

## Appendix C3

### ESEM Data for Test #5, Day-30 Fiberglass in High-Flow Zones

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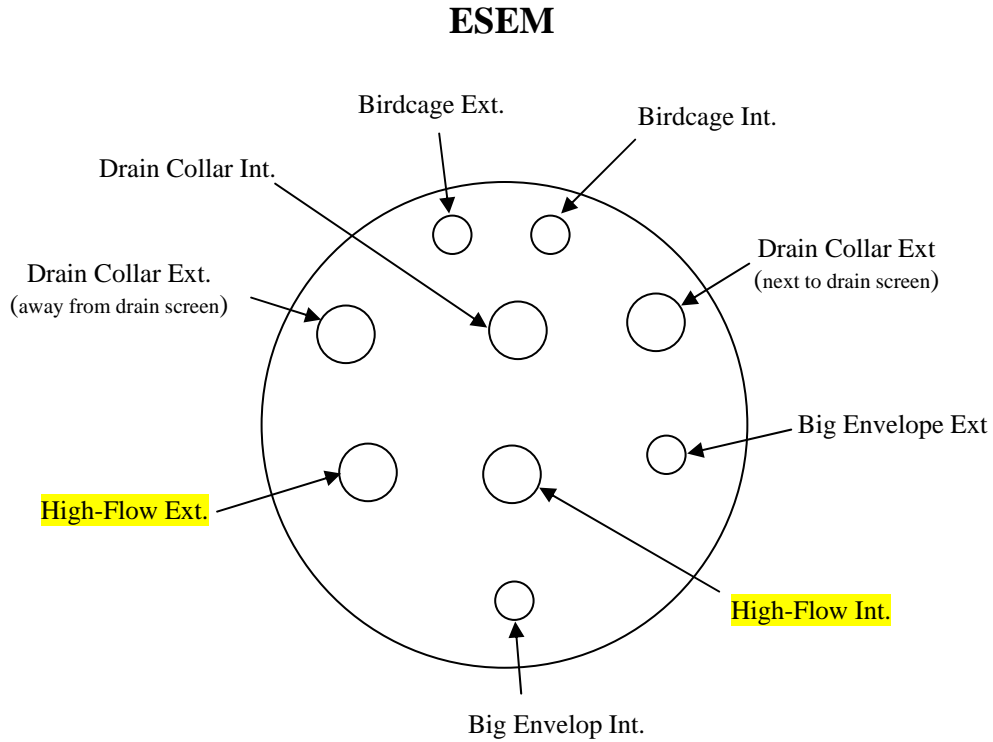
This appendix presents the fiberglass samples submerged in a high-flow zone, which were extracted on the date Test #5 was shut down (August 25, 2005). Both exterior and interior locations of the fiberglass samples were examined. ESEM was used to analyze the hydrated fiberglass samples under a low-vacuum condition (i.e., 80 Pa) and without any coating. This examination approach minimizes the modification of the fiberglass samples that can occur if samples are dried. The results of Test #5, Day-30 high-flow fiberglass samples were obtained on August 26, 2005.

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## Transcribed Laboratory Log

Laboratory session from August 26, 2005.

Test #5, Day-30 High-Flow Fiberglass

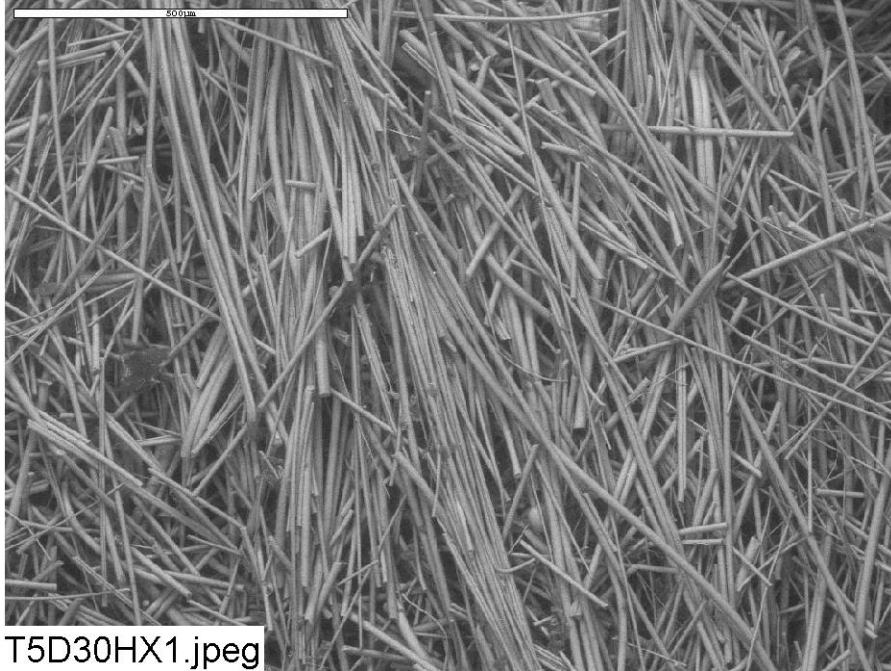


### Exterior High-Flow Fiberglass

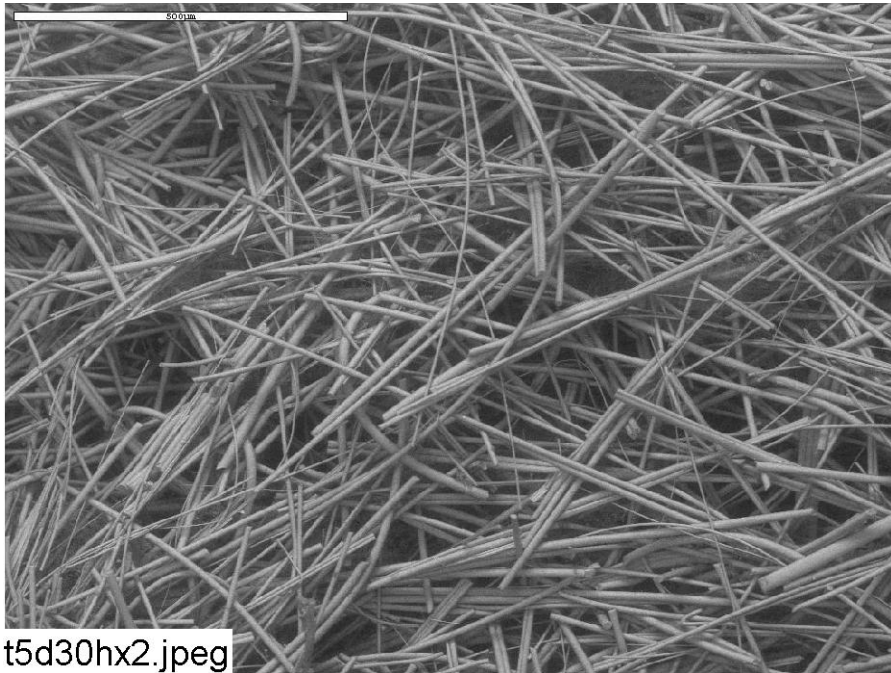
Image: T5D30HX1	100 ×	ESEM image	Figure C3-1
t5d30hx2	100 ×	ESEM image	Figure C3-2
t5d30hx3	500 ×	ESEM image higher magnification	Figure C3-3

### **Interior High-Flow Fiberglass**

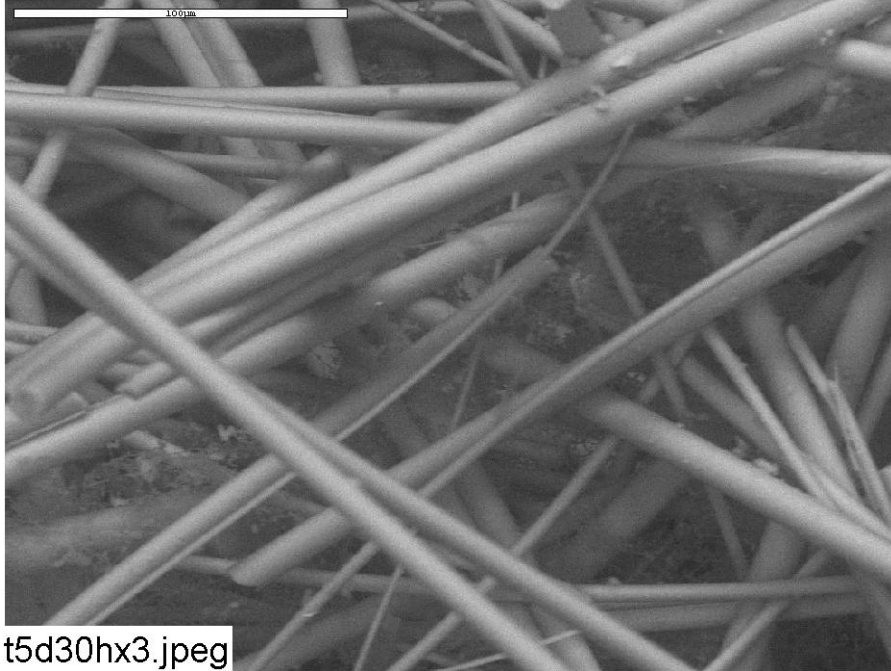
Image: T5D30HI4	100 ×	ESEM image	Figure C3-4
t5d30hi5	100 ×	ESEM image	Figure C3-5
t5d30hi6	500 ×	ESEM image higher magnification	Figure C3-6



