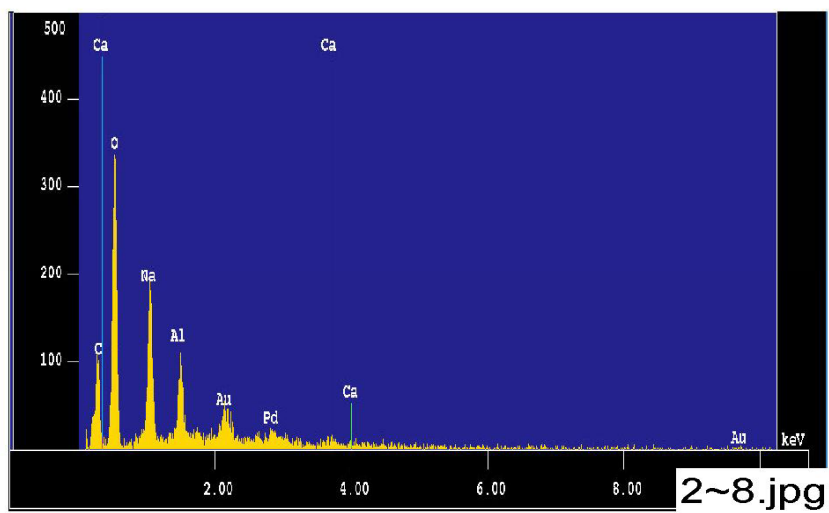


Figure B-17. Day-15, sample #2 counting spectrum (EDS 2-8) for the filtrate surface at location EDS 2-8, as shown in Figure B-15.

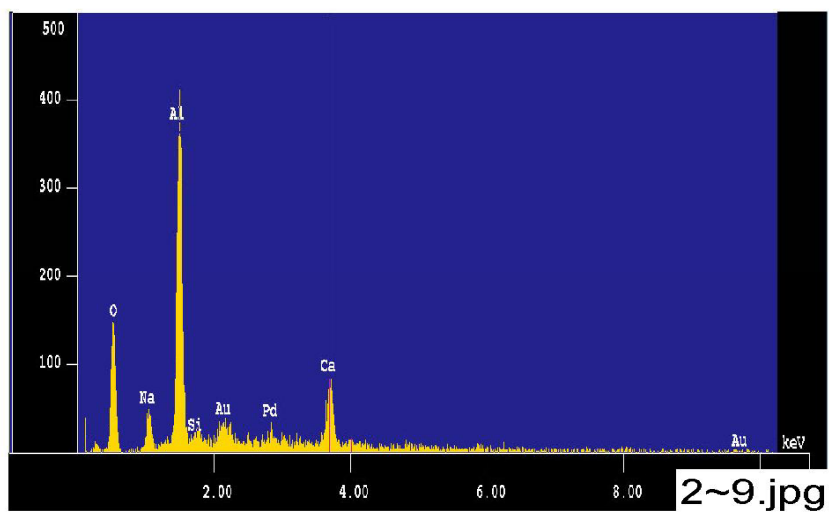
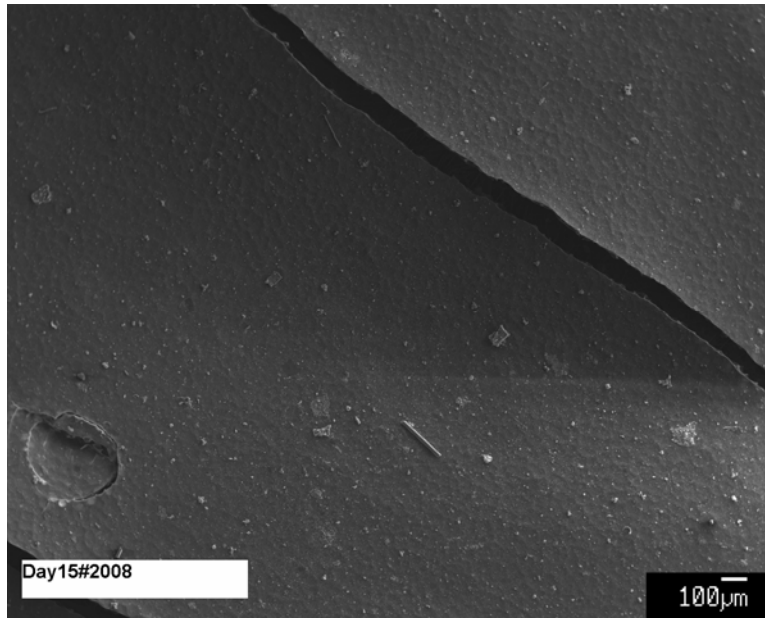
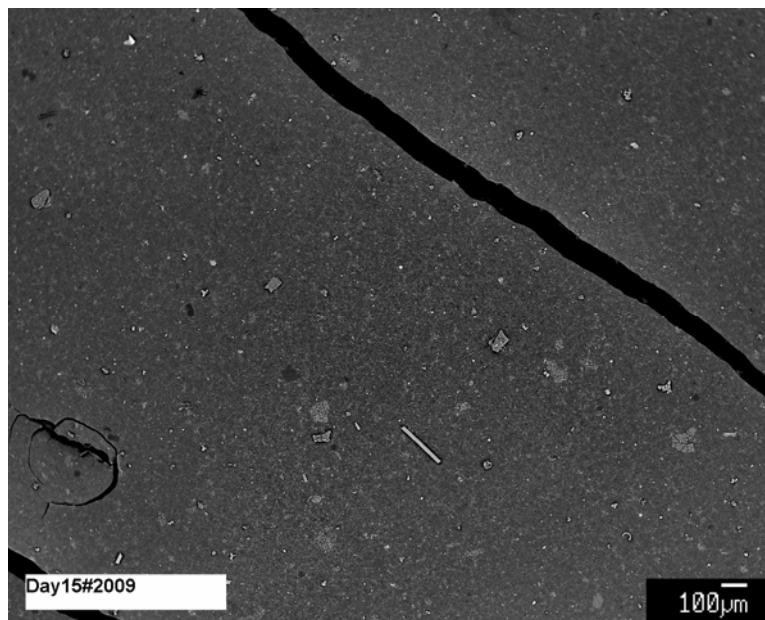


Figure B-18. Day-15, sample #2 counting spectrum (EDS 2-9) for the scale on the filtrate surface at location EDS 2-9, as shown in Figure B-15.





**Figure B-19. Day-15, sample #2 SEM image (#2008) magnified 40 times on the filtrate surface.**



**Figure B-20. Day-15, sample #2 SEM BSE image (#2009) for the same surface, as shown in Figure B-19.**

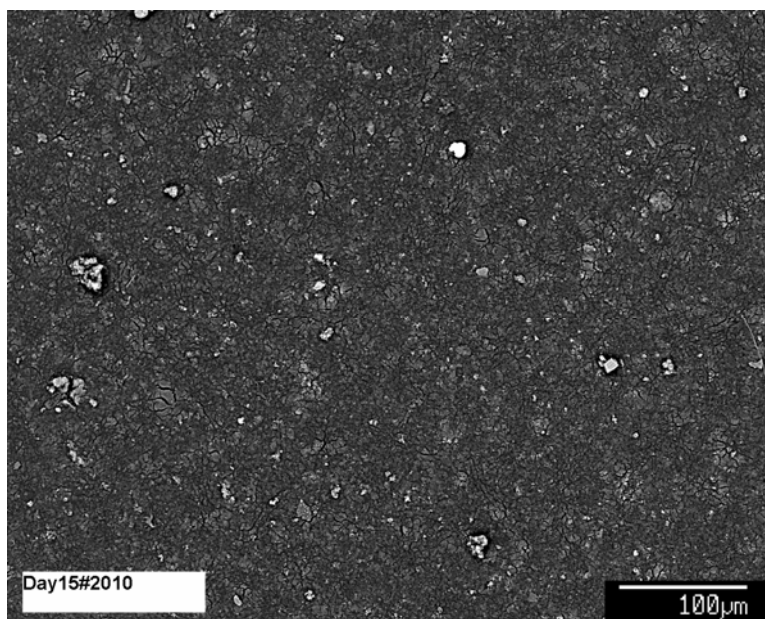


Figure B-21. Day-15, sample #2 SEM BSE close-up image (#2010) magnified 200 times for the same surface, as shown in Figure B-19.

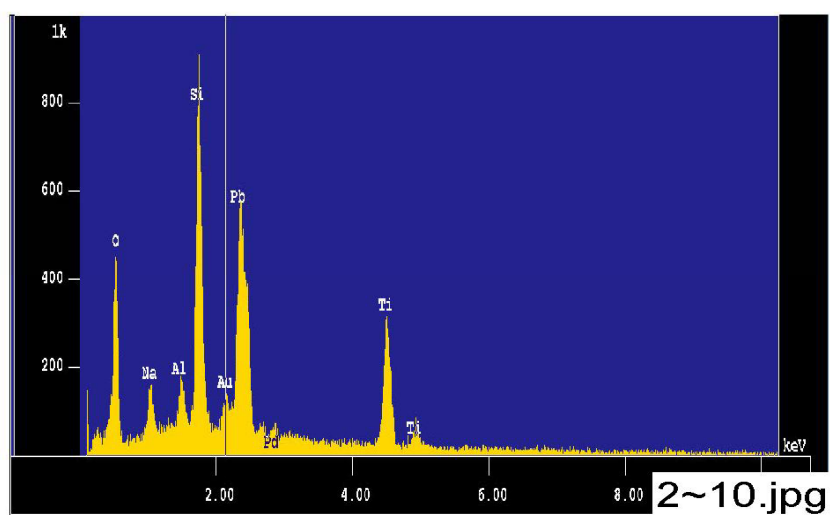


Figure B-22. Day-15, sample #2 counting spectrum (EDS 2-10) for the bright particle in upper center of image #2010, as shown in Figure B-21.

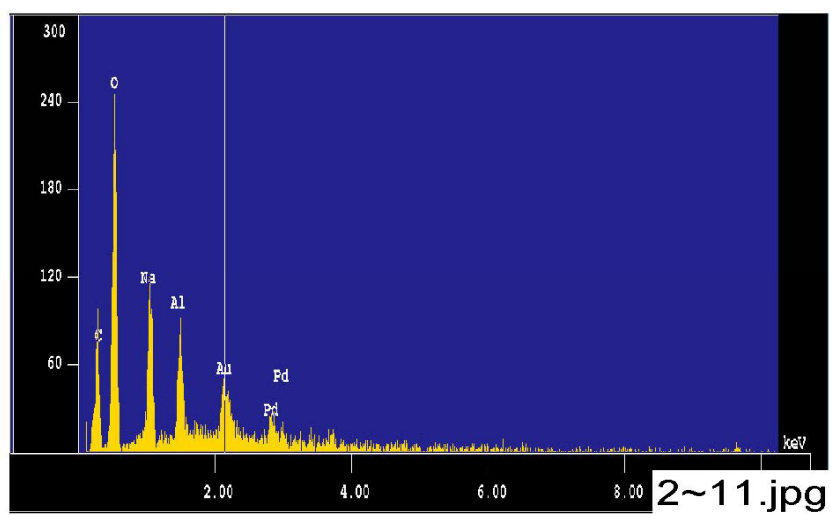


Figure B-23. Day-15, sample #2 EDS 2-11 typical counting spectrum for the filtrate, as shown in Figure B-19.

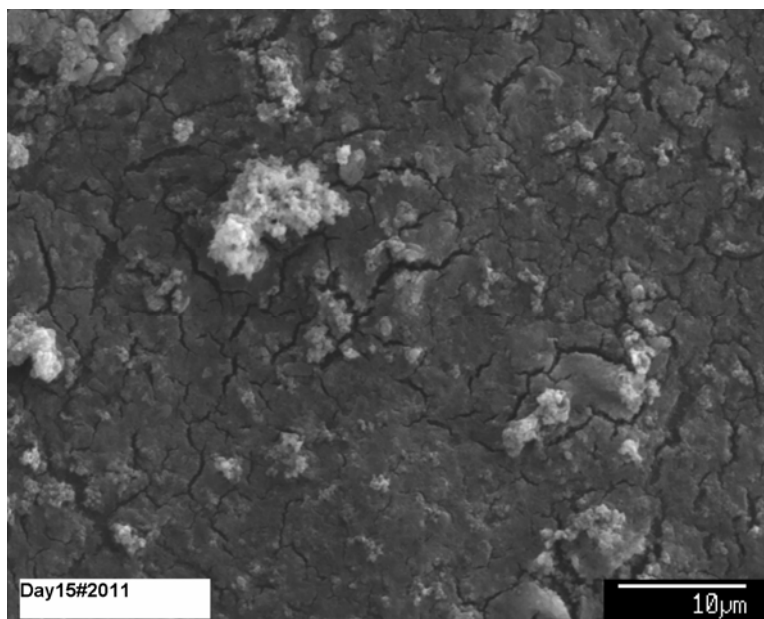
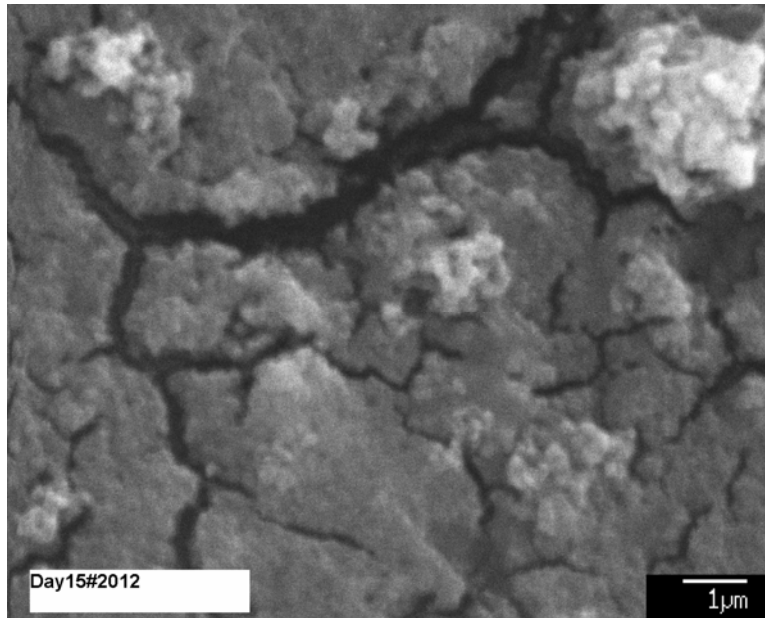
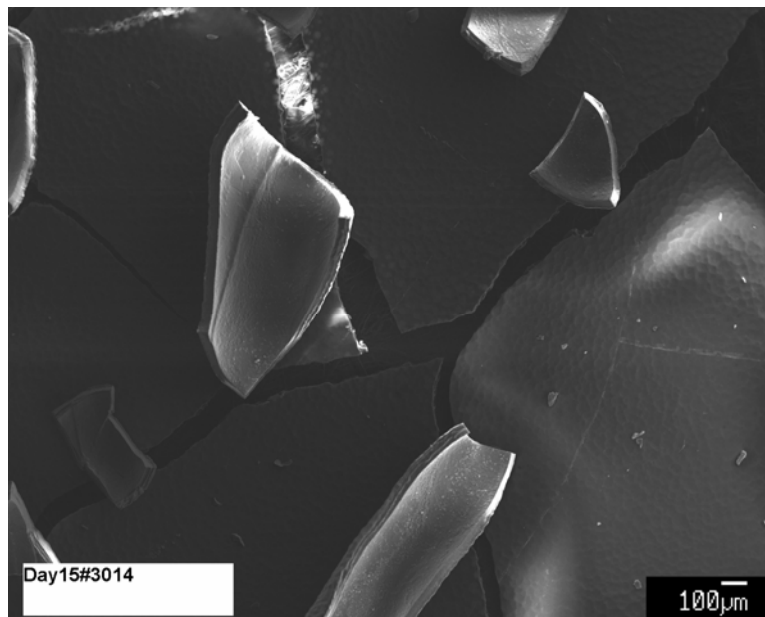


Figure B-24. Day-15, sample #2 SEM SEI image (#2011) magnified 2000 times on the filtrate surface.



**Figure B-25. Day-15, sample #2 SEM SEI image (#2012) magnified 10,000 times on the filtrate surface.**



**Figure B-26. Day-15, sample #3 SEM image (#3014) magnified 40 times on the scale and the filter.**

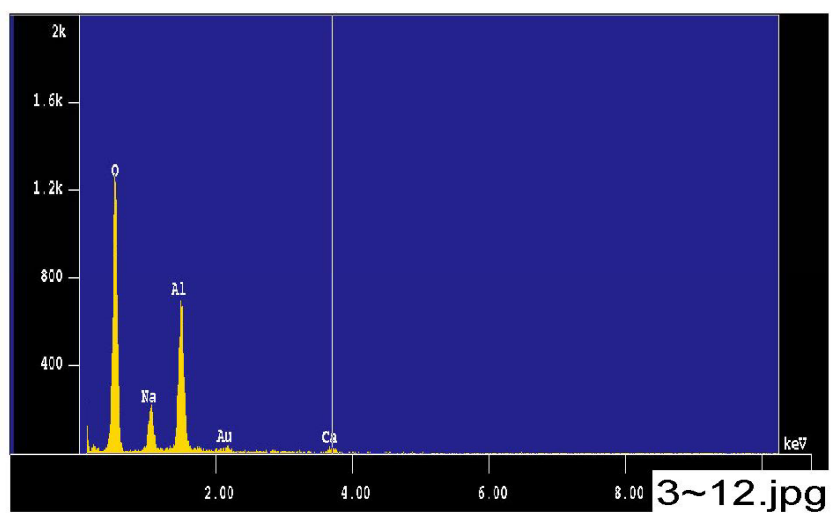


Figure B-27. Day-15, sample #3 counting spectrum (EDS 3-12) for the scale on the filter.