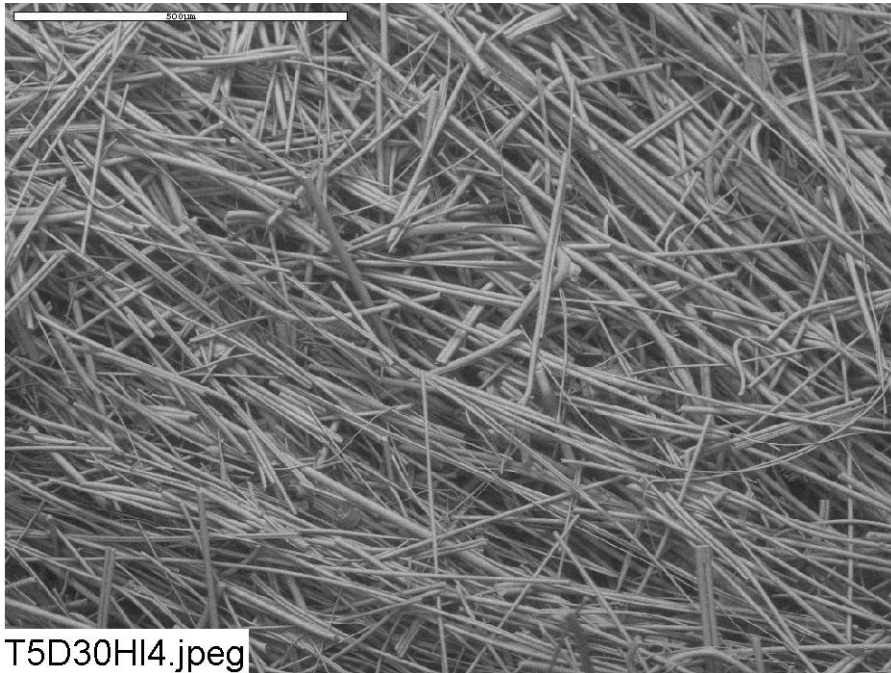
**Figure C3-1.** ESEM image magnified 100 times for a Test #5, Day-30 high-flow exterior fiberglass sample. (T5D30HX1.jpeg)



**Figure C3-2.** ESEM image magnified 100 times for a Test #5, Day-30 high-flow exterior fiberglass sample. (t5d30hx2.jpeg)

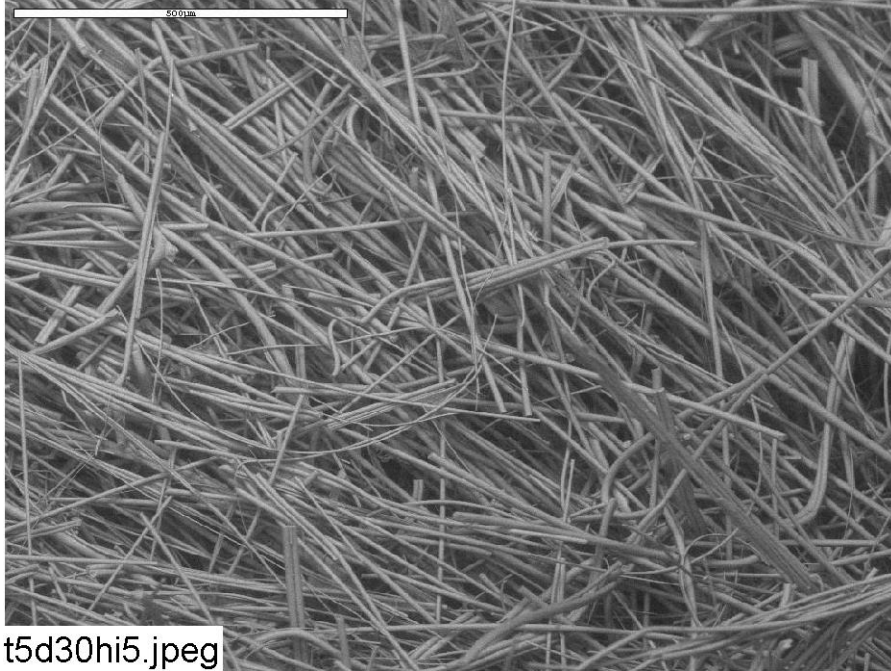


**Figure C3-3.** ESEM image magnified 500 times for a Test #5, Day-30 high-flow exterior fiberglass sample. (t5d30hx3.jpeg)

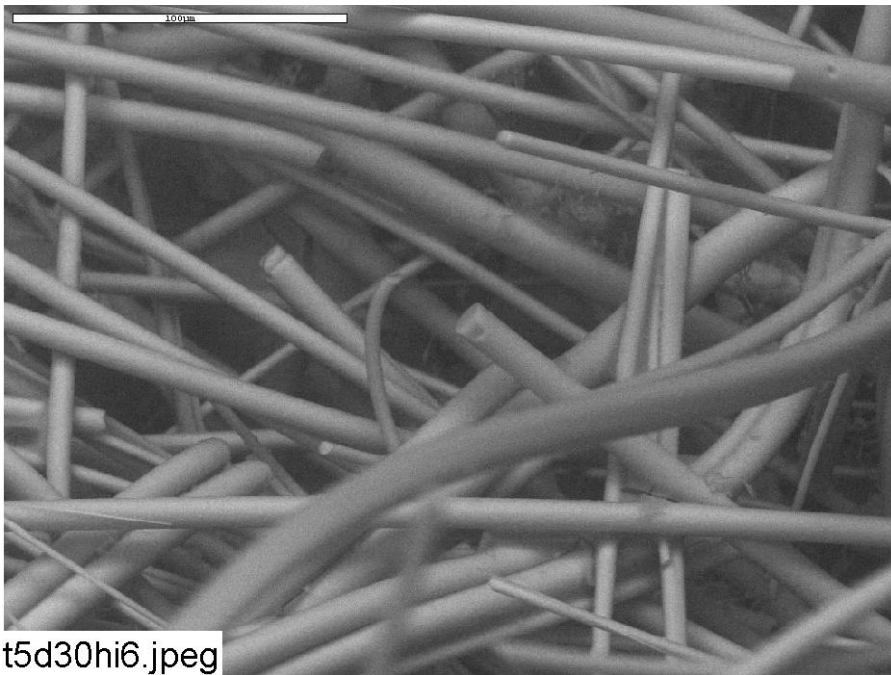


**Figure C3-4.** ESEM image magnified 100 times for a Test #5, Day-30 high-flow interior fiberglass sample. (T5D30HI4.jpeg)





**Figure C3-5. ESEM image magnified 100 times for a Test #5, Day-30 high-flow interior fiberglass sample. (t5d30hi5.jpeg)**



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## Appendix C4

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This appendix presents the results of the examinations performed on the high-flow fiberglass samples located in front of a test tank flow header. These samples were extracted on the date Test #5 was shut down (August 25, 2005). The samples were put in the tank on Day 6 of Test #5 (August 1, 2005). Both exterior and interior locations of the fiberglass samples were examined. ESEM was used to analyze the hydrated fiberglass samples under a low-vacuum condition (i.e., 80 Pa) and without any coating. This examination approach minimizes the modification of the fiberglass samples that can occur if samples are dried. The results of Test #5, Day-30 high-flow fiberglass samples were obtained on August 25, 2005.

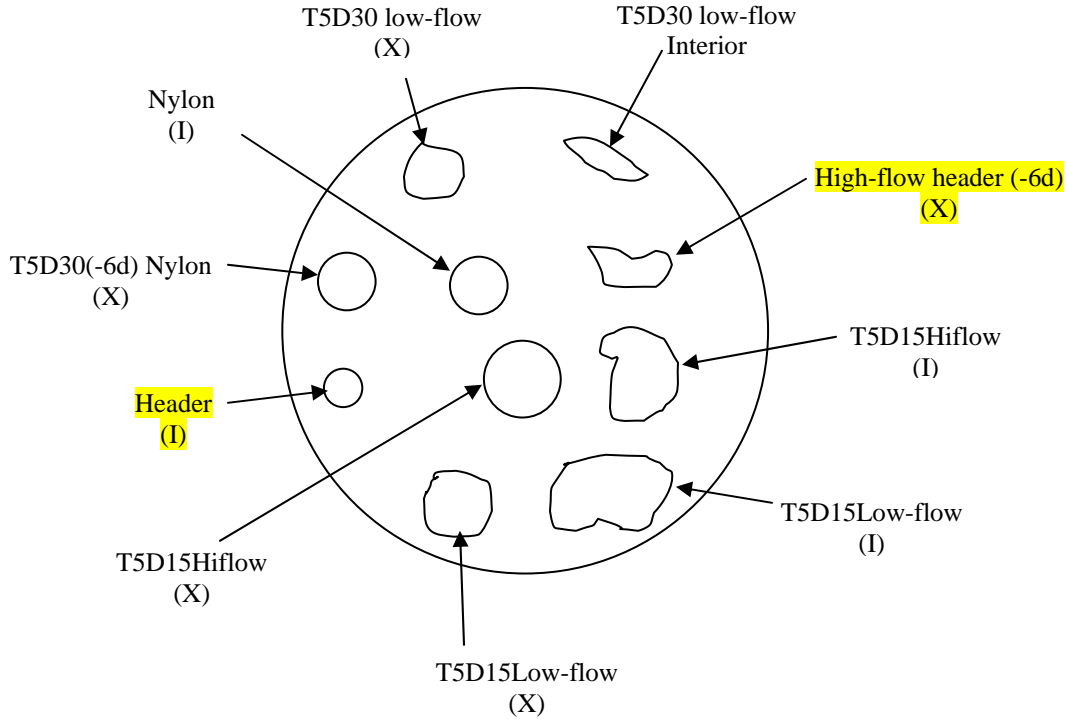
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## Transcribed Laboratory Log

Laboratory session from August 25, 2005.