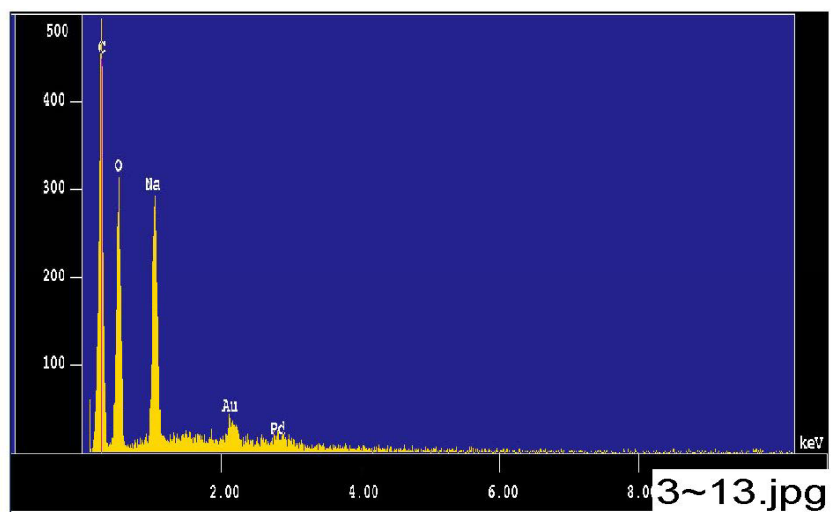
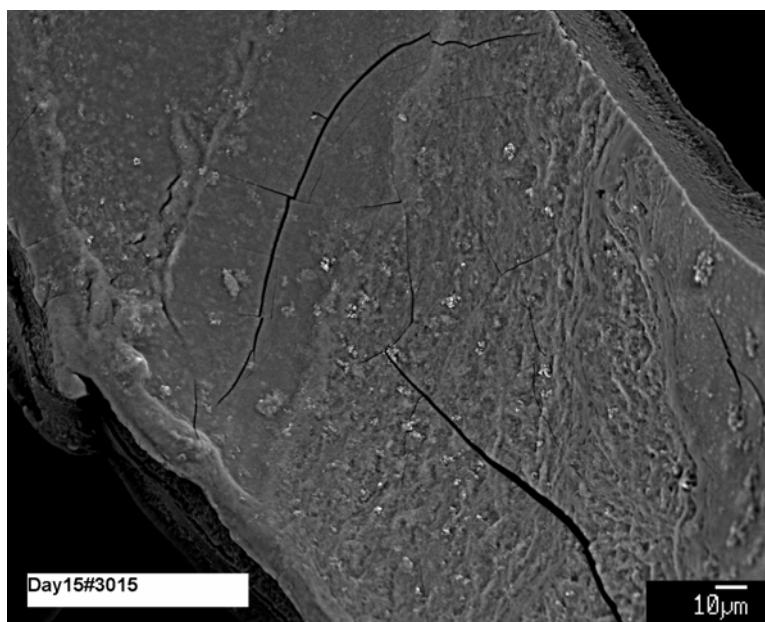
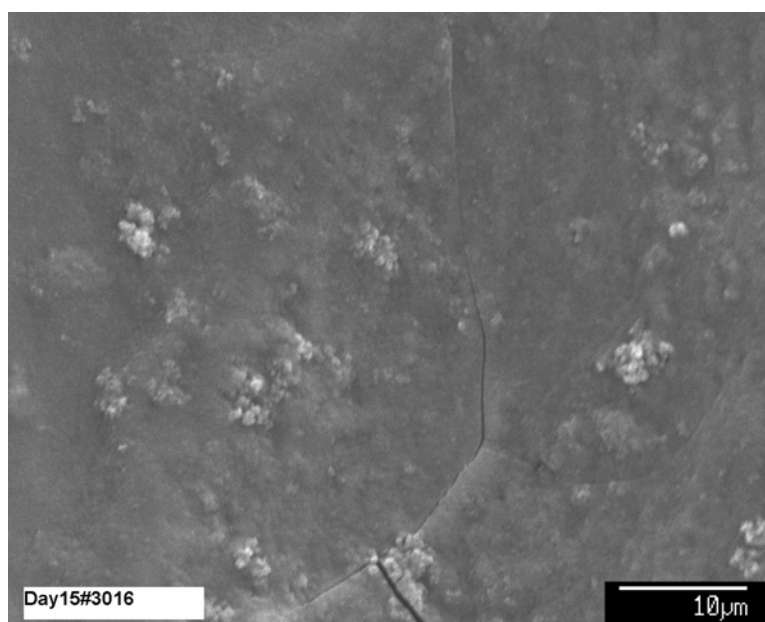


Figure B-28. Day-15, sample #3 counting spectrum (EDS 3-13) for the film on the filter.



**Figure B-29. Day-15, sample #3 SEM image (#3015) magnified 500 times: BSE on the scale.**



**Figure B-30. Day-15, sample #3 SEM image (#3016) magnified 2000 times: SEI close-up.**

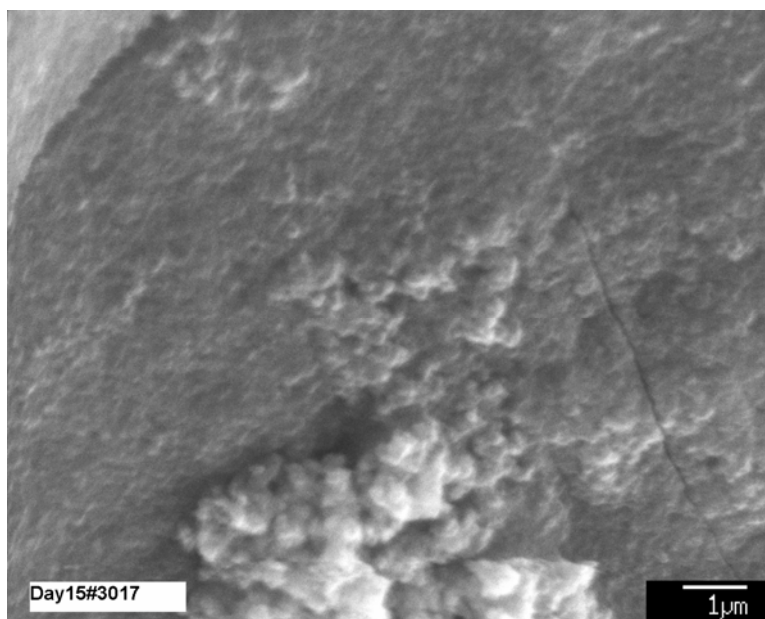


Figure B-31. Day-15, sample #3 SEM image (#3017) magnified 10,000 times on the scale.

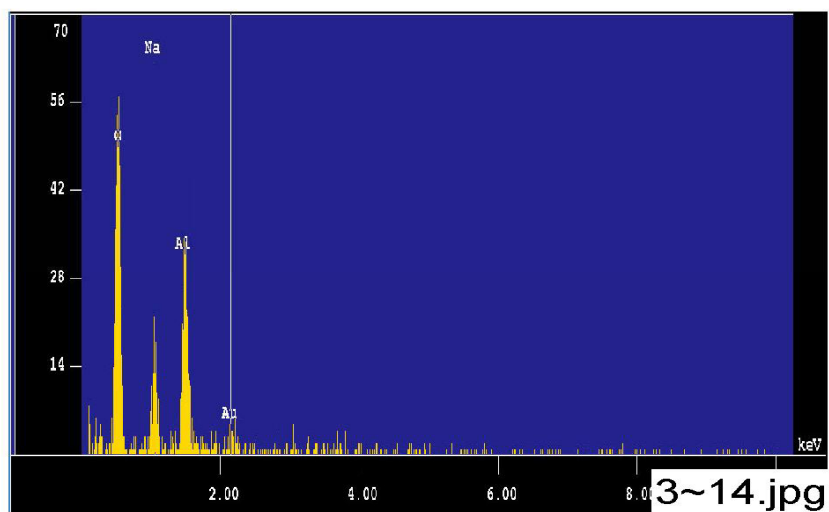
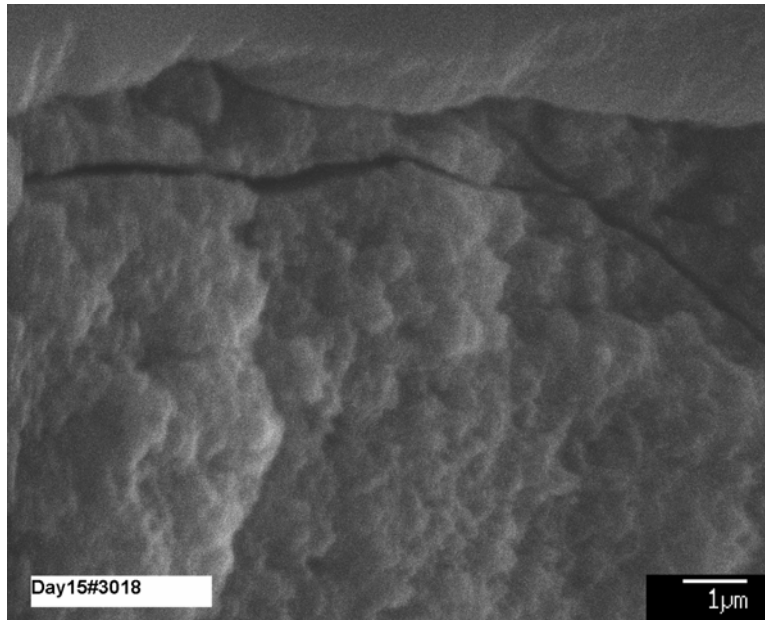
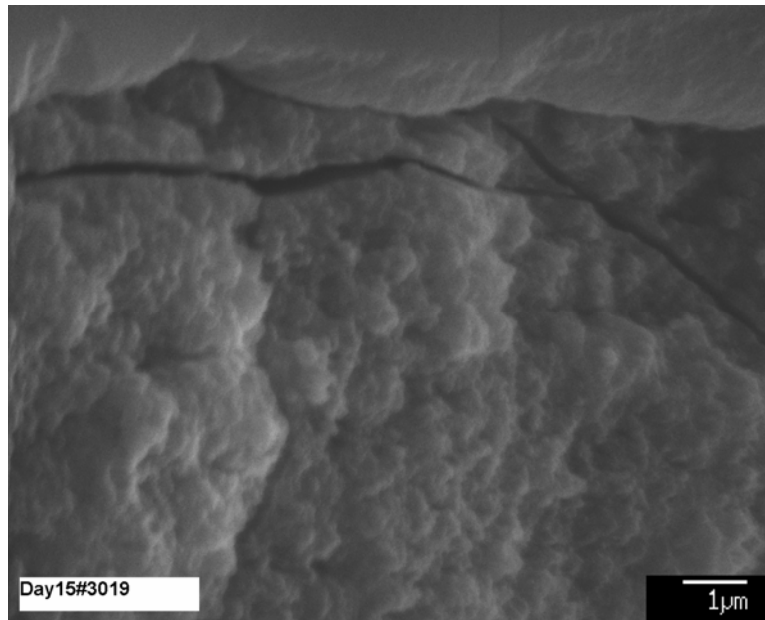


Figure B-32. Day-15, sample #3 counting spectrum (EDS 3-14) for the globular particles in image #3017 (see Figure B-31).



**Figure B-33. Day-15, sample #3 SEM image (#3018) magnified 10,000 times on the edge of a lone piece of scale, as shown in upper right of Figure B-26.**



**Figure B-34. Day-15, sample #3 SEM image (#3019) for the same piece of scale as in Figure B-33 but using a longer scanning time.**



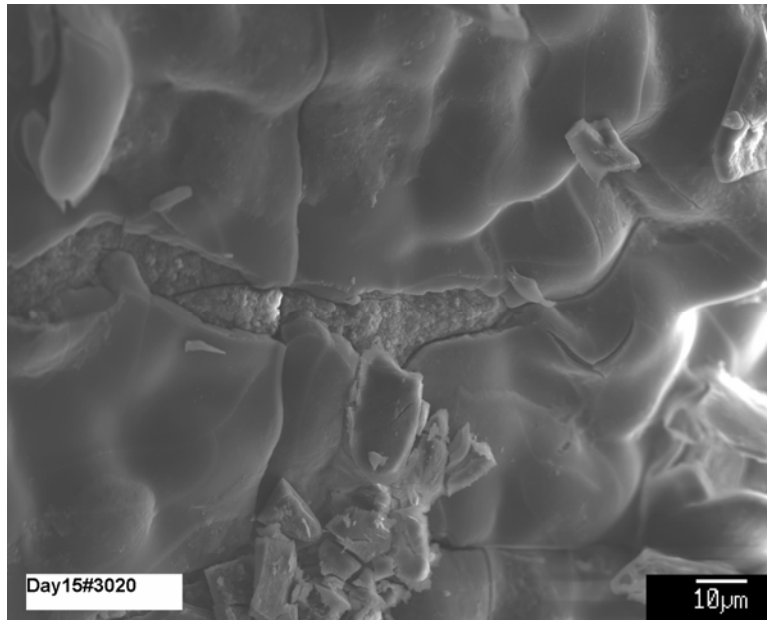


Figure B-35. Day-15, sample #3 SEM image (#3020) magnified 800 times on the lone piece of scale.

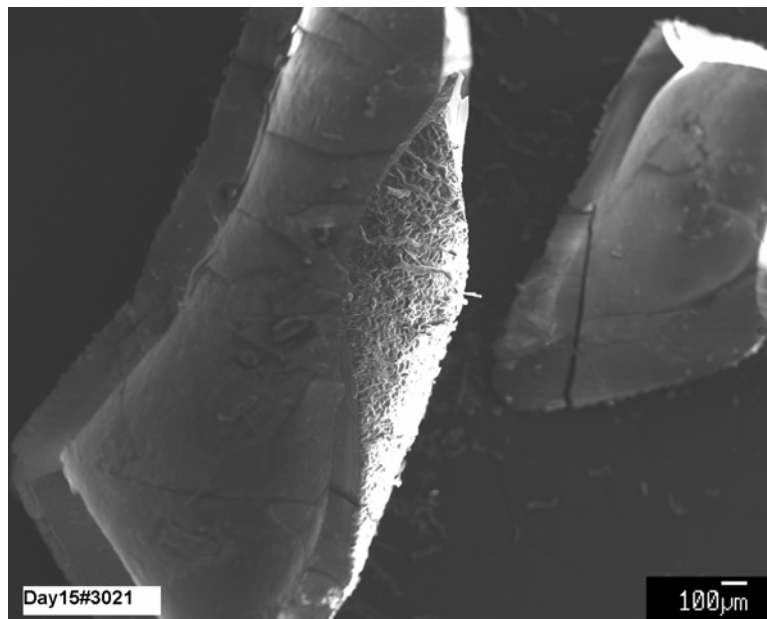
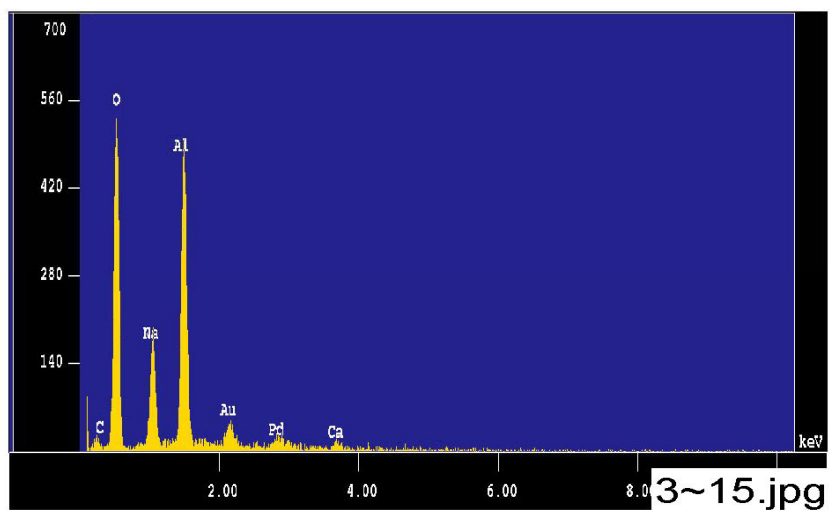
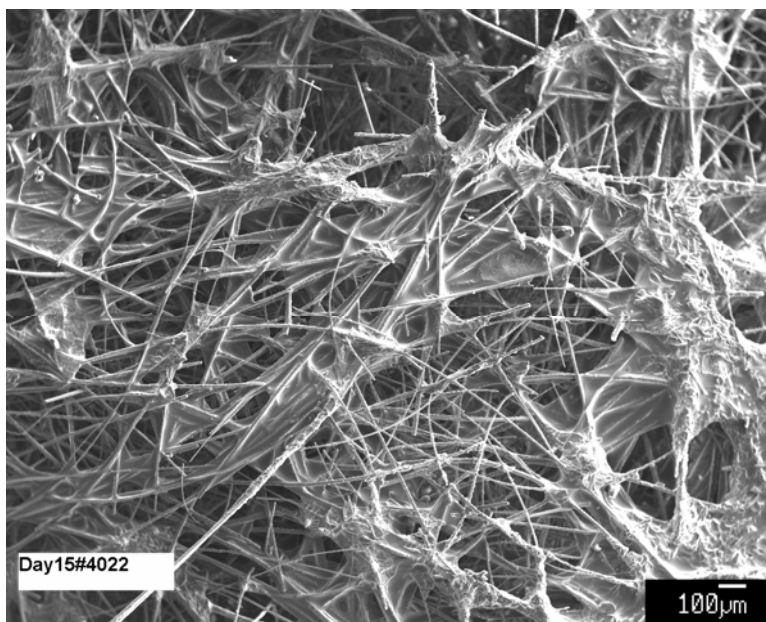


Figure B-36. Day-15, sample #3 SEM image (#3021) magnified 40 times on the lone piece of scale.



**Figure B-37. Day-15, sample #3 counting spectrum (EDS 3-15) for the side of the lone piece of scale.**



**Figure B-38. Day-15, sample #4 SEM image (#4022) magnified 43 times on the surface of the fiberglass.**

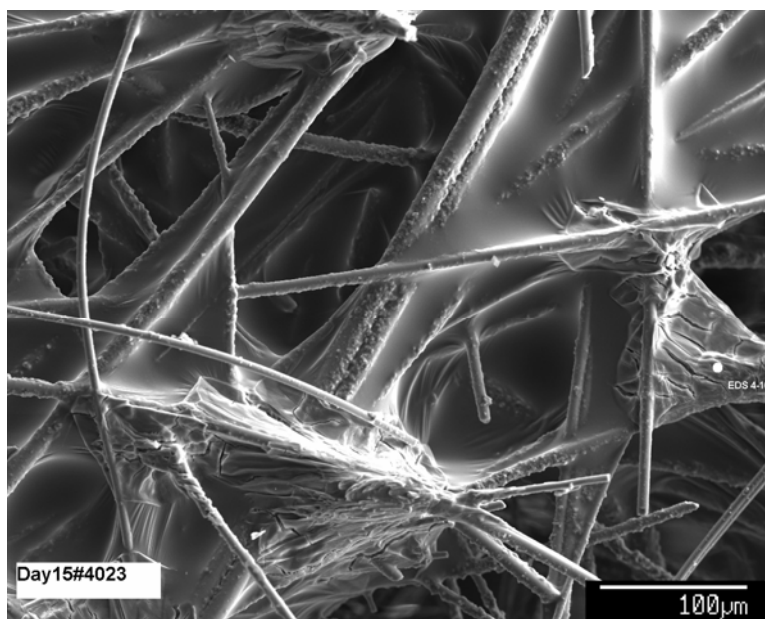


Figure B-39. Day-15, sample #4 SEM image (#4023) magnified 230 times on the gelatinous film.

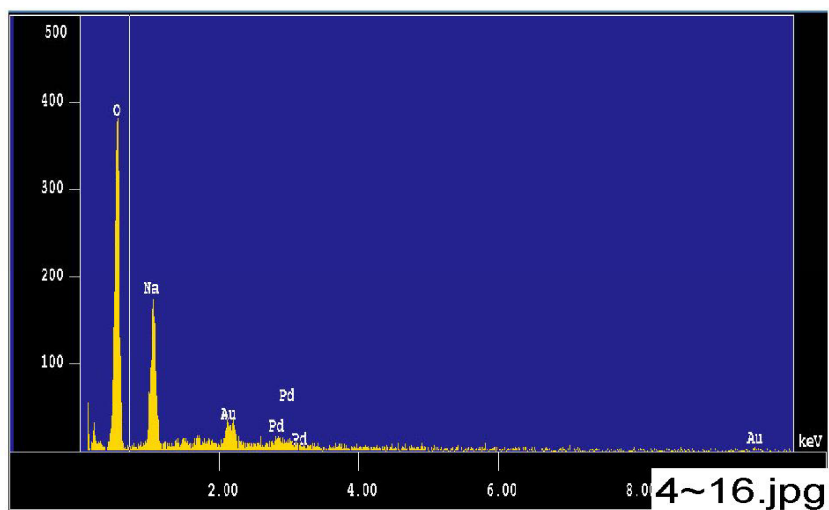


Figure B-40. Day-15, sample #4 counting spectrum (EDS 4-16) for the cracked gelatinous material shown at center right of Figure B-39.

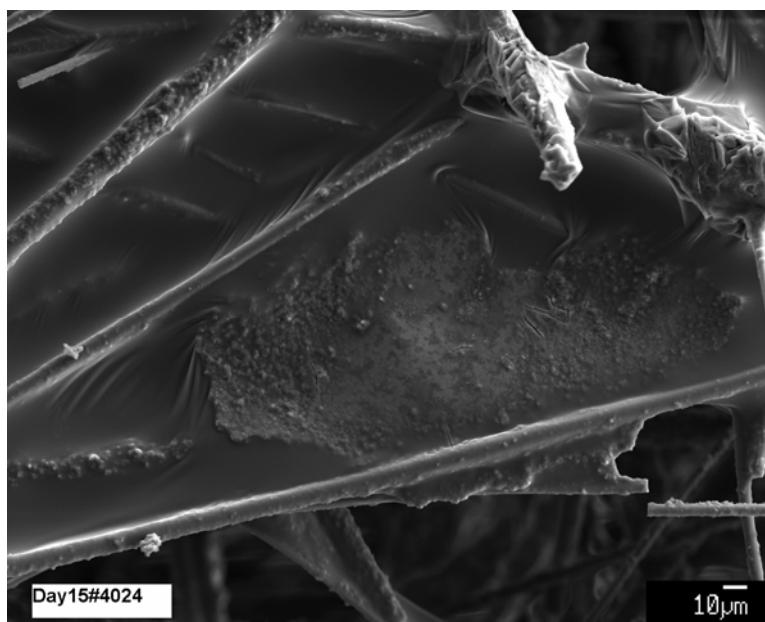


Figure B-41. Day-15, sample #4 SEM image (#4024) magnified 370 times on the film with particles.

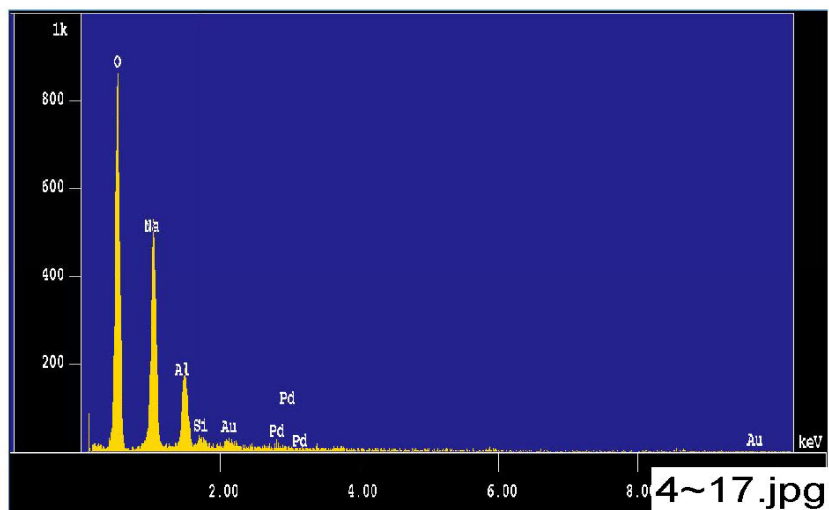


Figure B-42. Day-15, sample #4 counting spectrum (EDS 4-17) for the particles on the gelatinous film, as shown in Figure B-41.

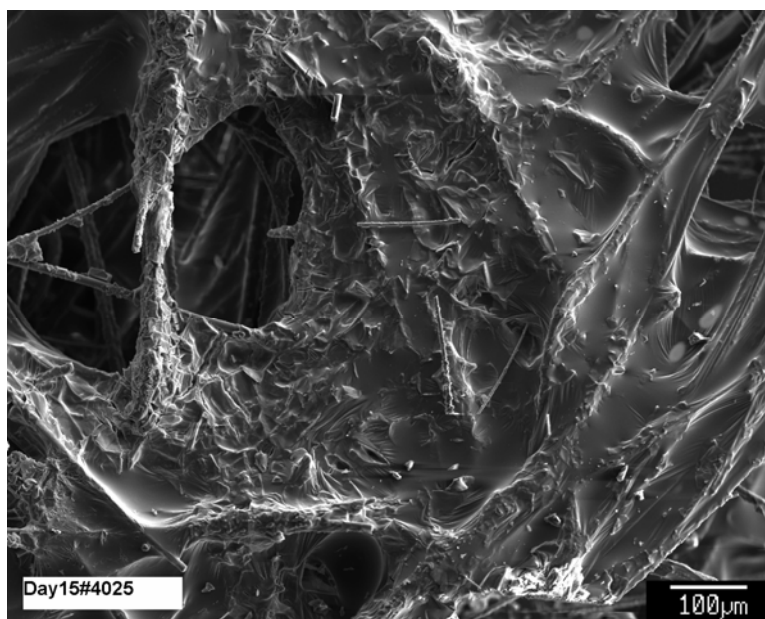


Figure B-43. Day-15, sample #4 SEM image (#4025) magnified 120 times on the rough gelatinous film.

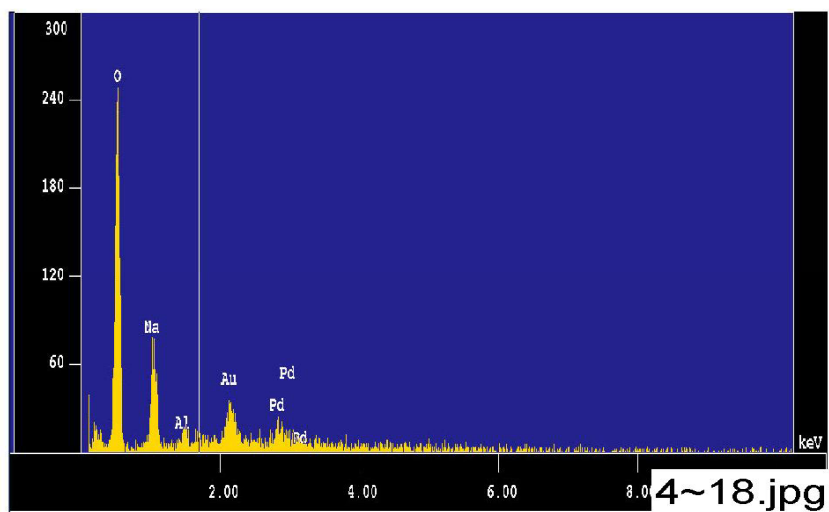
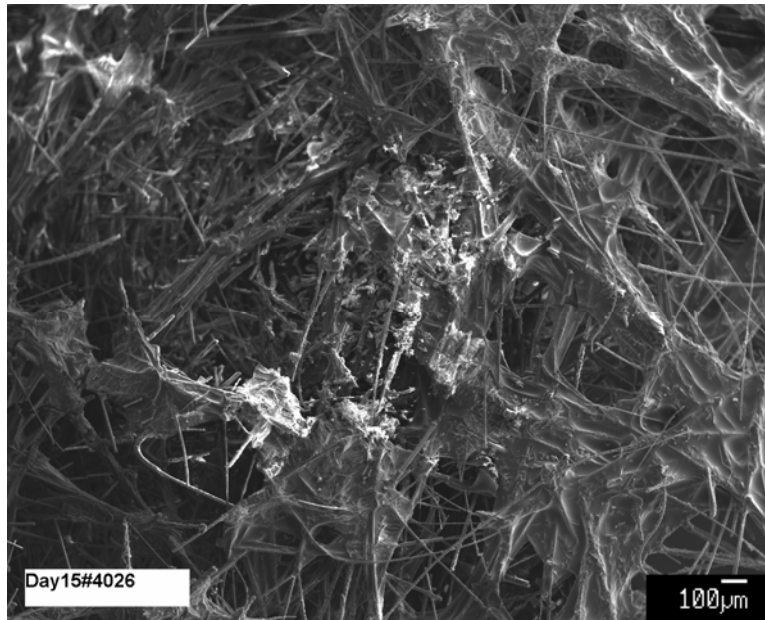
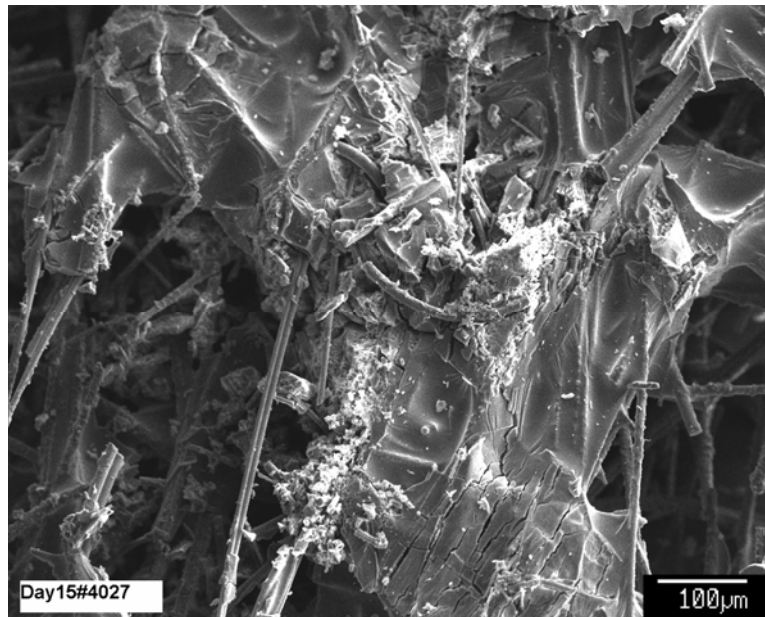


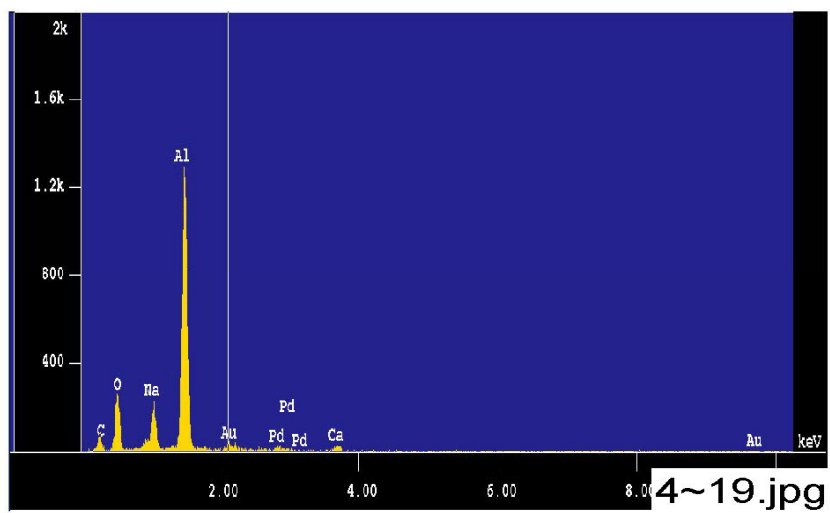
Figure B-44. Day-15, sample #4 counting spectrum (EDS 4-18) for the rough gelatinous film.



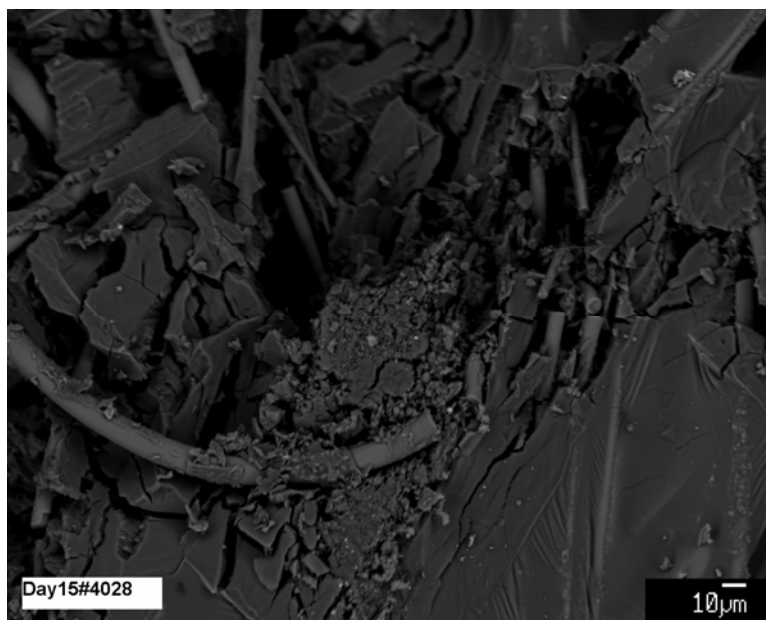
**Figure B-45. Day-15, sample #4 SEM image (#4026) magnified 40 times on the fiberglass surface.**



**Figure B-46. Day-15, sample #4 SEM image (#4027) magnified 140 times; close-up.**

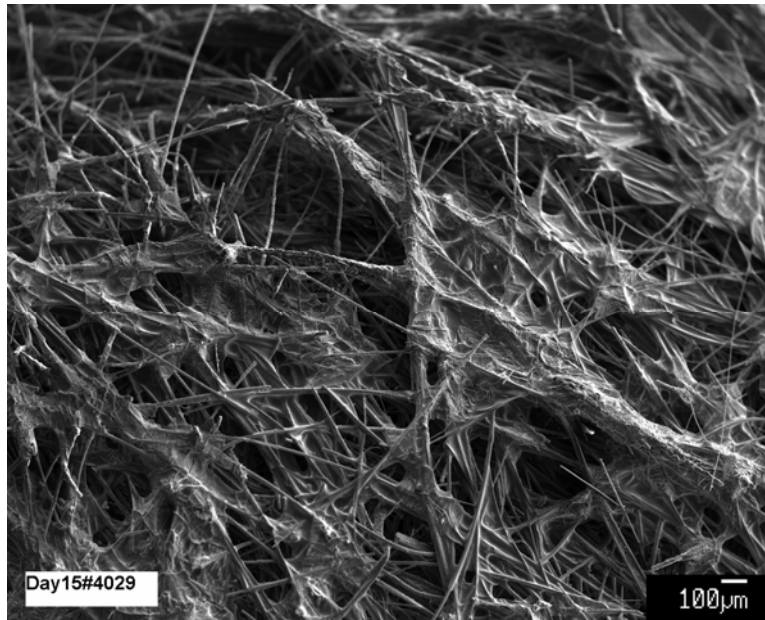


**Figure B-47.** Day-15, sample #4 counting spectrum (EDS 4-19) on bright particles attached to rough film in Figure B-46.