Test #5, Day-30 Fiberglass in Front of Header in High Flow

### ESEM



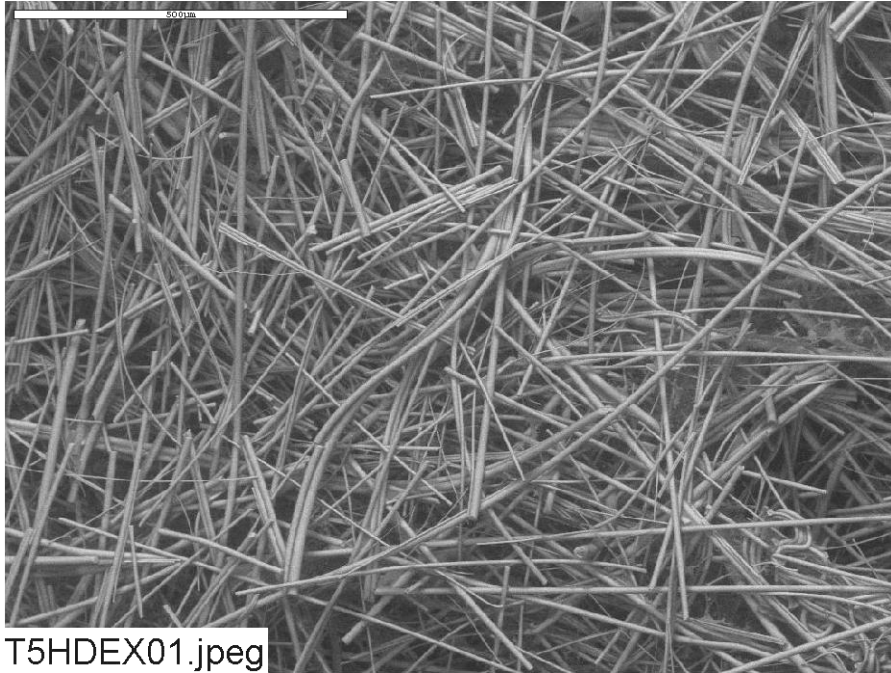
### High-Flow Header (-6-Day) Exterior

Image: T5HDEX01	100 ×	ESEM image	Figure C4-1
t5hdex02	100 ×	ESEM image	Figure C4-2
t5hdex03	500 ×	ESEM image higher magnification	Figure C4-3

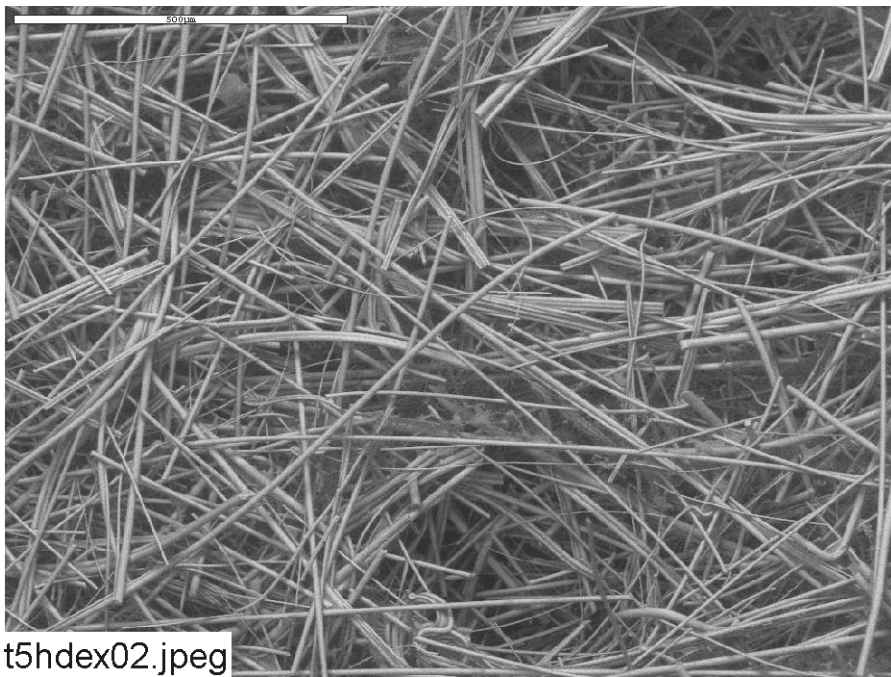
### High-Flow Header (-6-Day) Interior

Image: t5hdin04	100 ×	ESEM image of fiberglass	Figure C4-4
t5hdin05	500 ×	ESEM image higher magnification	Figure C4-5

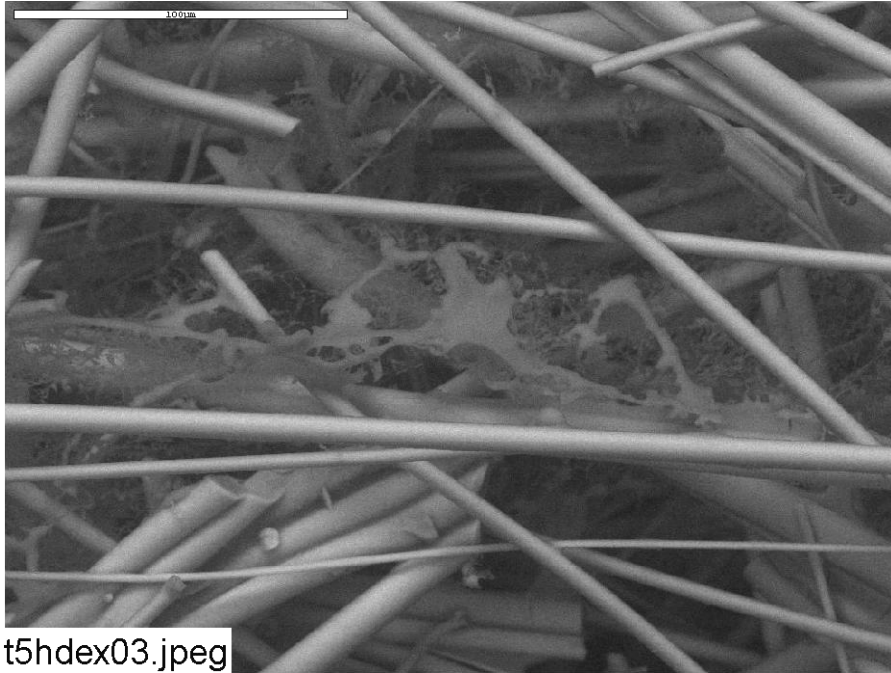




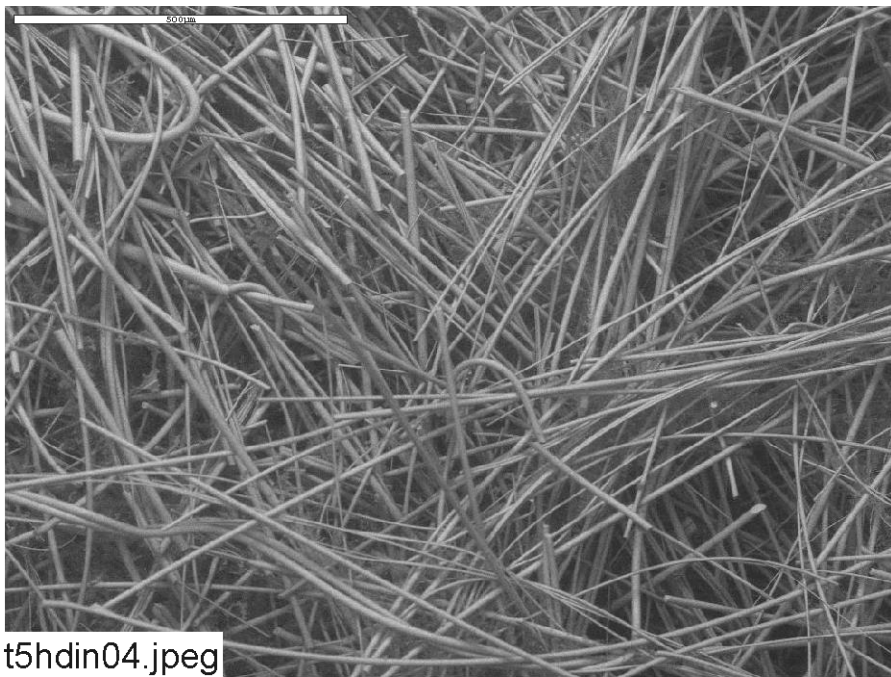
**Figure C4-1.** ESEM image magnified 100 times for a Test #5, Day-30 high-flow exterior fiberglass sample in front of the header. The sample was put in the tank on Day 6. (T5HDEX01.jpeg)



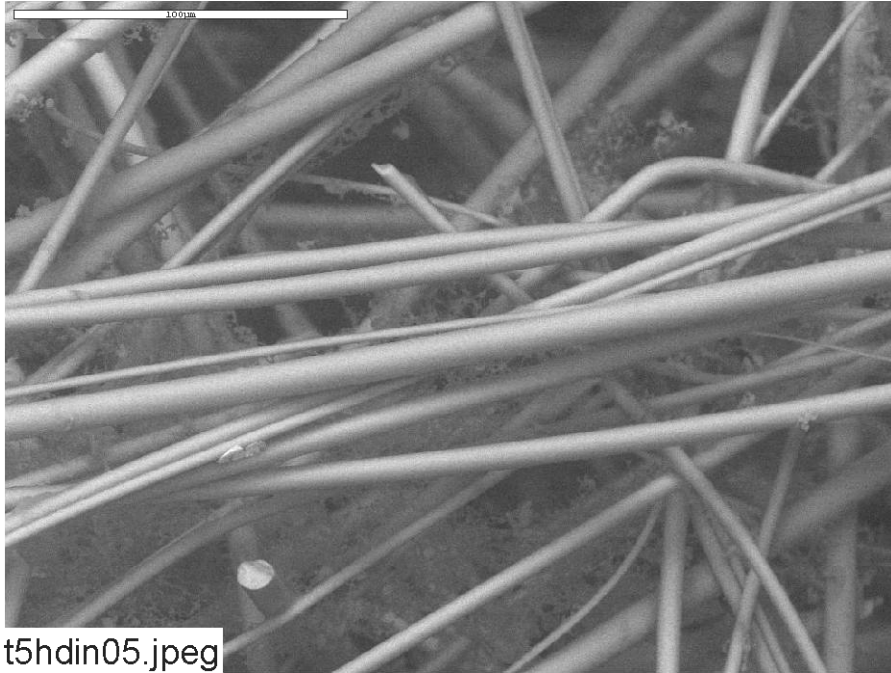
**Figure C4-2.** ESEM image magnified 100 times for a Test #5, Day-30 high-flow exterior fiberglass sample in front of the header. The sample was put in the tank on Day 6. (t5hdex02.jpeg)



**Figure C4-3.** ESEM image magnified 500 times for a Test #5, Day-30 high-flow exterior fiberglass sample in front of the header. The sample was put in the tank on Day 6. (t5hdex03.jpeg)



**Figure C4-4.** ESEM image magnified 100 times for a Test #5, Day-30 high-flow interior fiberglass sample in front of the header. The sample was put in the tank on Day 6. (t5hdin04.jpeg)



**Figure C4-5.** ESEM image magnified 500 times for a Test #5, Day-30 high-flow interior fiberglass sample in front of the header. The sample was put in the tank on Day 6. (t5hdin05.jpeg)

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## Appendix C5

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This appendix presents the ESEM results on fiberglass samples inserted in a nylon mesh submerged in a low-flow zone in the test tank. The purpose of using a nylon mesh is to see if the mesh material (i.e., stainless steel or nylon) affects the deposits on fiberglass samples. The samples were put in the tank on Day 6 (August 1, 2005). The fiberglass samples were extracted on August 25, 2005, the date Test #5 was shut down. Both exterior and interior locations of the fiberglass samples were examined. ESEM was used to analyze the wet fiberglass samples without any coating and under a low-vacuum condition (i.e., 80 Pa). This examination approach minimizes the modification of the fiberglass samples that can occur if samples are dried. The results of Test #5, Day-30 low-flow fiberglass samples in a nylon mesh were obtained on August 25, 2005.