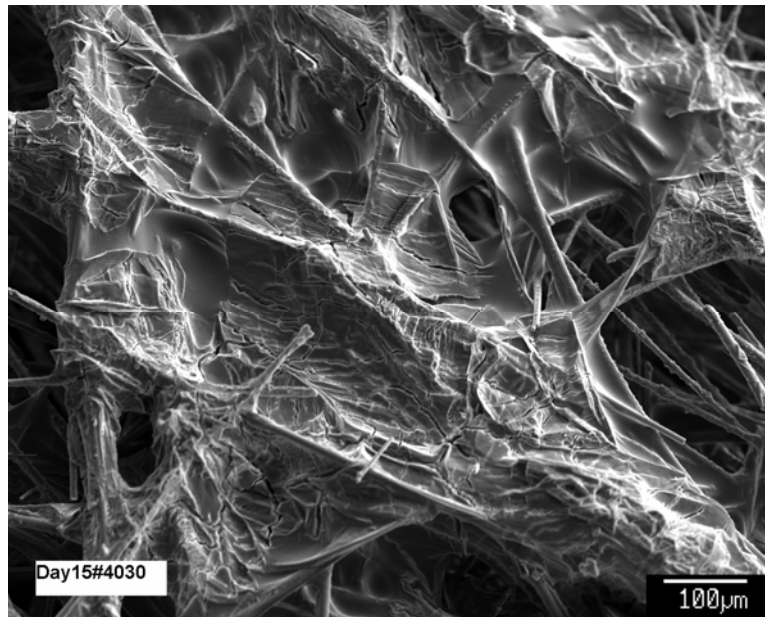


**Figure B-48.** Day-15, sample #4 SEM image (#4028) magnified 370 times; BSE close-up of the upper center of Figure B-46.



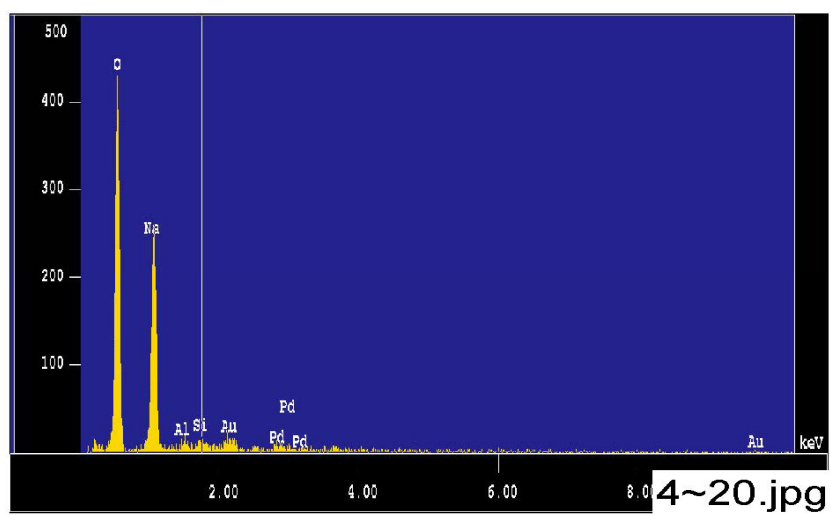


**Figure B-49.** Day-15, sample #4 SEM image (#4029) magnified 40 times on the fractured film.

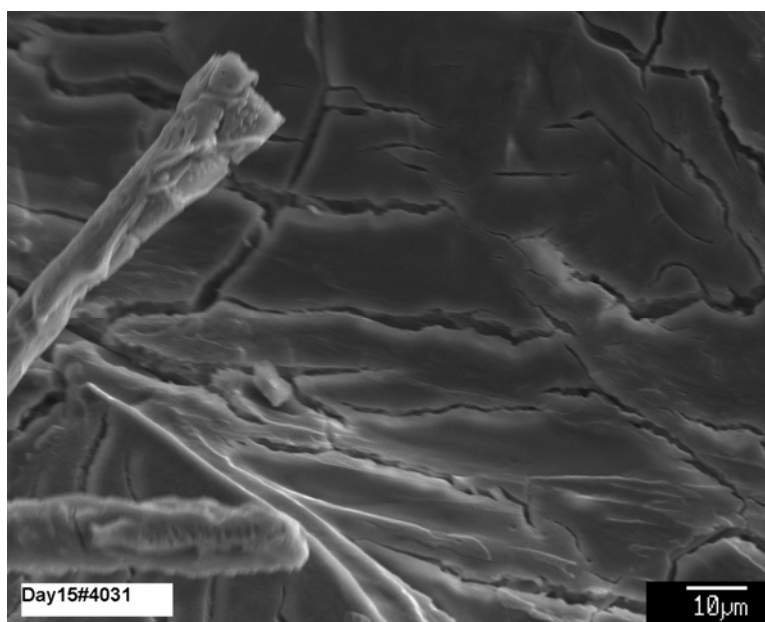


**Figure B-50.** Day-15, sample #4 SEM image (#4030) magnified 130 times, BSE close-up.





**Figure B-51.** Day-15, sample #4 counting spectrum (EDS 4-20) on the fractured film.



**Figure B-52.** Day-15, sample #4 SEM image (#4031) magnified 950 times on the BSE close-up.

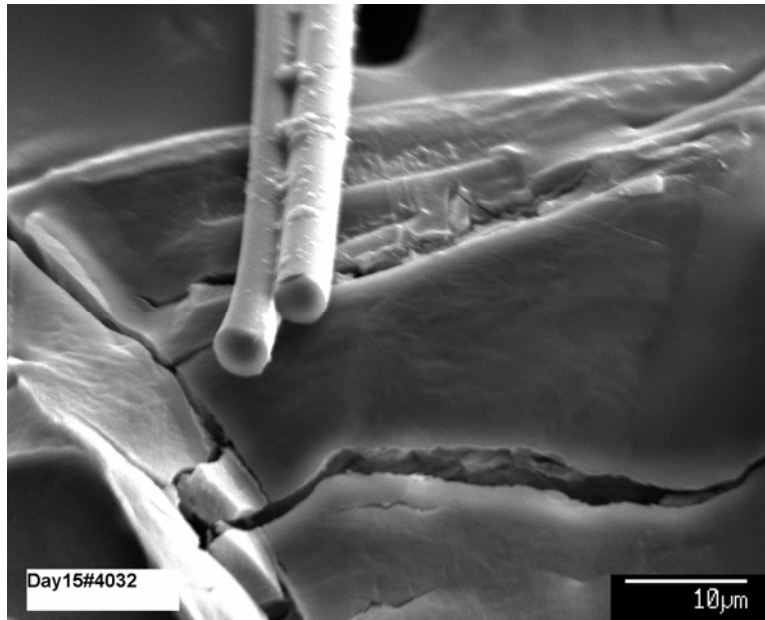


Figure B-53. Day-15, sample #4 SEM image (#4032) magnified 1900 times on the BSE close-up.

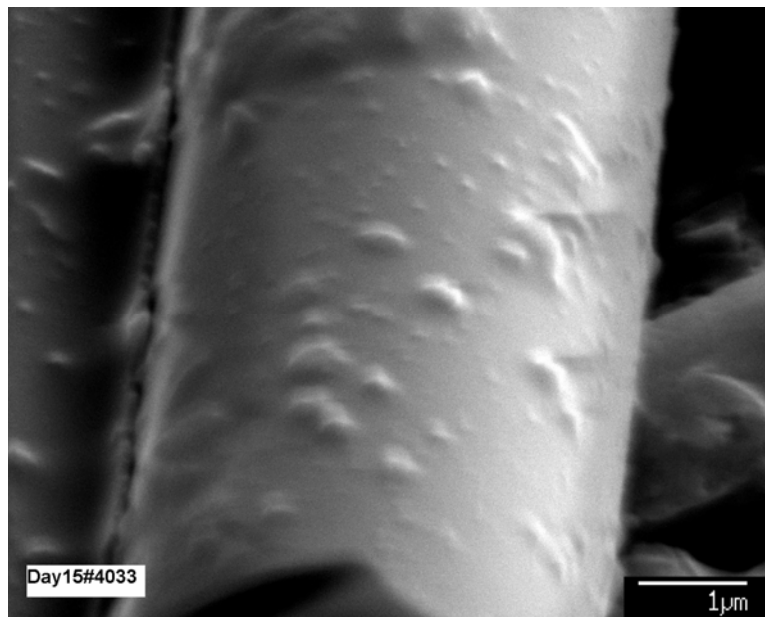


Figure B-54. Day-15, sample #4 SEM image (#4033) magnified 17,000 times on the BSE close-up.

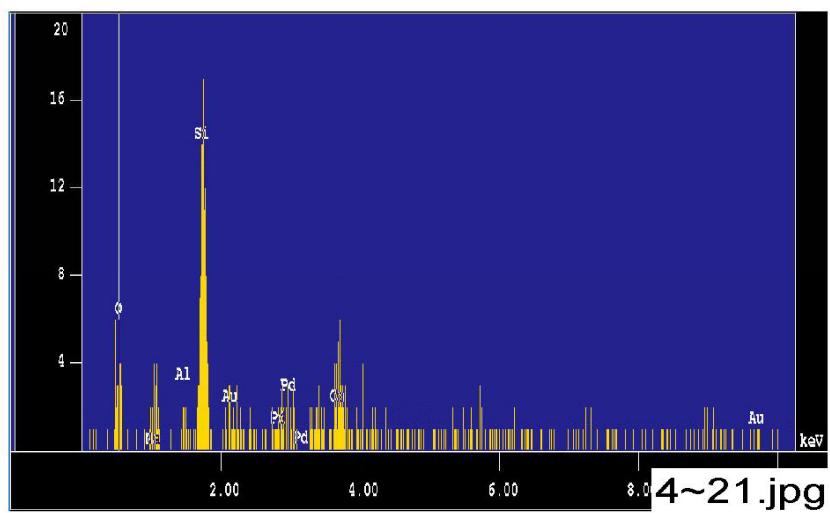


Figure B-55. Day-15, sample #4 counting spectrum (EDS 4-21) for the precipitate on the fiberglass.

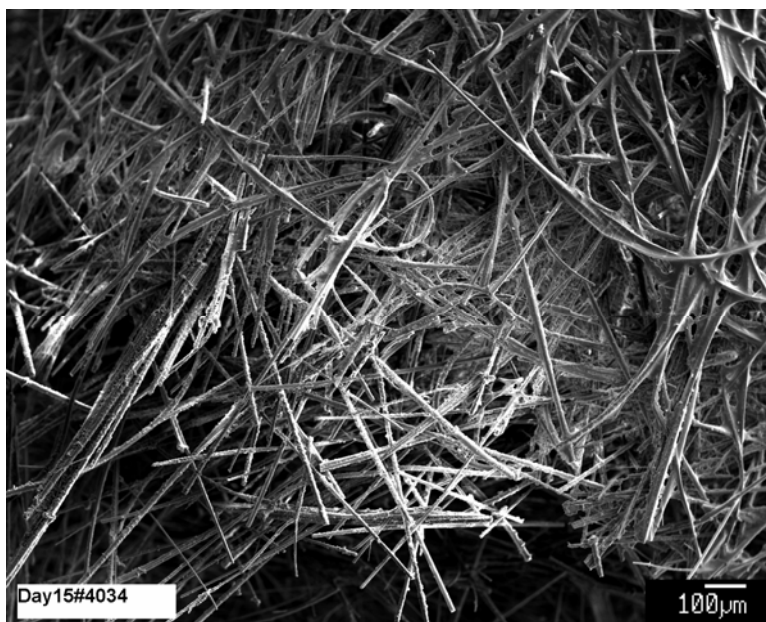


Figure B-56. Day-15, sample #4 SEM image (#4034) magnified 65 times on the particles and gelatinous film on the fiberglass.

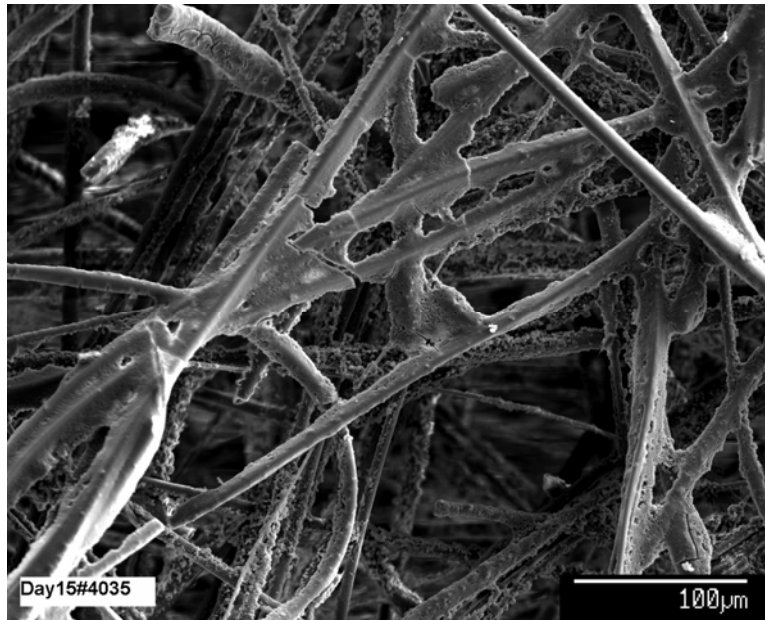


Figure B-57. Day-15, sample #4 SEM image (#4035) magnified 270 times; BSE close-up.

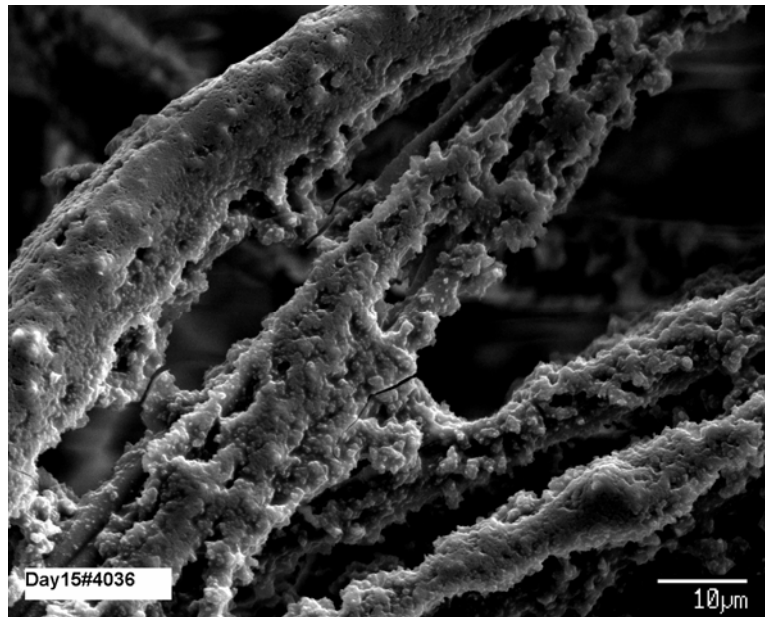


Figure B-58. Day-15, sample #4 SEM image (#4036) magnified 1400 times; BSE close-up.

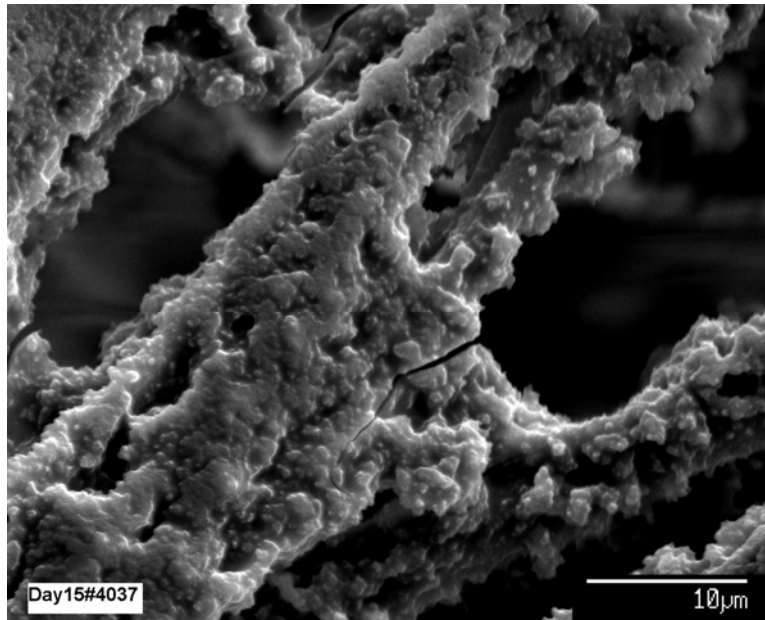


Figure B-59. Day-15, sample #4 SEM image (#4037) magnified 2500 times; BSE close-up.

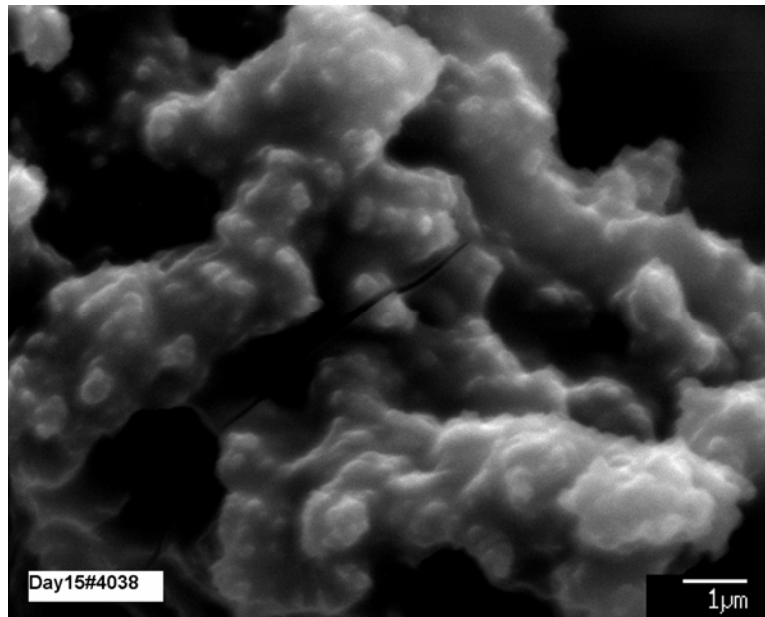


Figure B-60. Day-15, sample #4 SEM image (#4038) magnified 10,000 times; BSE close-up.

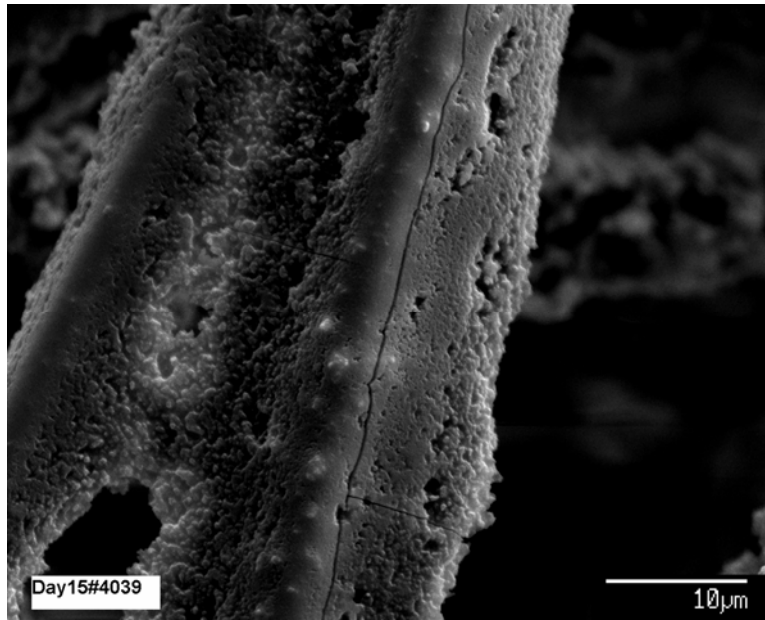


Figure B-61. Day-15, sample #4 SEM image (#4039) magnified 2200 times; close-up of crust.

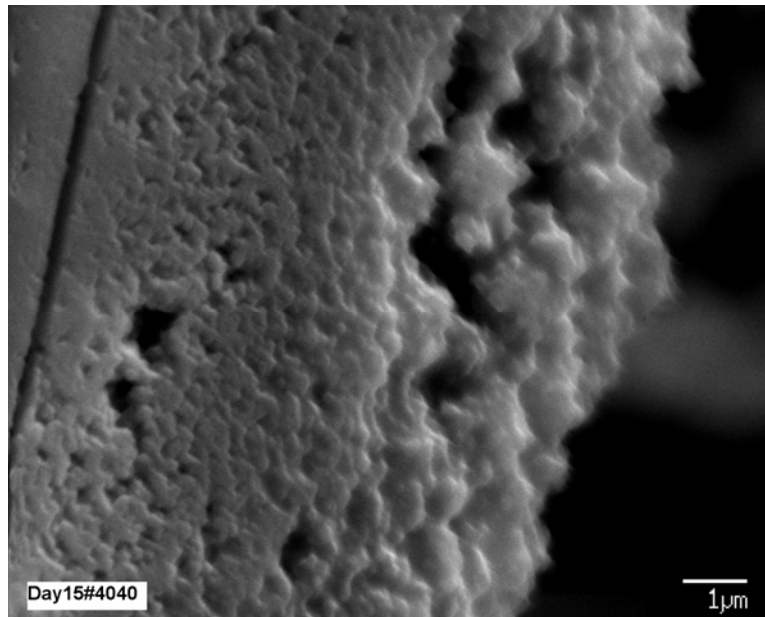


Figure B-62. Day-15, sample #4 SEM image (#4040) magnified 10,000 times; close-up of crust.

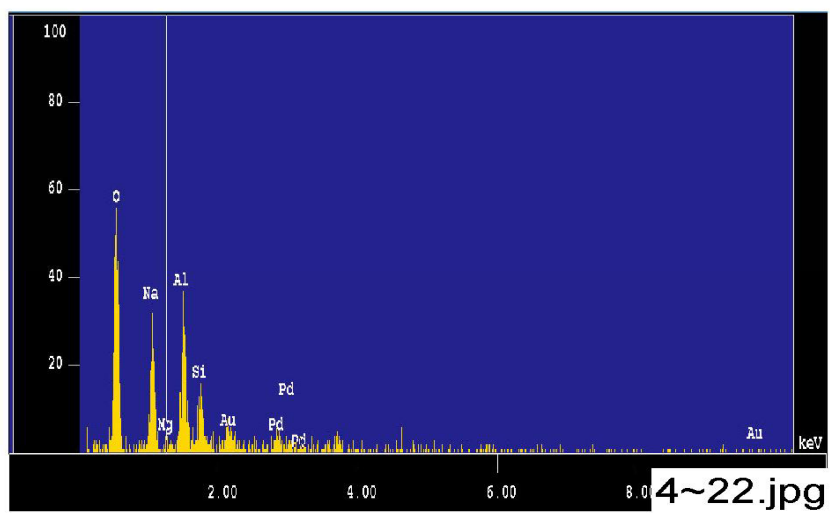


Figure B-63. Day-15, sample #4 counting spectrum (EDS 4-22) for the crust on the fiberglass, as shown in Figure B-62.

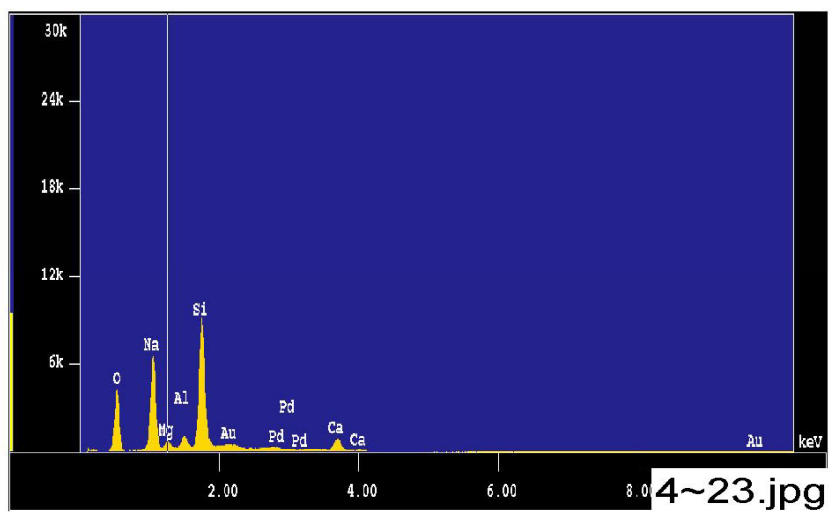
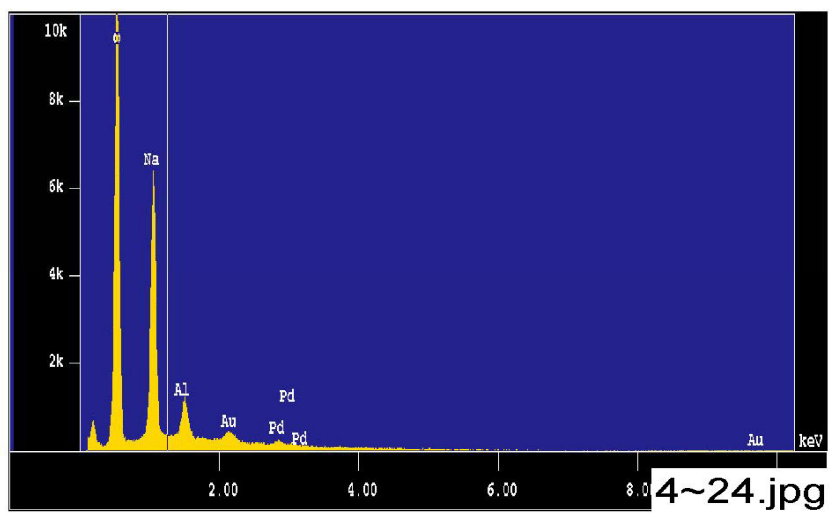
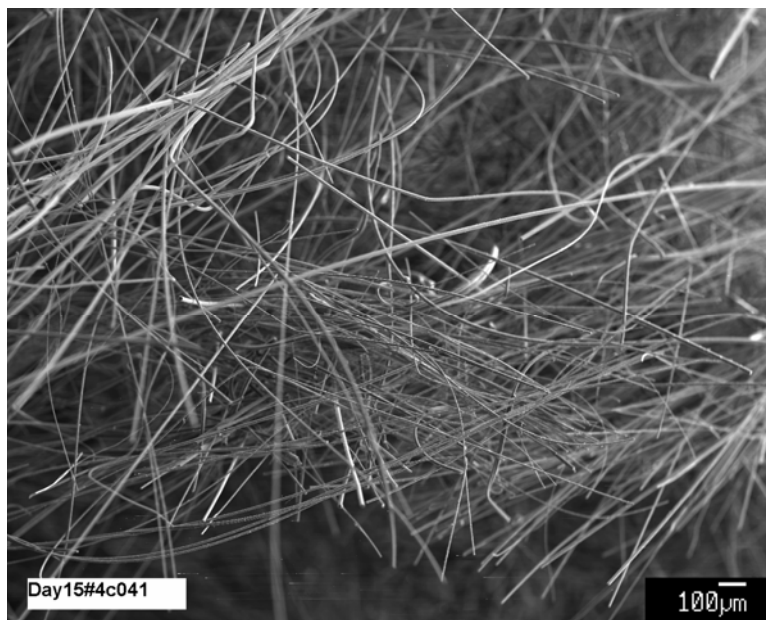


Figure B-64. Day-15, sample #4 counting spectrum (EDS 4-23) for the particles on the fiberglass, as shown in Figure B-60.

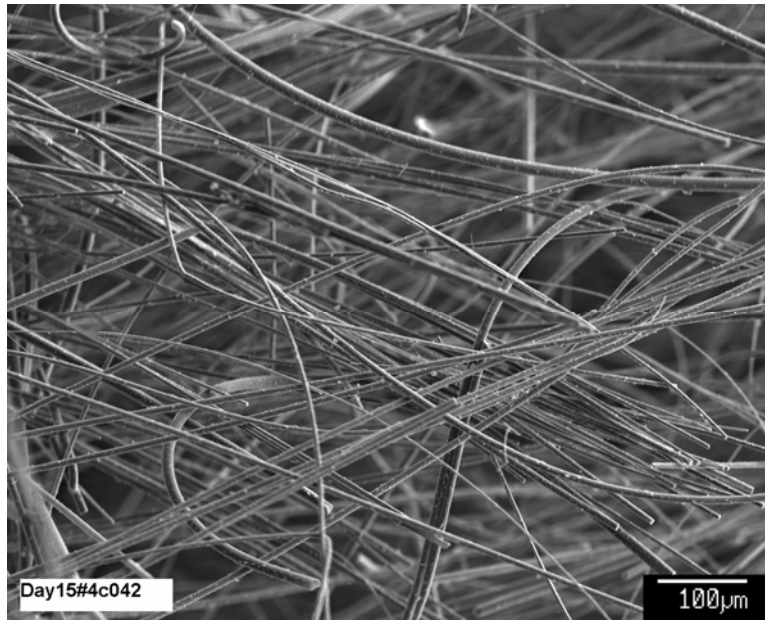


**Figure B-65. Day-15, sample #4 counting spectrum (EDS 4-24) for the thin film on the fiberglass, as shown in Figure B-57.**

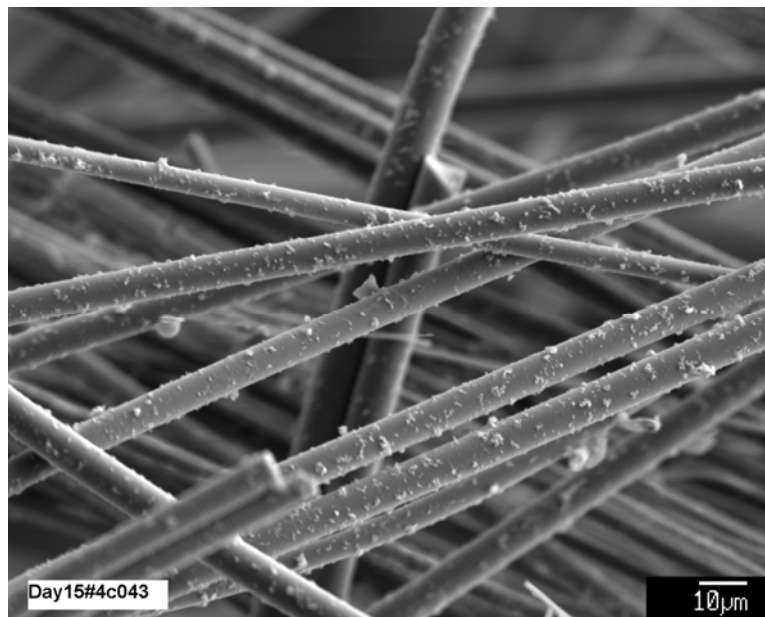


**Figure B-66. Day-15, sample #4C SEM image (#4C041) magnified 43 times on fiberglass from center of high-flow sample.**





**Figure B-67.** Day-15, sample #4C SEM image (#4C042) magnified 140 times on fiberglass.



**Figure B-68.** Day-15, sample #4C SEM image (#4C043) magnified 750 times on fiberglass.

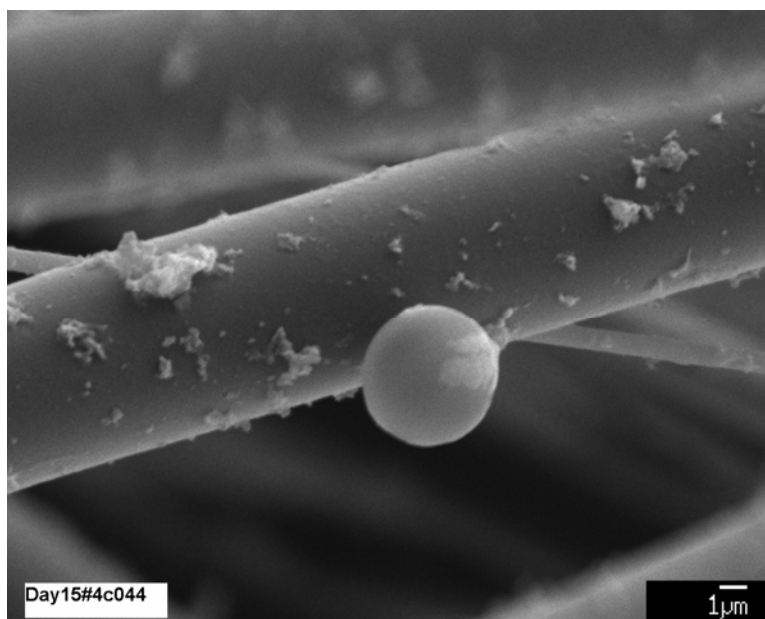


Figure B-69. Day-15, sample #4C SEM image (#4C044) magnified 4300 times on fiberglass.

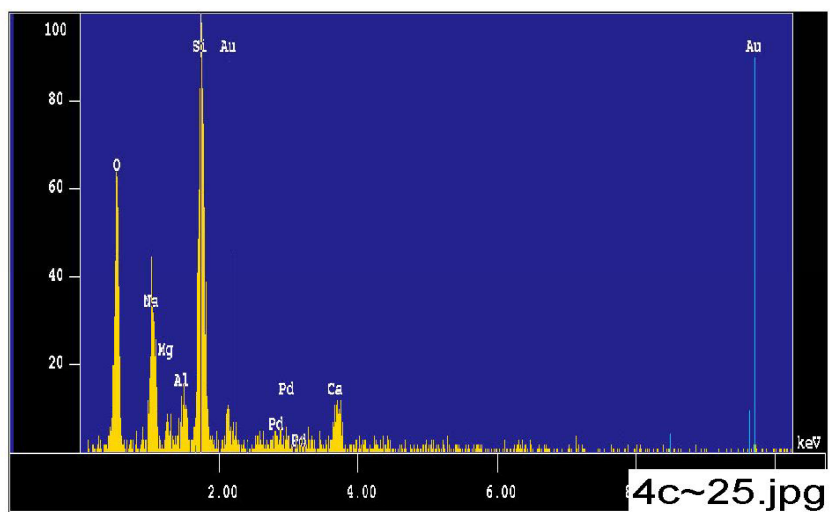


Figure B-70. Day-15, sample #4C counting spectrum (EDS 4C-25) for the sphere on the fiberglass, as shown in Figure B-69.