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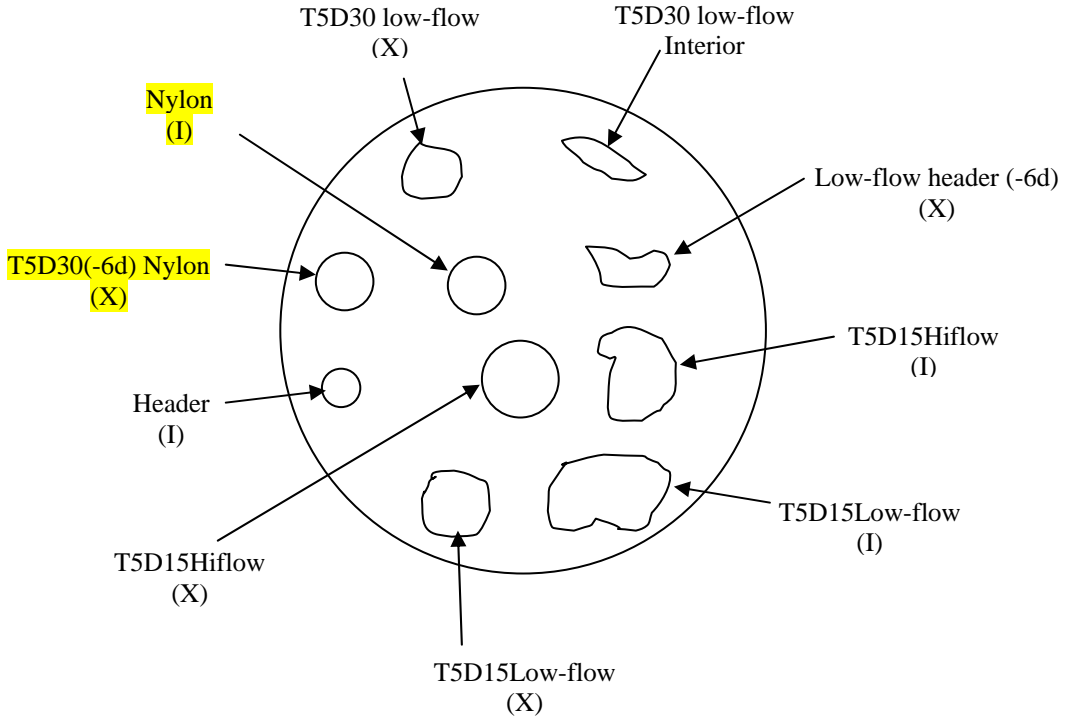


# Transcribed Laboratory Log

Laboratory session from August 25, 2005.

Test #5, Day-30 Nylon Mesh in Low-Flow Zones

## ESEM



### Nylon Low-Flow Exterior (-6 days)

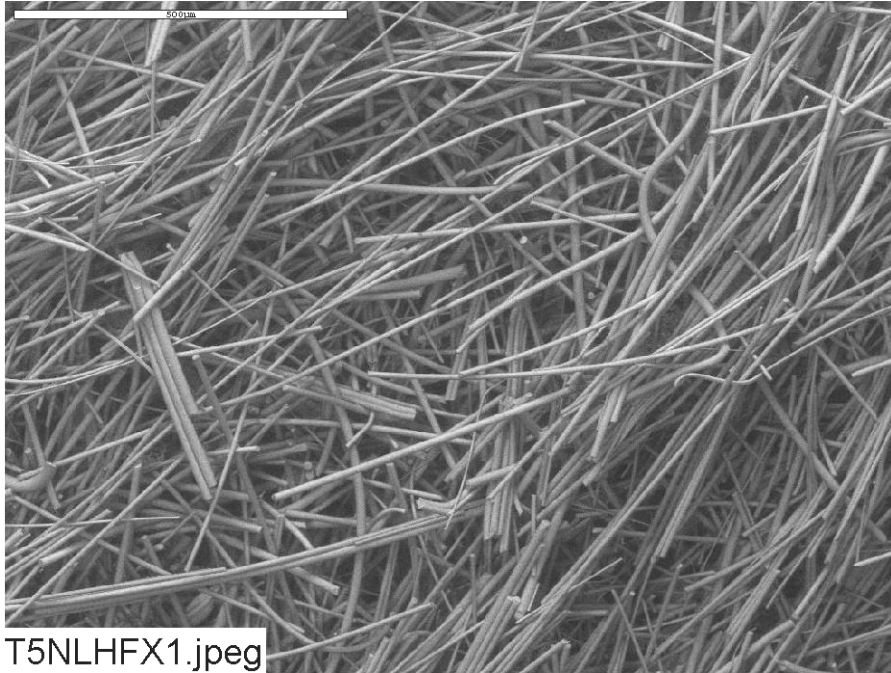
Image: T5NLHFX1      100 ×      ESEM image  
t5nlhfx1      500 ×      ESEM image

Figure C5-1

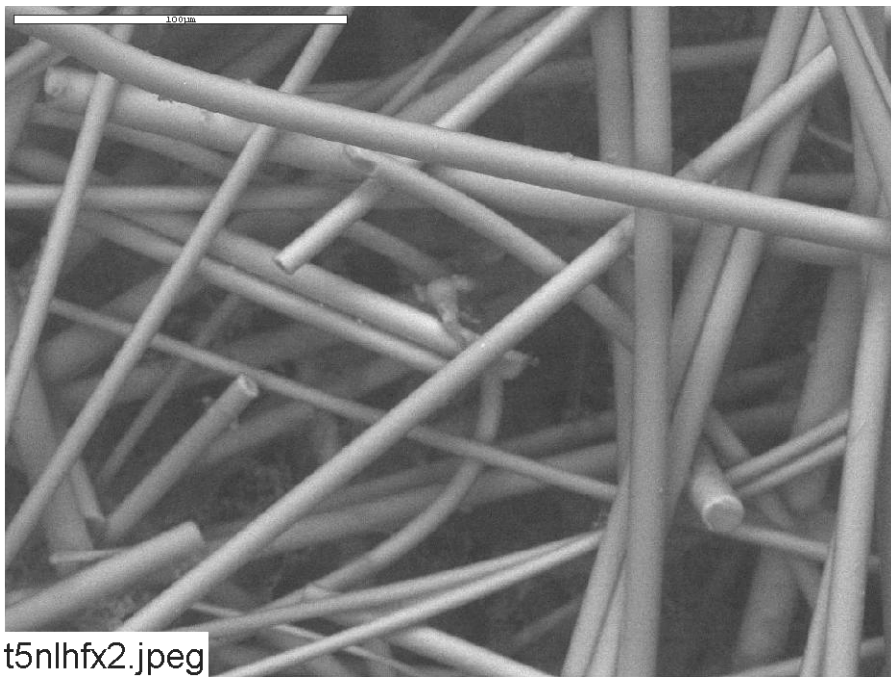
Figure C5-2

**Nylon Low-Flow Interior (-6 days)**

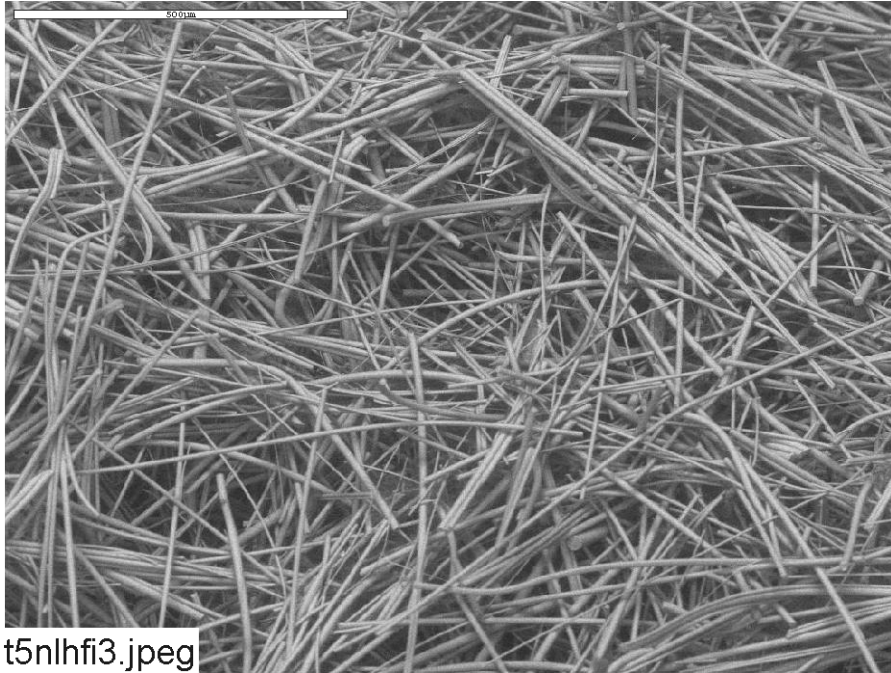
Image:	t5nlhfi3	100 ×	ESEM image of fiberglass	Figure C5-3
	t5nlhfi4	500 ×	ESEM image higher magnification	Figure C5-4
EDS	t5nlhfi5		EDS on floc in image t5nlhfi4	Figure C5-5



**Figure C5-1.** ESEM image magnified 100 times for a Test #5, Day-30 low-flow exterior fiberglass sample in a nylon mesh. The sample was put in the tank on Day 6. (T5NLHFX1.jpeg)

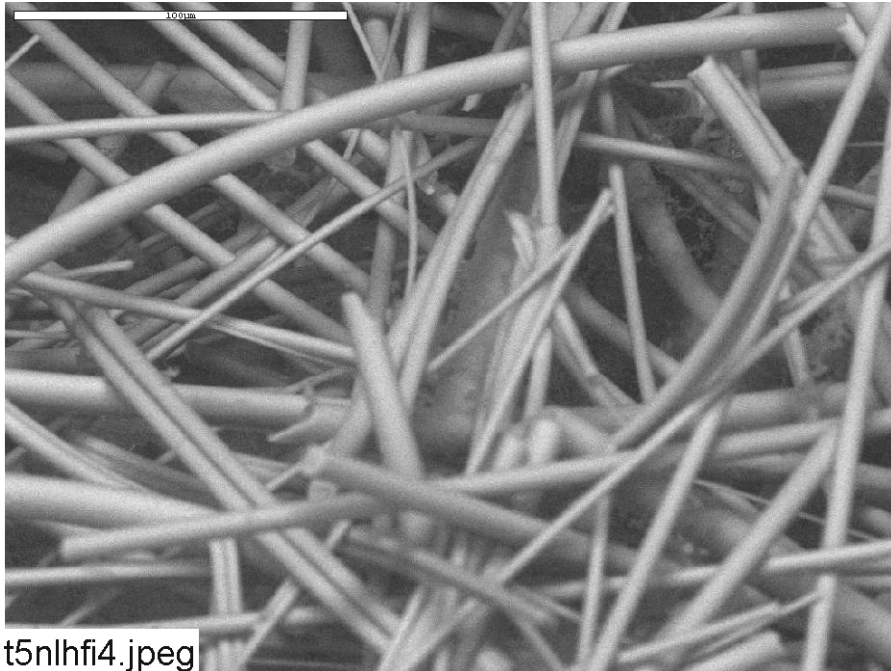


**Figure C5-2.** ESEM image magnified 500 times for a Test #5, Day-30 low-flow exterior fiberglass sample in a nylon mesh. The sample was put in the tank on Day 6. (t5nlhfx2.jpeg)



t5nlhfi3.jpeg

**Figure C5-3.** ESEM image magnified 100 times for a Test #5, Day-30 low-flow interior fiberglass sample in a nylon mesh. The sample was put in the tank on Day 6. (t5nlhfi3.jpeg)



t5nlhfi4.jpeg

**Figure C5-4.** ESEM image magnified 500 times for a Test #5, Day-30 low-flow interior fiberglass sample in a nylon mesh. The sample was put in the tank on Day 6. (t5nlhfi4.jpeg)

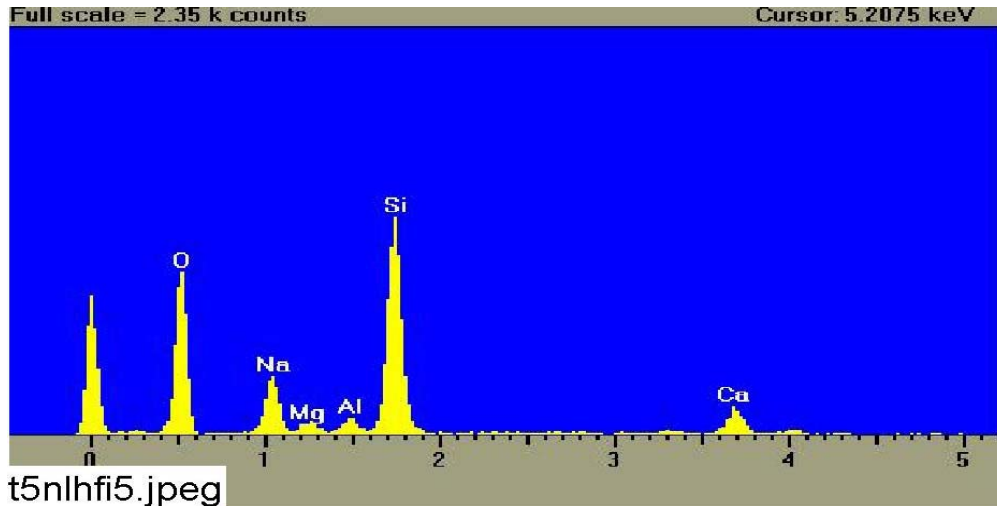


Figure C5-5. EDS counting spectrum for the deposits between the fibers shown in Figure C5-4. (t5nlhfi5.jpeg)

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## Appendix C6

# ESEM/EDS and SEM Data for Test #5, Day-30 Drain Collar Fiberglass

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Table C6-2. Chemical Compositions for T5D30fiber floc17.jpg, Figure C6-16 .... C6-14



In this appendix, the fiberglass samples within the drain collar were extracted on the date Test #5 was shut down (August 25, 2005). The fiberglass samples located at the exterior farthest from the drain screen, the exterior next to the drain screen, and the interior were examined. ESEM was used to analyze the wet fiberglass samples under a low-vacuum condition (i.e., 80 Pa) and without any coating. In addition to ESEM analysis, the samples were totally dried and coated with Au/Pd for probe SEM examination. ESEM/EDS results of the Test #5, Day-30 drain collar fiberglass samples were obtained on August 26, 2005, and probe SEM/EDS results were obtained on August 30, 2005, and September 6, 2005. EDS results provide a semi-quantitative elemental composition analysis of the debris attached on fiberglass.

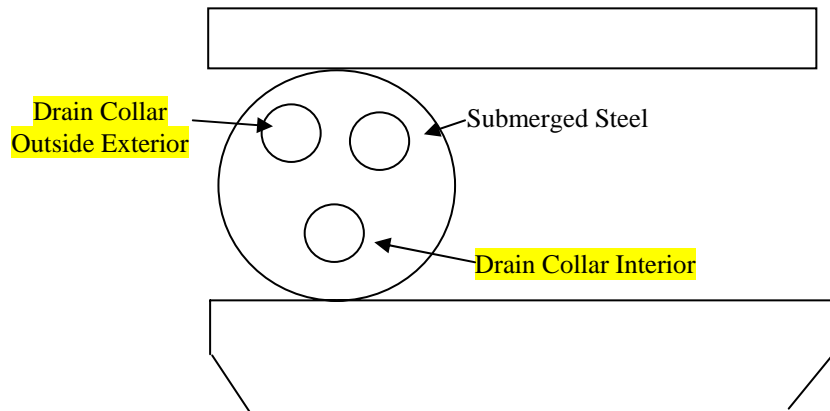
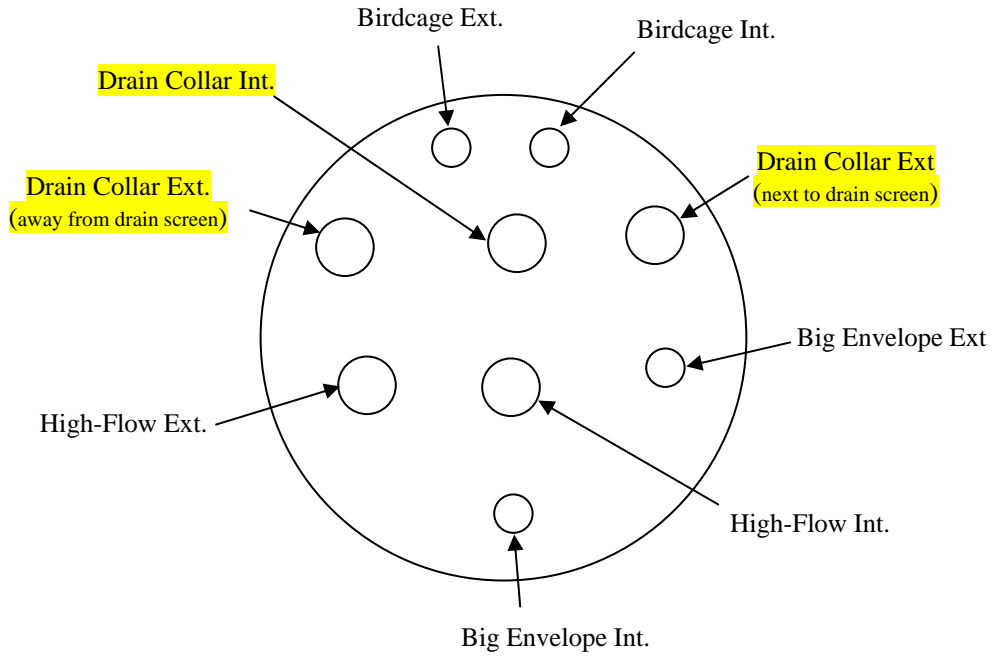
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# Transcribed Laboratory Log

Laboratory session from August 26, 2005.

Test #5, Day-30 Drain Collar Fiberglass

## ESEM



### **Drain Collar Exterior (away from the drain screen)**

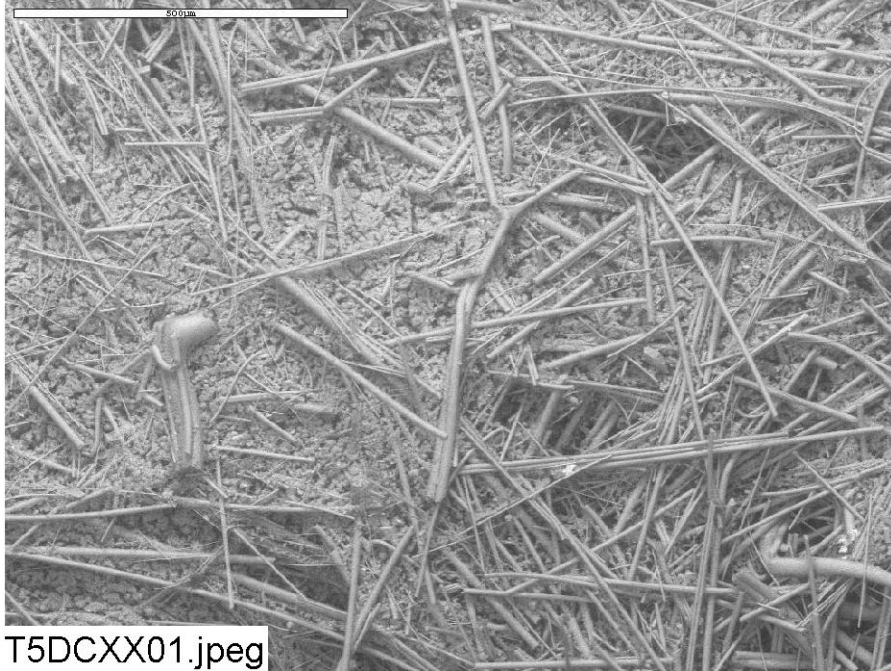
Image:	T5DCXX01	100 ×	ESEM image	Figure C6-1
	t5dcxx02	100 ×	ESEM image	Figure C6-2
	t5dcxx03	500 ×	Annotated ESEM image	Figure C6-3
EDS:	t5dcxx04		EDS on particles in t5dcxx03	Figure C6-4
	t5dcxx05		EDS on particles in t5dcxx03	Figure C6-5
	T5D30Draincollar Particle16		EDS on particles on exterior of drain collar	Figure C6-6