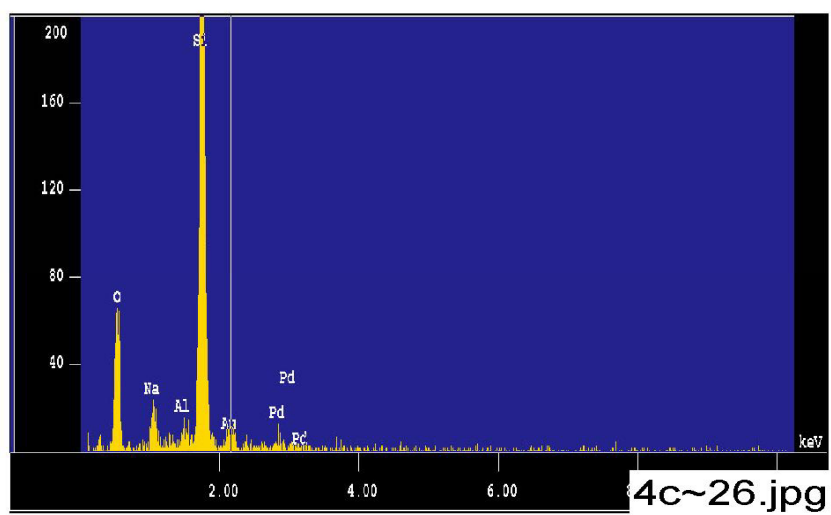


Figure B-71. Day-15, sample #4C counting spectrum (EDS 4C-26) for a particle on the fiberglass, as shown in Figure B-69.

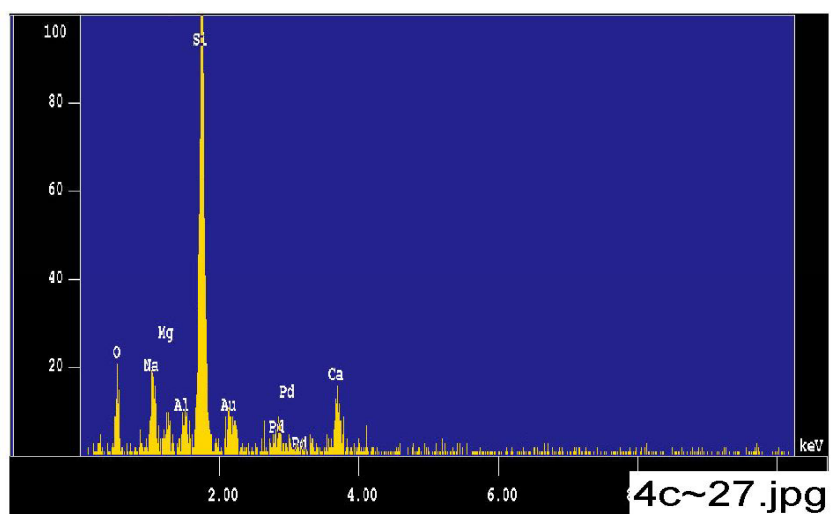


Figure B-72. Day-15, sample #4C counting spectrum (EDS 4C-27) for the fiberglass strand, as shown in Figure B-69.

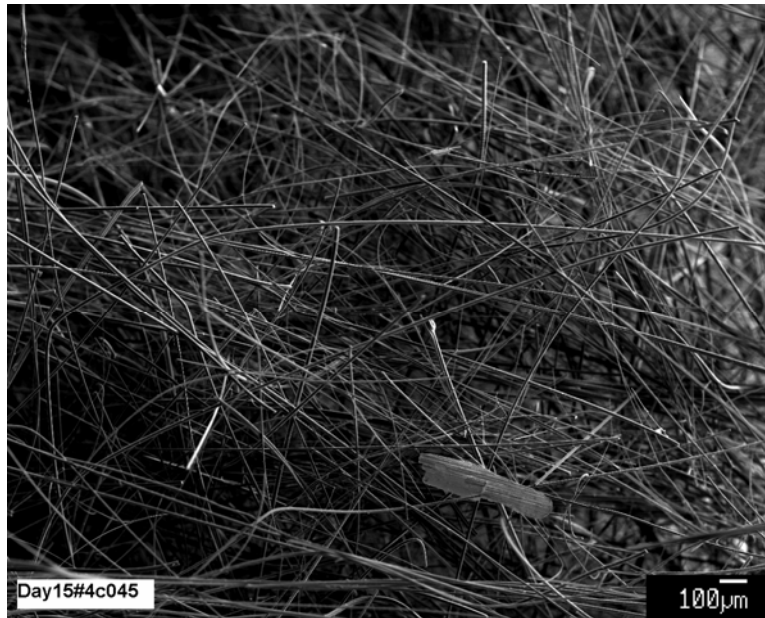


Figure B-73. Day-15, sample #4C SEM image (#4C045) magnified 43 times on the fiberglass.

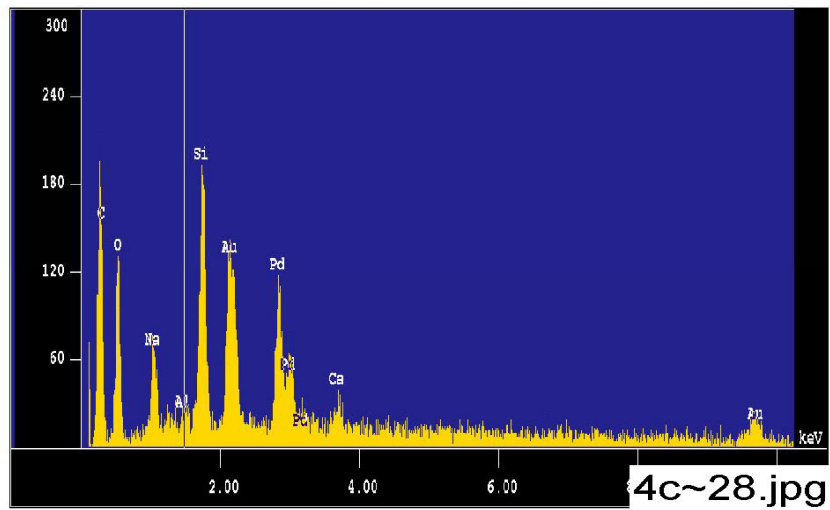


Figure B-74. Day-15, sample #4C counting spectrum (4C-28) for the large fragment on top of the fiberglass, as shown in Figure B-73.

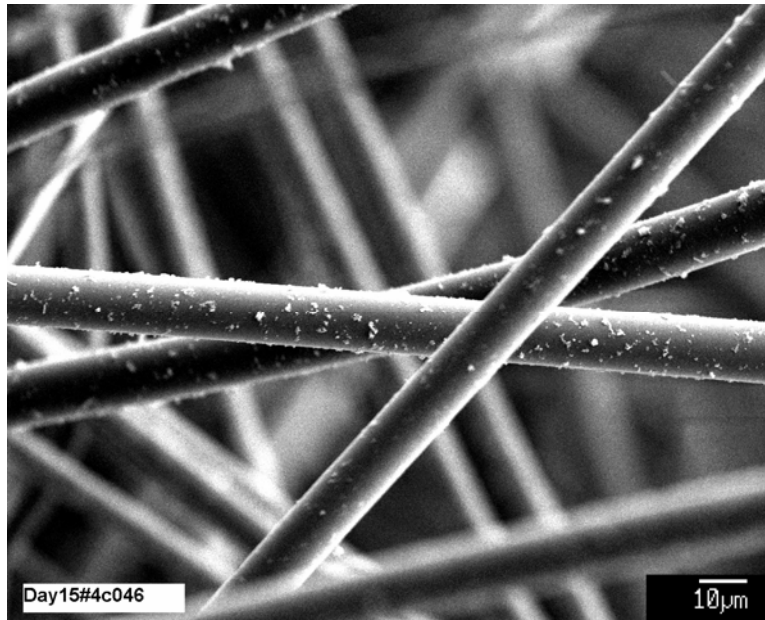


Figure B-75. Day-15, sample #4C SEM image (#4C046) magnified 750 times on the fiberglass.

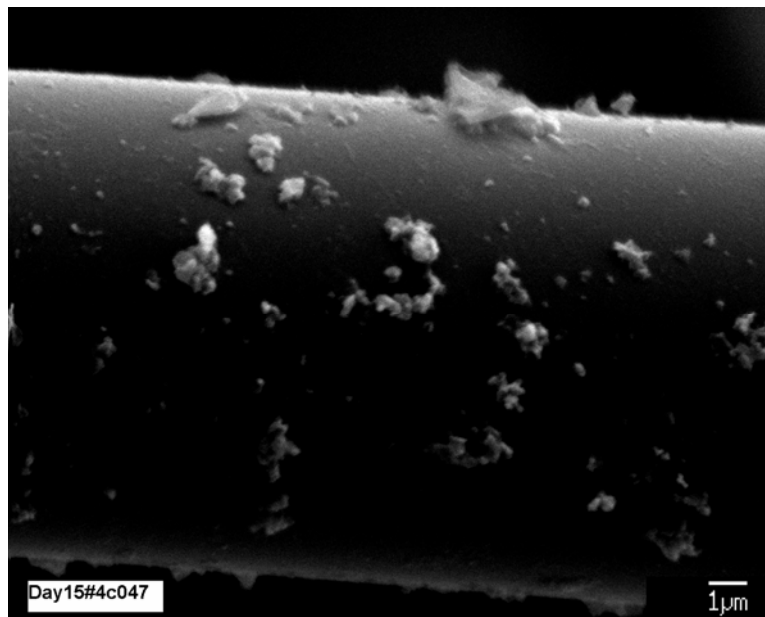


Figure B-76. Day-15, sample #4C SEM image (#4C047) magnified 6000 times on the fiberglass.

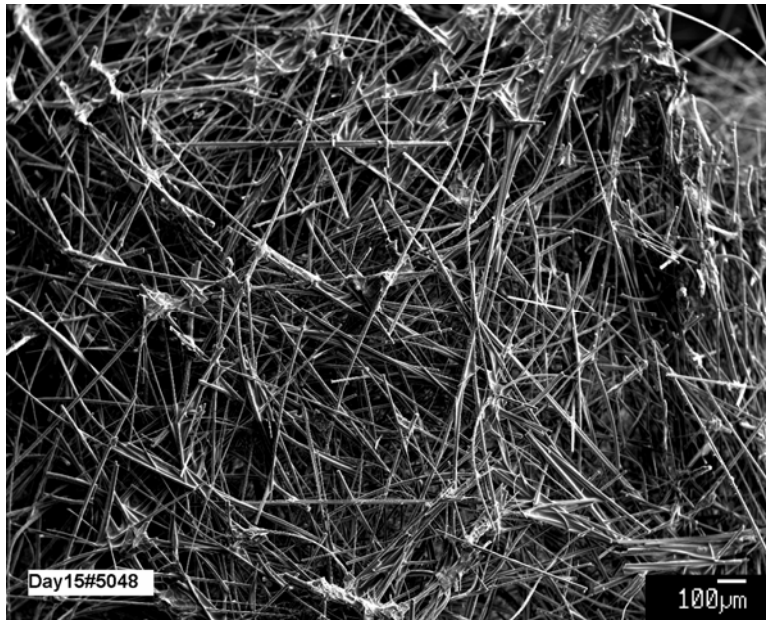


Figure B-77. Day-15, sample #5 SEM image (#5048) magnified 45 times on the fiberglass.

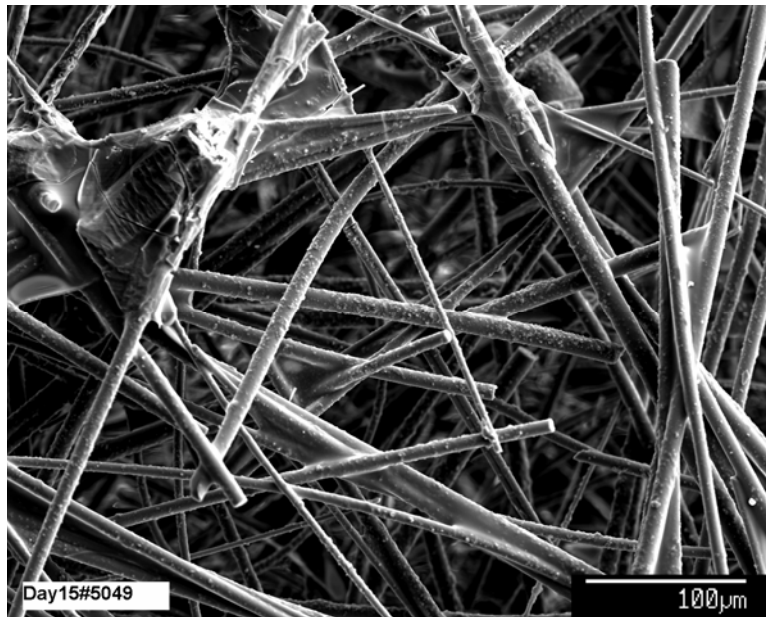


Figure B-78. Day-15, sample #5 SEM image (#5049) magnified 250 times on the fiberglass.

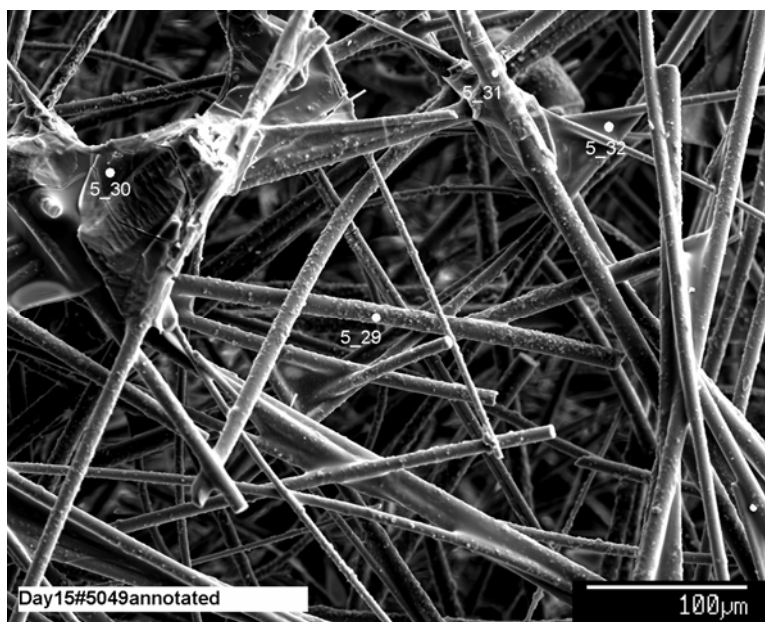


Figure B-79. Day-15, sample #5 SEM image (#5049 annotated) annotating the EDS locations.

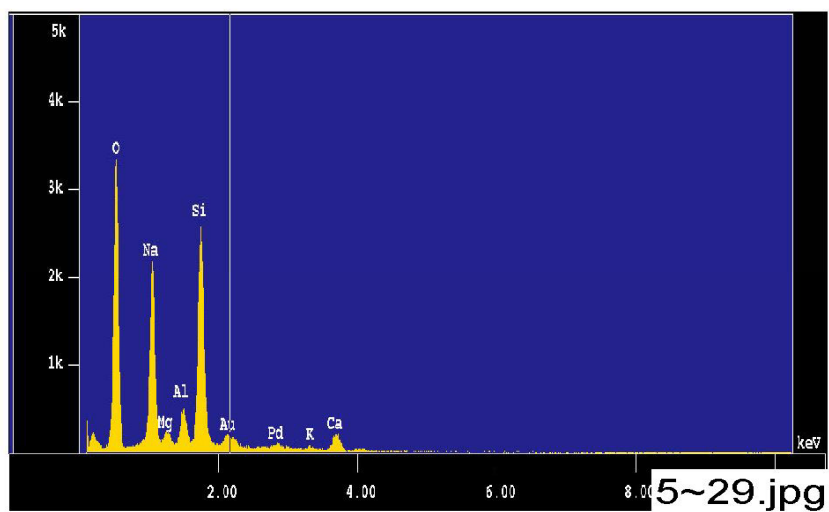


Figure B-80. Day-15, sample #5 counting spectrum (EDS 5-29) for a particle on the fiberglass at location 5-29, as shown in Figure B-79.

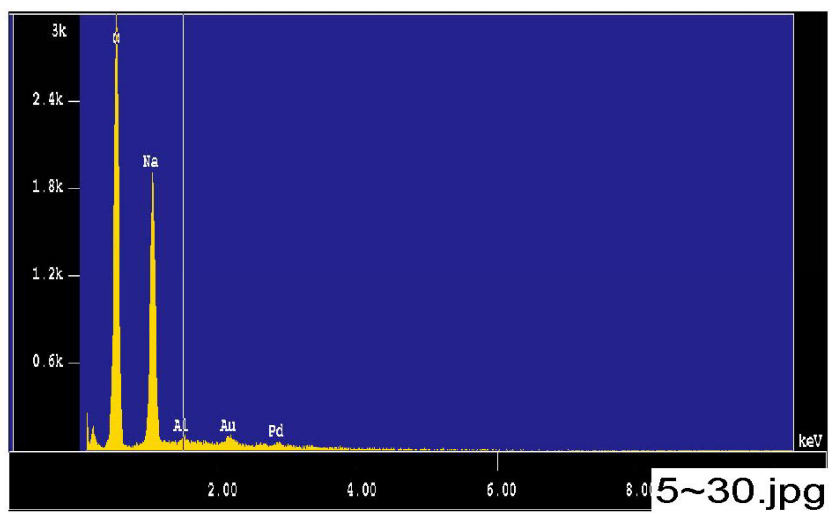


Figure B-81. Day-15, sample #5 counting spectrum (EDS 5-30) for the large deposit at location 5-30, as shown in Figure B-79.