### **Drain Collar Exterior (next to the drain screen)**

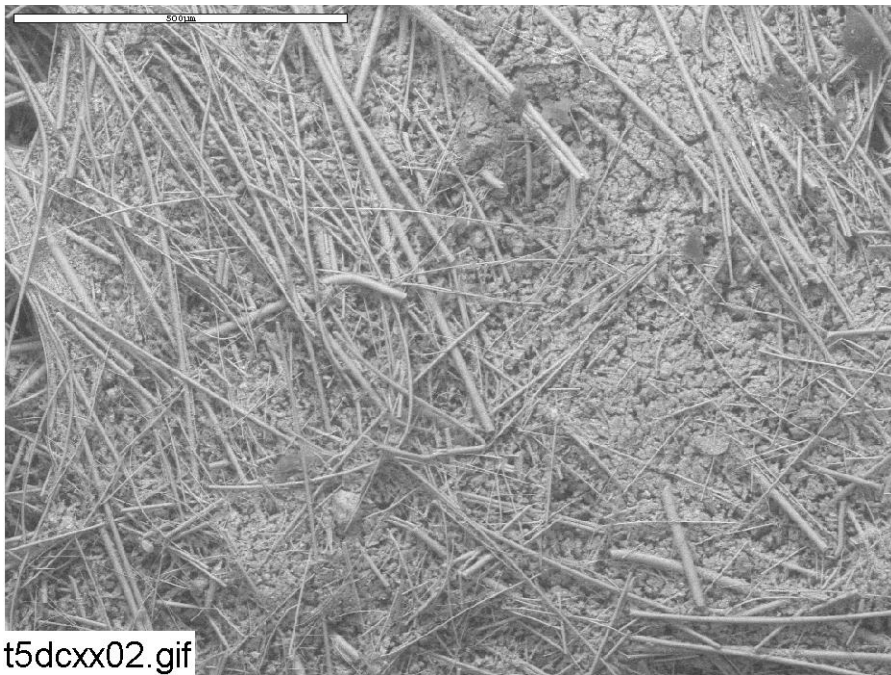
Image:	t5dcix01	100 ×	ESEM image	Figure C6-7
	t5dcix05	100 ×	ESEM image	Figure C6-8
	t5dcix02	100 ×	ESEM image higher magnification	Figure C6-9
	t5dcix03	500 ×	ESEM image high magnification	Figure C6-10
EDS:	t5dcix04		EDS on particles image t5dcix03	Figure C6-11

### **Drain Collar Interior**

Image:	t5dcii01	100 ×	ESEM image	Figure C6-12
	T5D30DraincollarInt027	200 ×	Probe SEM image	Figure C6-13
	t5dcii02	500 ×	ESEM image	Figure C6-14
	T5D30DraincollarInt026	1000 ×	Probe SEM image higher	Figure C6-15
EDS:	T5D30fiber flocc17		EDS on particles in t4dcix08	Figure C6-16



**Figure C6-1. ESEM image magnified 100 times for a Test #5, Day-30 exterior drain collar fiberglass sample farthest from the drain screen. (T5DCXX01.jpeg)**



**Figure C6-2. ESEM image magnified 100 times for a Test #5, Day-30 exterior drain collar fiberglass sample farthest from the drain screen. (t5dcxx02.gif)**

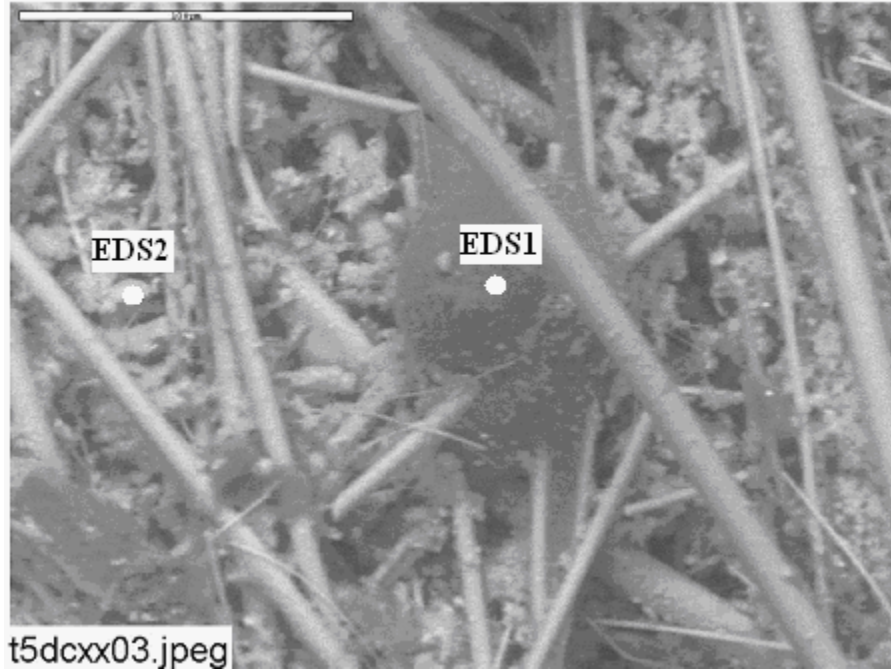


Figure C6-3. Annotated ESEM image magnified 500 times for a Test #5, Day-30 exterior drain collar fiberglass sample farthest from the drain screen. (t5dcxx03.jpeg)

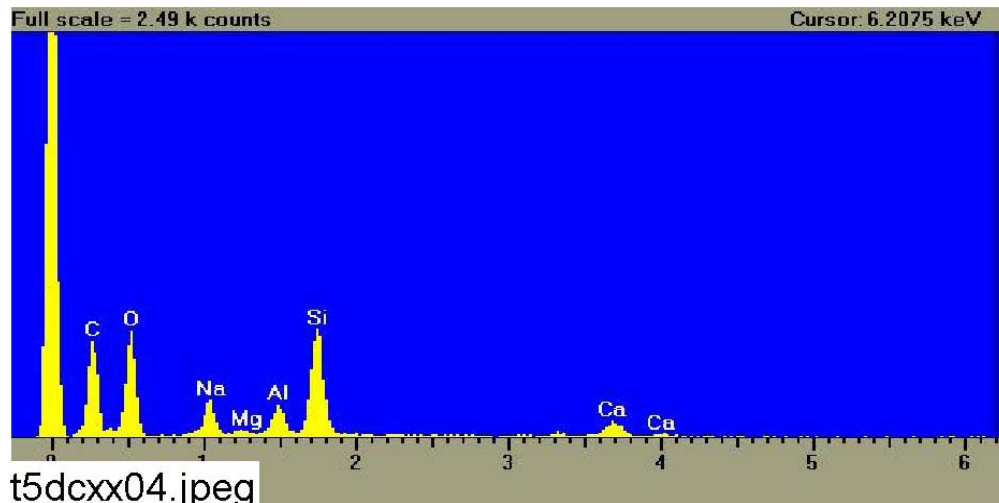


Figure C6-4. EDS counting spectrum for the dark deposits (EDS1) between fibers shown in Figure C6-3. (t5dcxx04.jpeg)

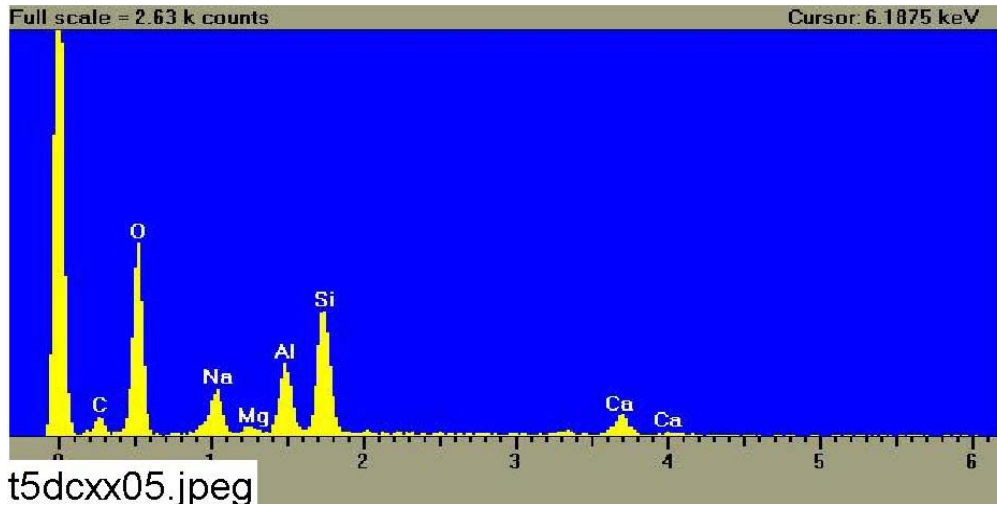


Figure C6-5. EDS counting spectrum for the small particulate deposits (EDS2) between fibers shown in Figure C6-3. (t5dcxx05.jpeg)