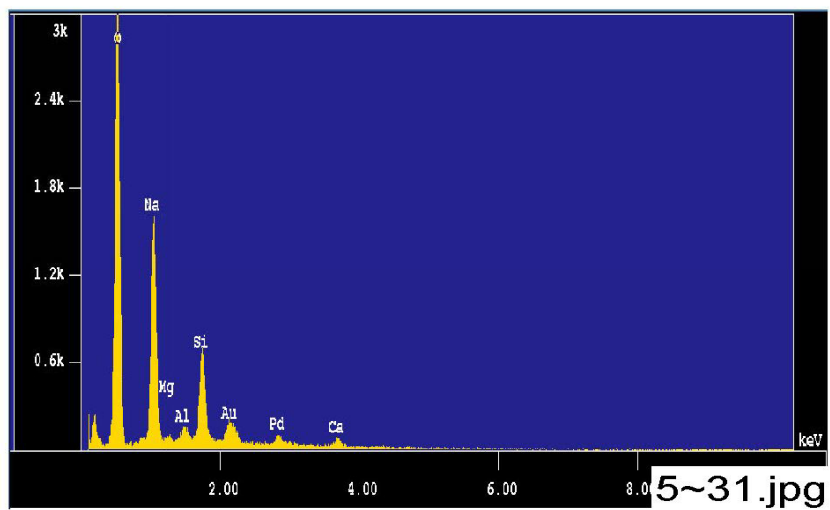


Figure B-82. Day-15, sample #5 counting spectrum (EDS 5-31) for the crust at location 5-31, as shown in Figure B-79.



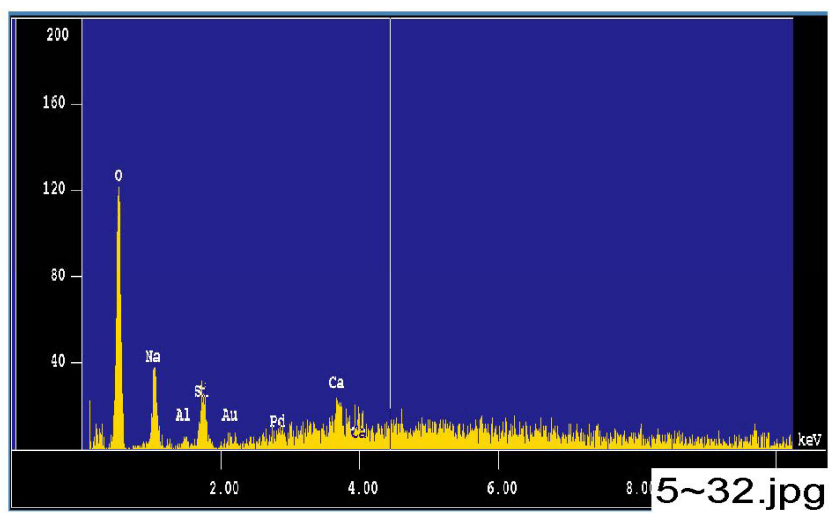


Figure B-83. Day-15, sample #5 counting spectrum (EDS 5-32) for the film at location 5-32, as shown in Figure B-79.

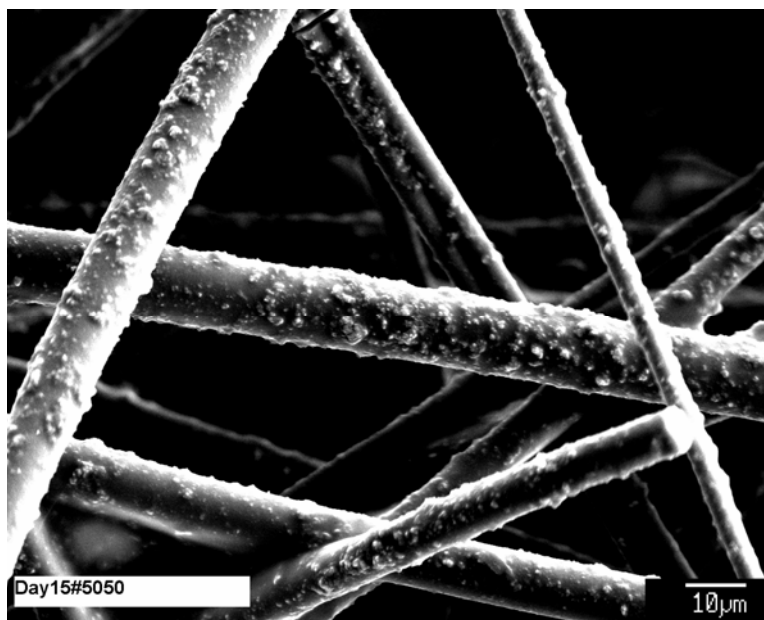
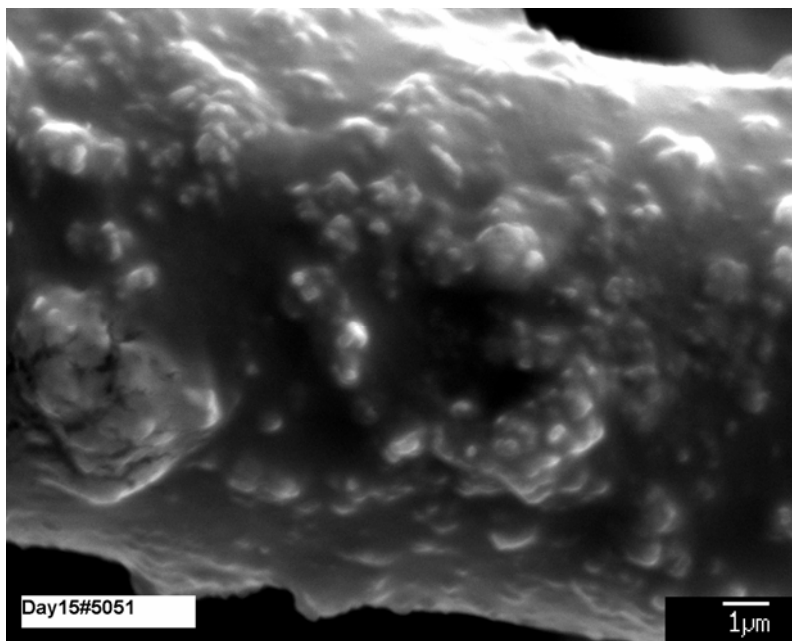
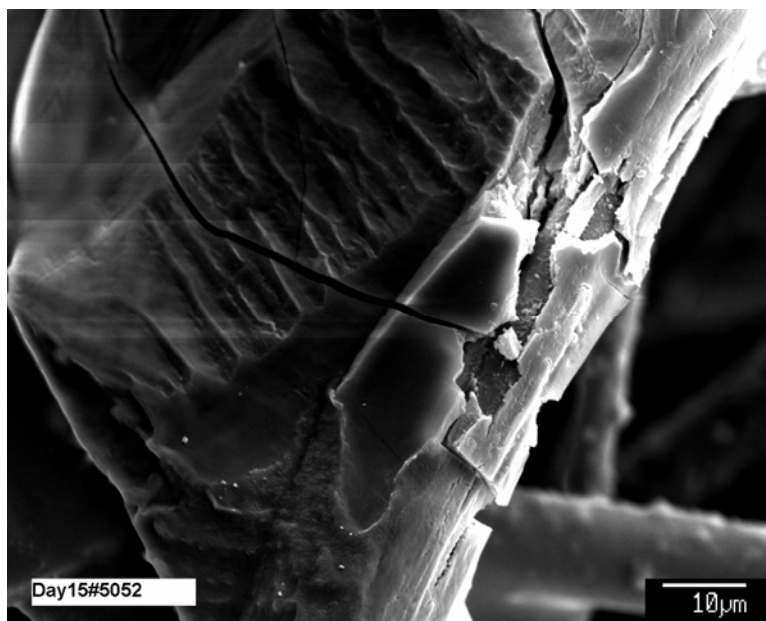


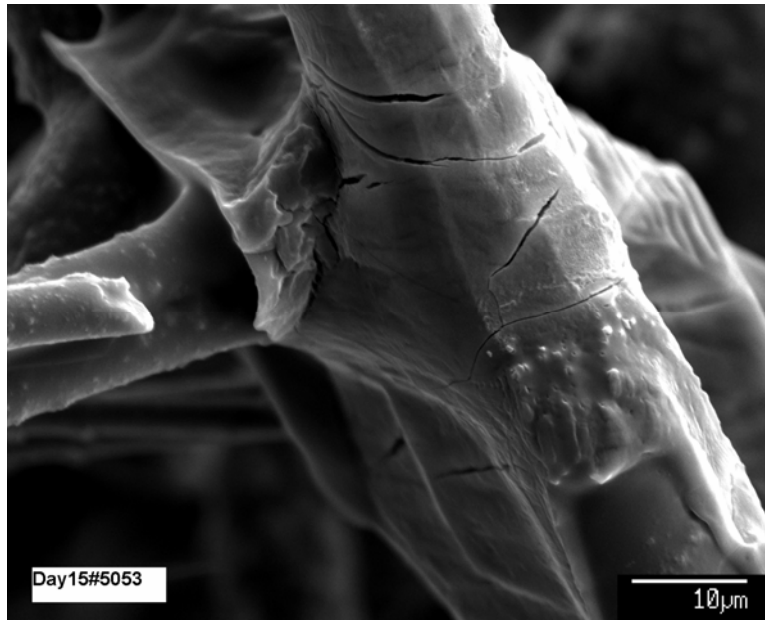
Figure B-84. Day-15, sample #5 SEM image (#5050) magnified 950 times on particles on fiberglass.



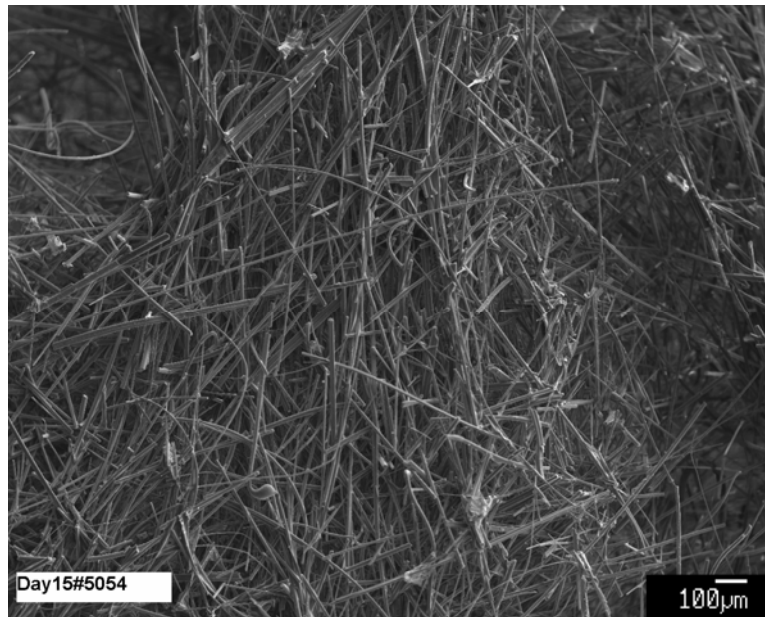
**Figure B-85. Day-15, sample #5 SEM image (#5051) magnified 7000 times on a particle on fiberglass.**



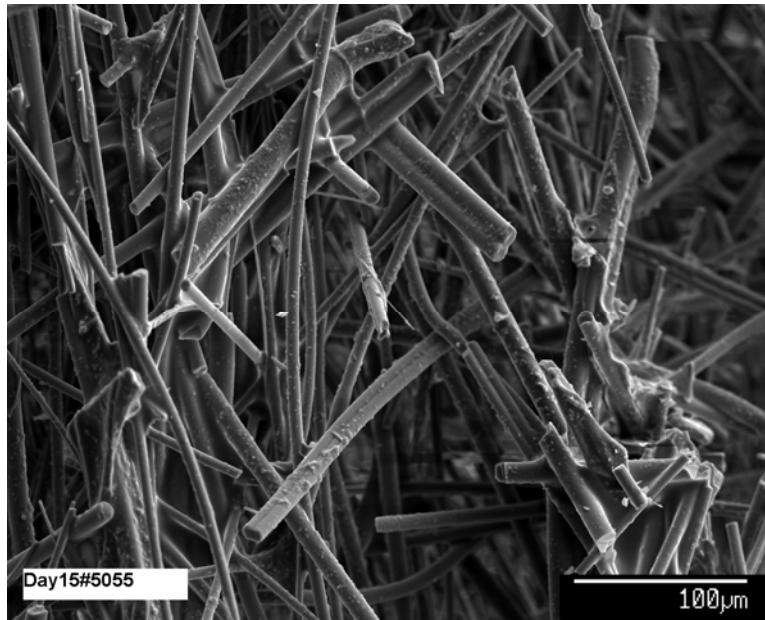
**Figure B-86. Day-15, sample #5 SEM image (#5052) magnified 1300 times on the large piece of wax-like material.**



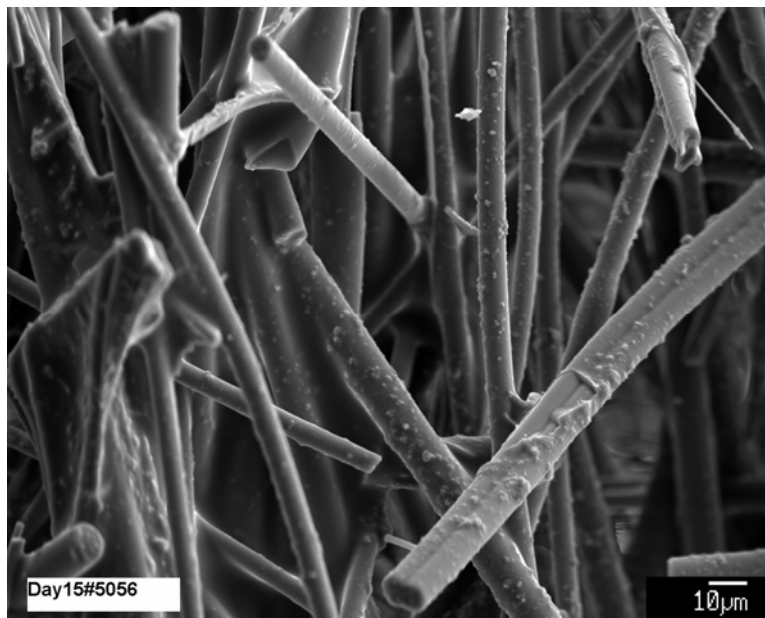
**Figure B-87. Day-15, sample #5 SEM image (#5053) magnified 1800 times on the crust.**



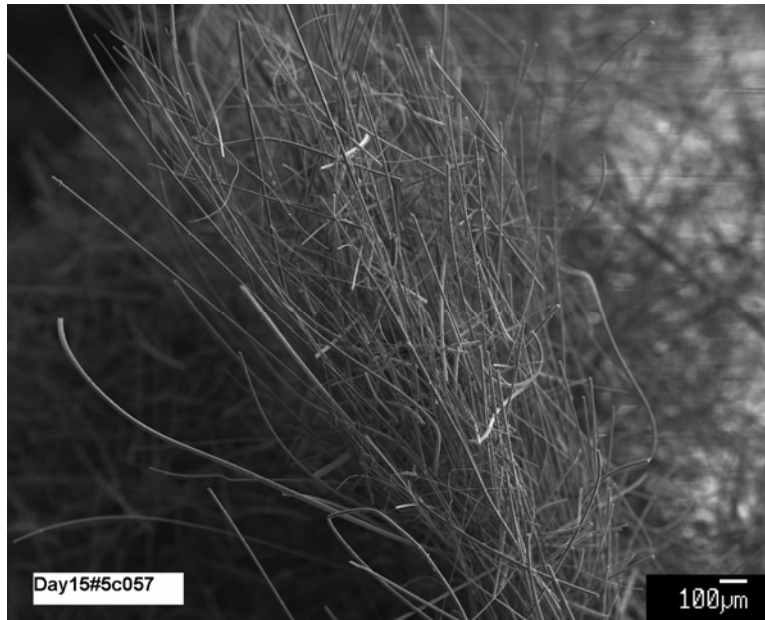
**Figure B-88. Day-15, sample #5 SEM image (#5054) magnified 50 times on fiberglass in a new area.**



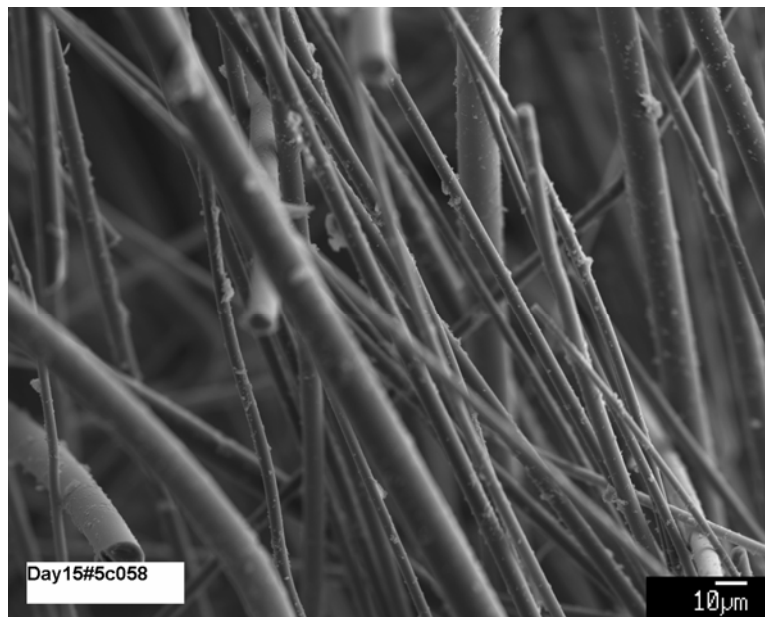
**Figure B-89. Day-15, sample #5 SEM image (#5055) magnified 270 times on close-up.**



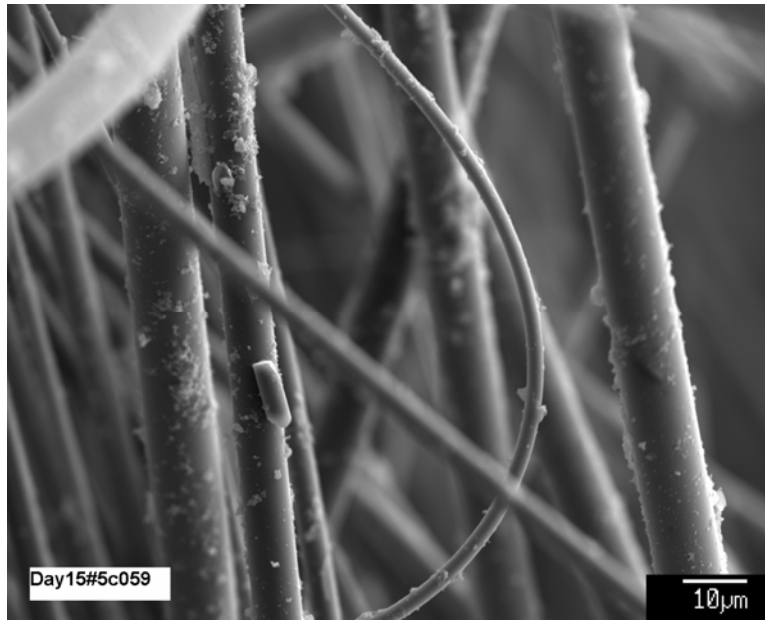
**Figure B-90. Day-15, sample #5 SEM image (#5056) magnified 600 times on close-up.**



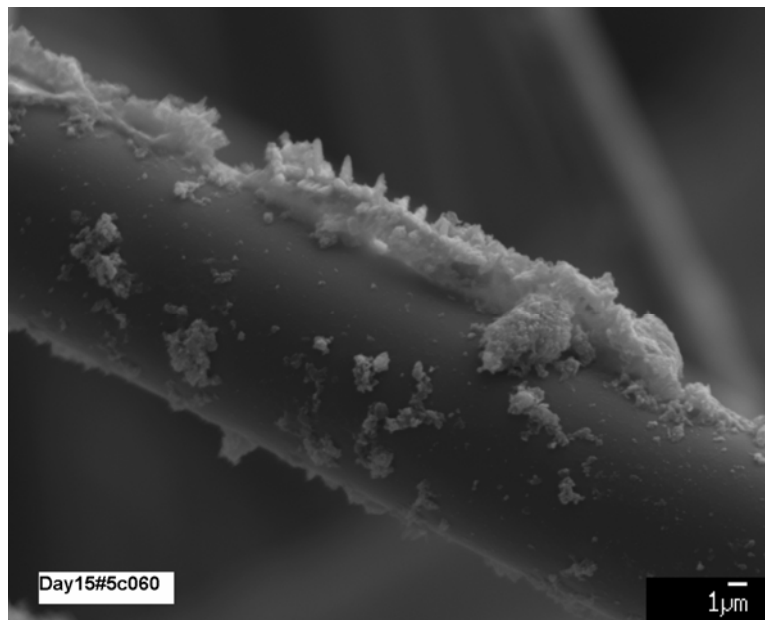
**Figure B-91. Day-15, sample #5C SEM image (#5C057) magnified 40 times on fiberglass.**



**Figure B-92. Day-15, sample #5C SEM image (#5C058) magnified 500 times on fiberglass in the same area as in Figure B-91.**



**Figure B-93.** Day-15, sample #5C SEM image (#5C059) magnified 1000 times on fiberglass in the different area, as shown in Figure B-91.



**Figure B-94.** Day-15, sample #5C SEM image (#5C060) magnified 3000 times of deposits on the fiberglass.

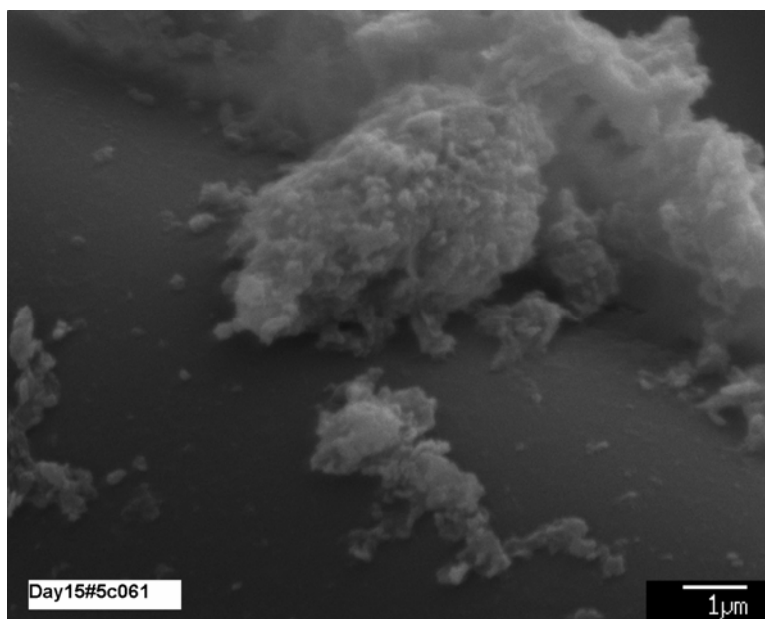


Figure B-95. Day-15, sample #5C SEM image (#5C061) magnified 10,000 times on close-up of the fluffy material on fiberglass.

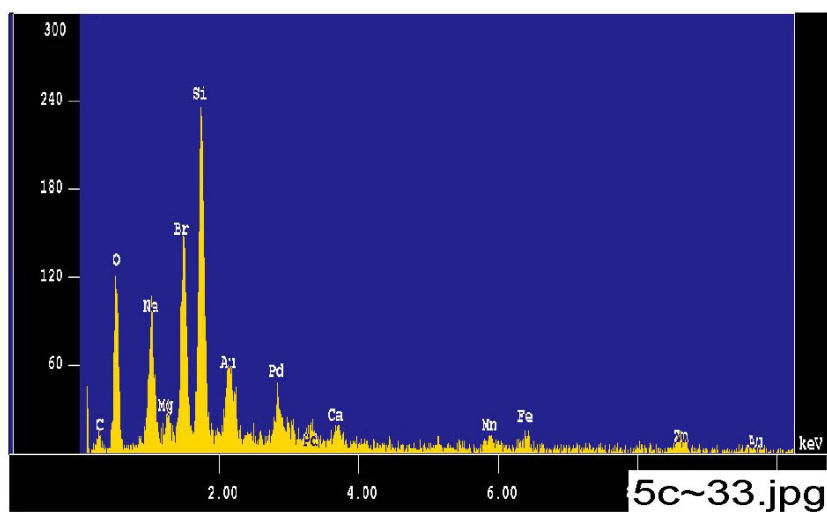
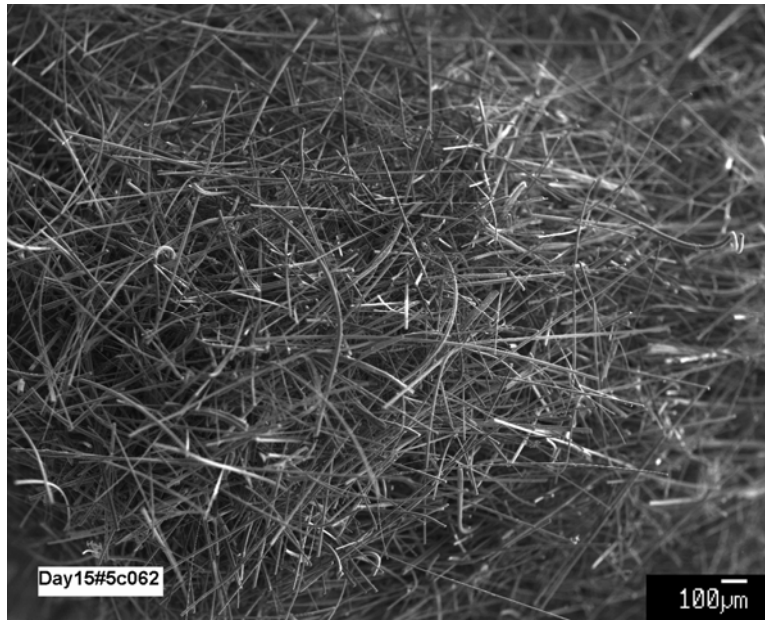
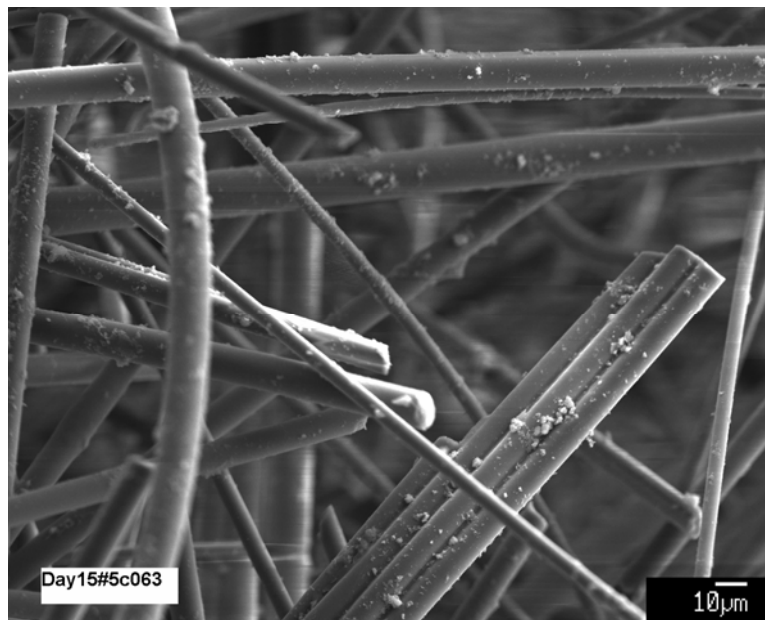


Figure B-96. Day-15, sample #5C counting spectrum (EDS 5C-33) for the fluffy material on fiberglass, as shown in Figure B-95 (Br peak may be mislabeled).



**Figure B-97.** Day-15, sample #5C SEM image (#5C062) magnified 40 times on fiberglass in the same area of the sample.



**Figure B-98.** Day-15, sample #5C SEM image (#5C063) magnified 500 times on close-up of the fiberglass, as shown in Figure B-97.



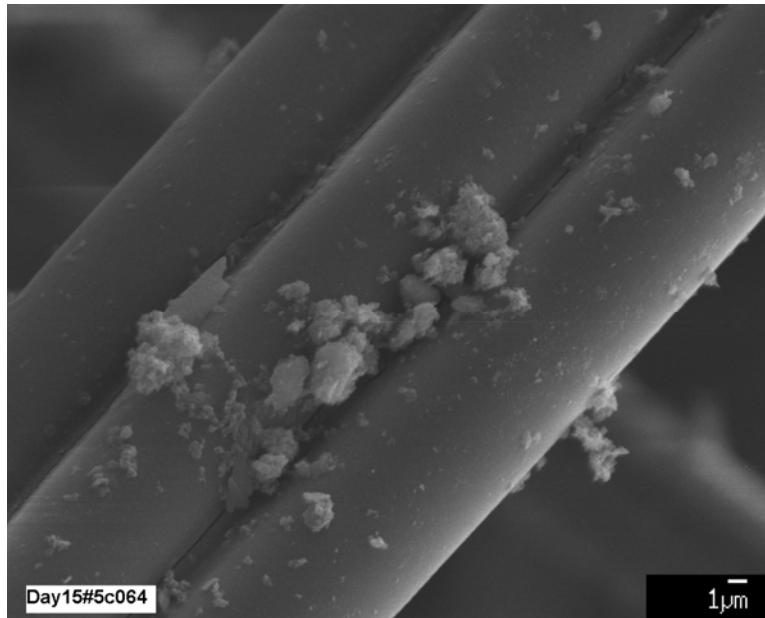


Figure B-99. Day-15, sample #5C SEM image (#5C064) magnified 3000 times on close-up of particles on the fiberglass, as shown in Figure B-98.

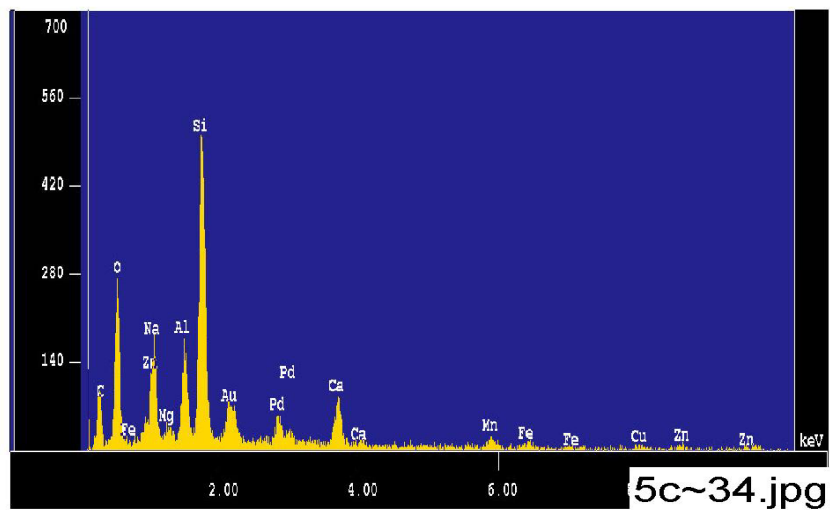


Figure B-100. Day-15, sample #5C counting spectrum (EDS 5C-34) for the pile of particles at left side of SEM image #5C064, as shown in Figure B-99.

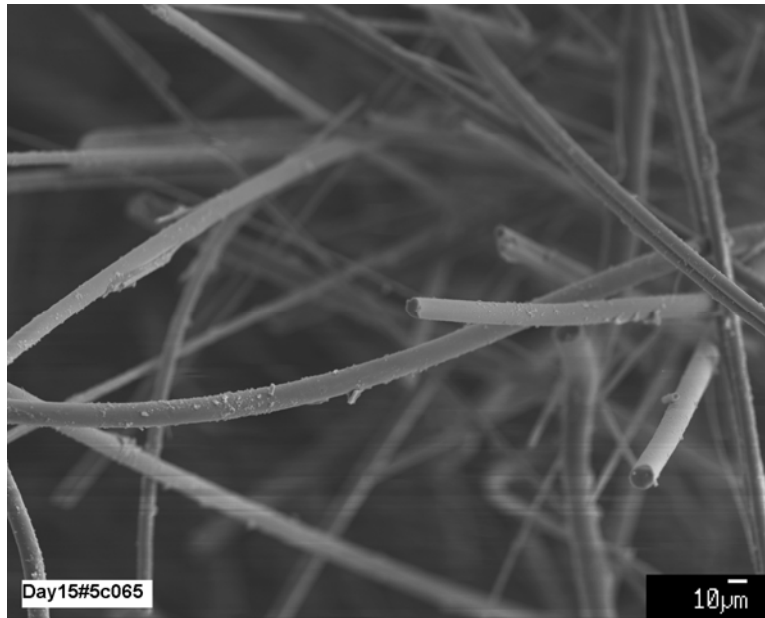


Figure B-101. Day-15, sample #5C SEM image (#5C065) magnified 300 times on fiberglass in a new area of the sample.

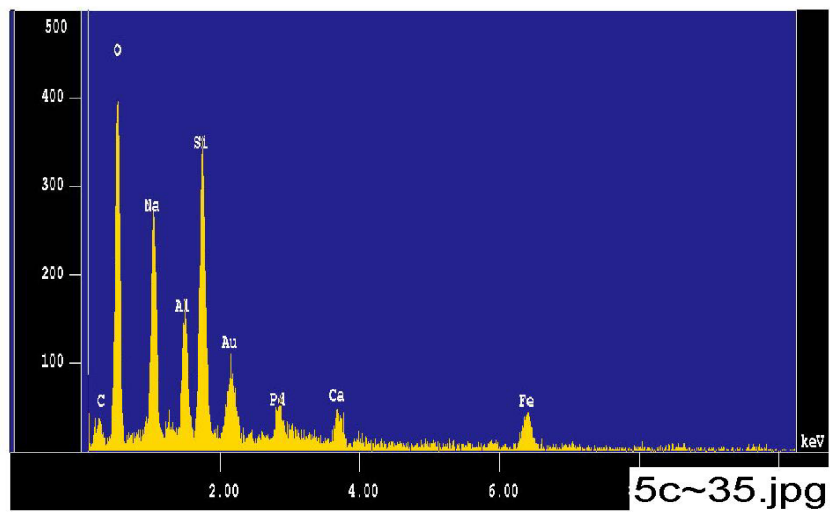


Figure B-102. Day-15, sample #5C counting spectrum (EDS 5C-35) for deposits on the fiberglass, as shown in Figure B-101.