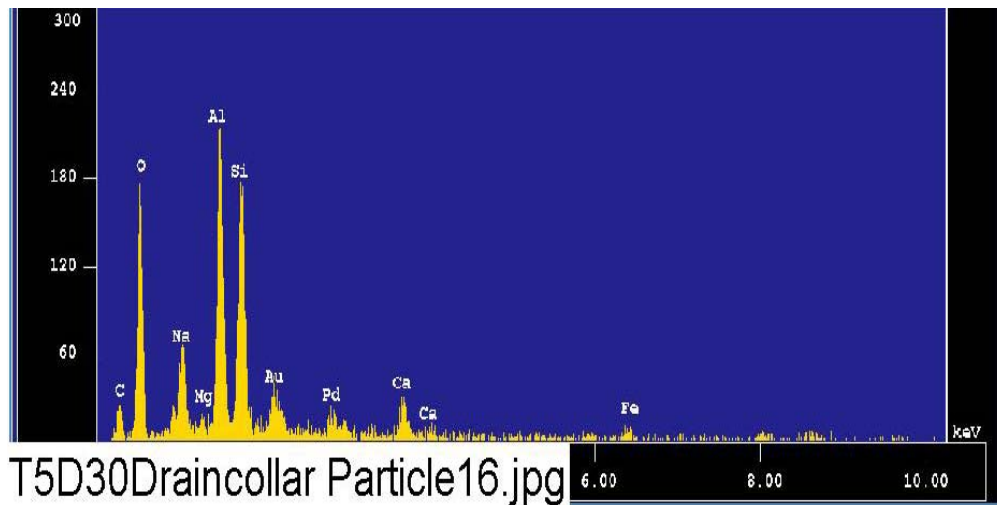


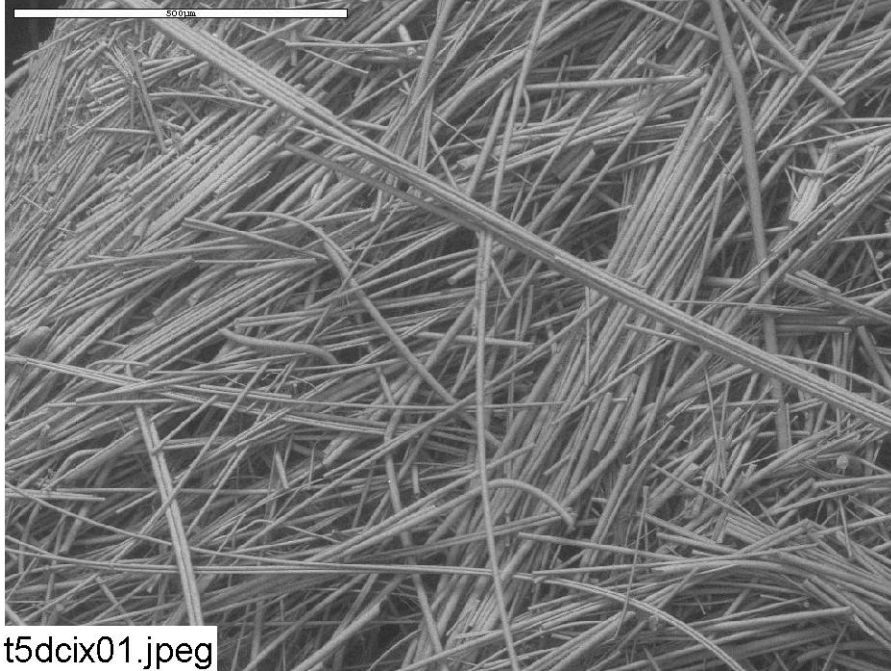
Figure C6-6. EDS counting spectrum by probe SEM for the small particulate deposits (EDS2) between fibers shown in Figure C6-3. (T5D30Draincollar Particle16.jpg)

The results from the chemical composition analysis for T5D30Draincollar Particle16.jpg are given in Table C6-1.

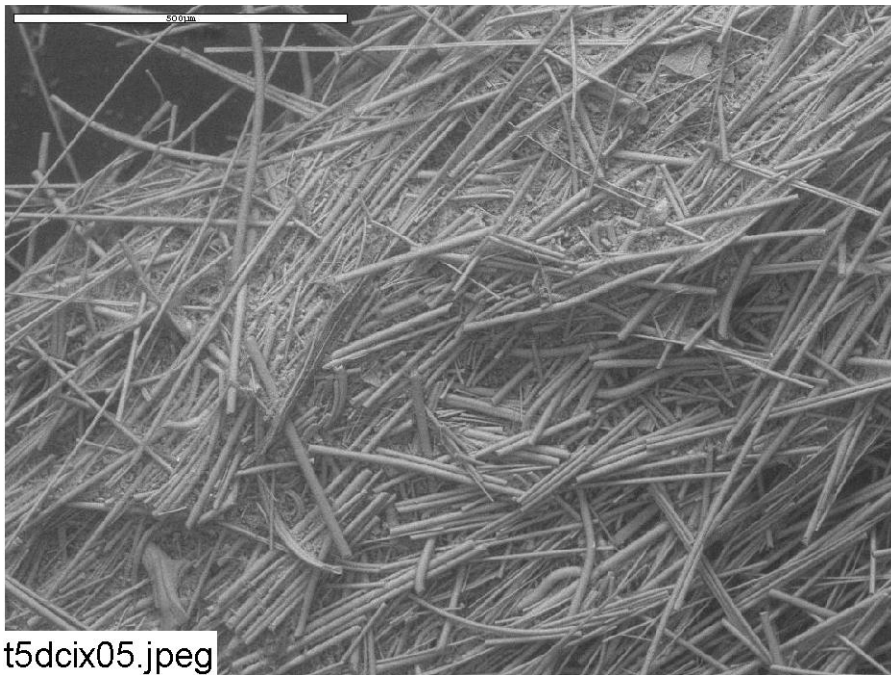
**Table C6-1. Chemical Compositions for T5D30Draincollar Particle16.jpg, Figure C6-6**

Group	: NRC						
Sample	: T5D30 ID# : 22						
Comment	: Particles on Drain collar out exterior						
Condition	: Full Scale : 20KeV(10eV/ch, 2Kch)						
	Live Time	: 72.190 sec		Aperture #	: 1		
	Acc. Volt	: 15.0 KV		Probe Current	: 1.003E-09 A		
	Stage Point	: X=76.455 Y=54.980 Z=11.000					
	Acq. Date	: Tue Aug 30 18:08:20 2005					
Element	Mode	ROI(KeV)	K-ratio(%)	+/-	Net/Background		
Na K	Normal	0.83- 1.28	0.3947	0.0041	351 /	16	
Al K	Normal	1.26- 1.78	1.2712	0.0008	1702 /	55	
Si K	Normal	1.50- 2.07	1.0873	0.0004	1598 /	110	
Ca K	Normal	3.40- 4.30	0.4688	0.0034	332 /	4	
Mg K	Normal	1.00- 1.53	0.1133	0.0002	85 /	66	
O K	Normal	0.31- 0.74	4.4301	0.0055	5013 /	7	
C K	Normal	0.11- 0.47	14.5489	0.0068	176 /	25	
Fe K	Normal	6.04- 7.40	0.4946	0.0012	158 /	2	
-----							
Chi_square = 2.8684							
Element	Mass%	Atomic%	ZAF	Z	A	F	
Na	2.761	1.9859	1.0916	0.9815	1.1113	1.0007	
Al	8.876	5.4401	1.0897	0.9899	1.1034	0.9977	
Si	8.579	5.0513	1.2314	0.9822	1.2538	0.9999	
Ca	2.914	1.2022	0.9700	0.9929	0.9778	0.9991	
Mg	1.039	0.7068	1.4318	0.9712	1.4778	0.9976	
O	42.666	44.1002	1.5030	0.9888	1.5200	1.0000	
C	29.326	40.3765	0.3146	0.9920	0.3171	1.0000	
Fe	3.840	1.1369	1.2115	1.2176	0.9950	1.0000	
-----							
Total	100.000	100.0000					
Normalization factor = 6.4077							

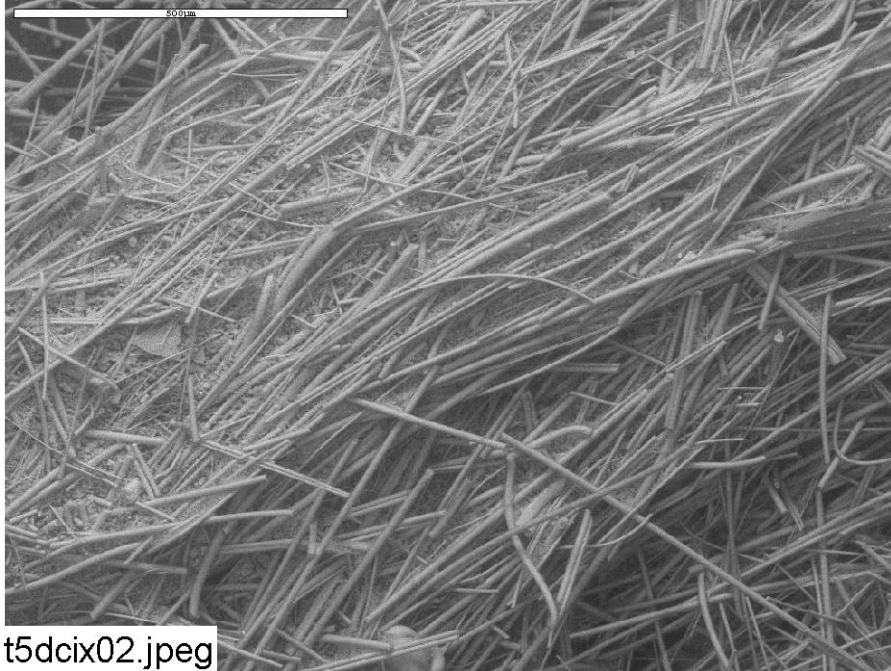




**Figure C6-7. ESEM image magnified 100 times for a Test #5, Day-30 exterior drain collar fiberglass sample next to the drain screen. (t5dcix01.jpeg)**

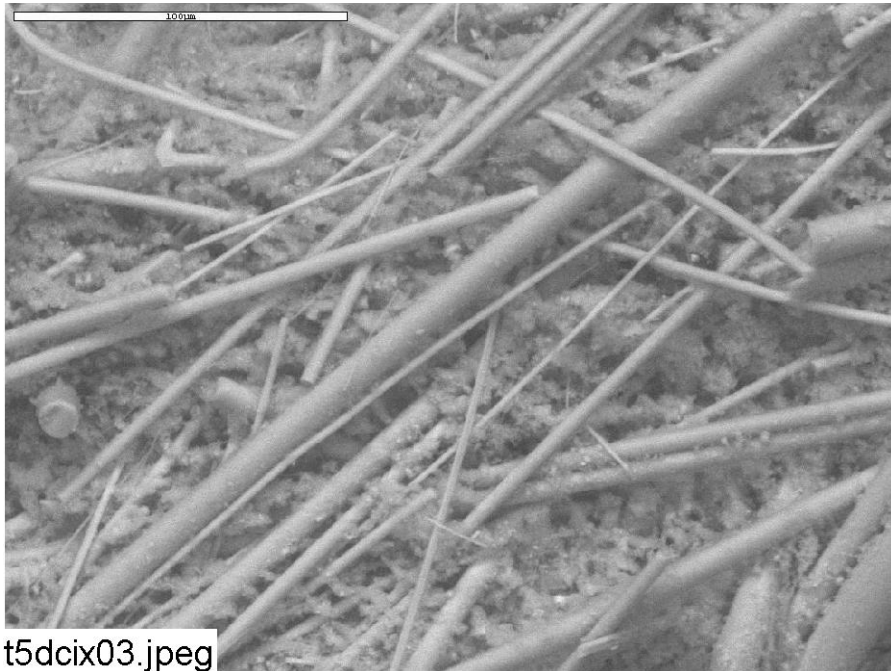


**Figure C6-8. ESEM image magnified 100 times for a Test #5, Day-30 exterior drain collar fiberglass sample next to the drain screen. (t5dcix05.jpeg)**



t5dcix02.jpeg

**Figure C6-9.** ESEM image magnified 100 times for a Test #5, Day-30 exterior drain collar fiberglass sample next to the drain screen. (t5dcix02.jpeg)



t5dcix03.jpeg

**Figure C6-10.** ESEM image magnified 500 times for a Test #5, Day-30 exterior drain collar fiberglass sample next to the drain screen. (t5dcix03.jpeg)

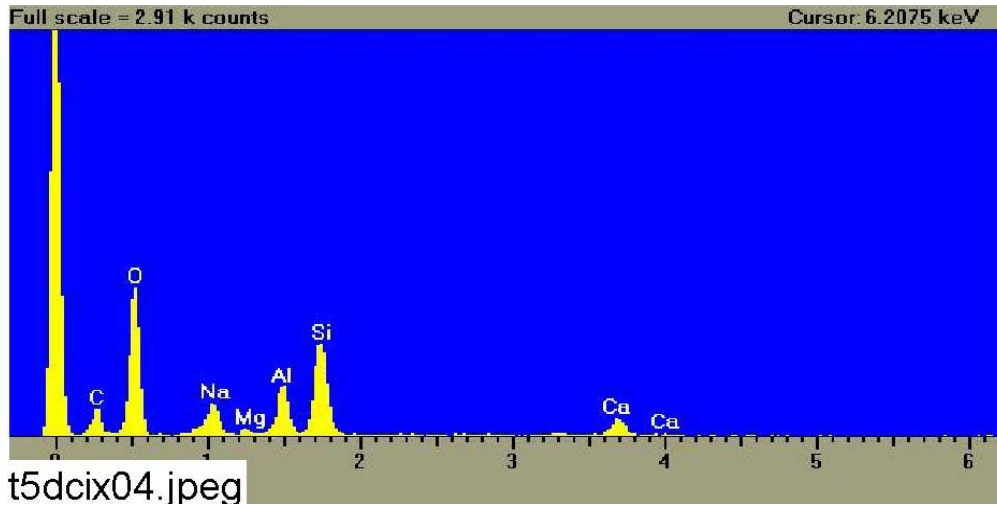


Figure C6-11. EDS counting spectrum for the particulate deposits between fibers shown in Figure C6-10. (t5dcix04.jpeg)

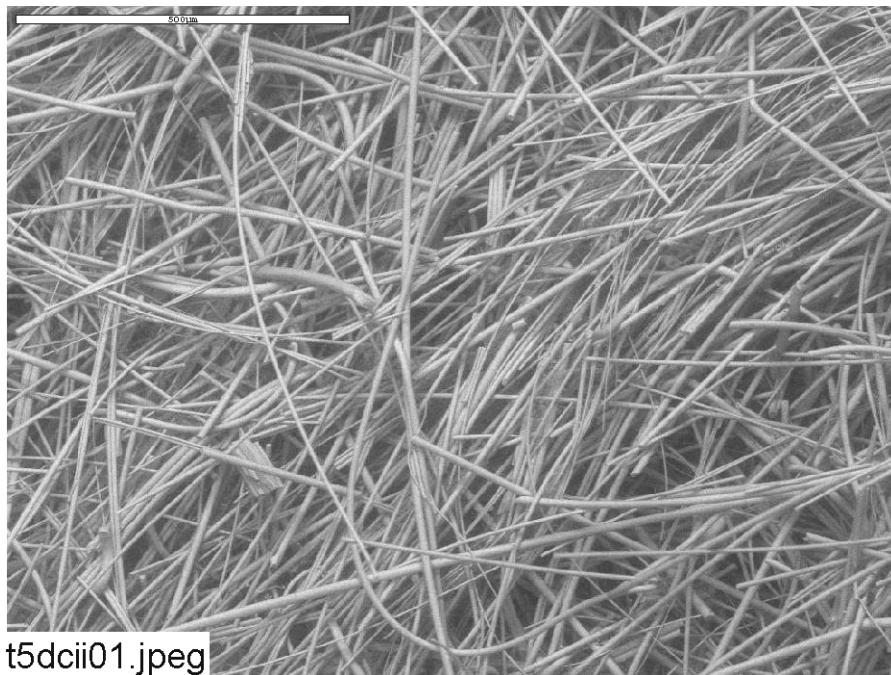
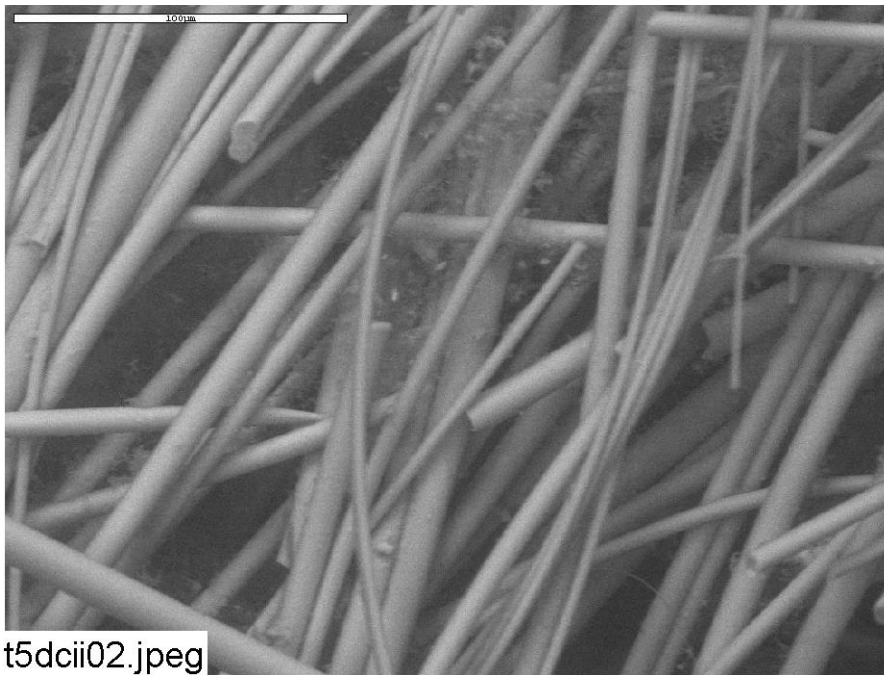


Figure C6-12. ESEM image magnified 100 times for a Test #5, Day-30 interior drain collar fiberglass sample. (t5dcii01.jpeg)



**Figure C6-13. Probe SEM image magnified 200 times for a Test #5, Day-30 interior drain collar fiberglass sample. (T5D30DraincollarInt027.bmp)**



**Figure C6-14. ESEM image magnified 500 times for a Test #5, Day-30 interior drain collar fiberglass sample. (t5dcii02.jpeg)**

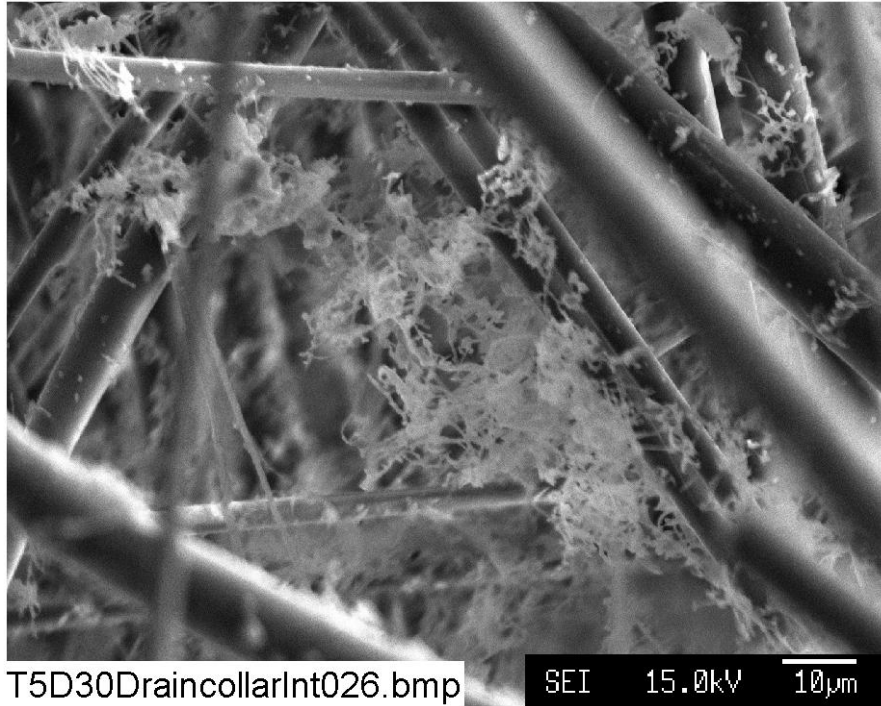


Figure C6-15. Probe SEM image magnified 1000 times for a Test #5, Day-30 interior drain collar fiberglass sample. (T5D30DraincollarInt026.bmp)

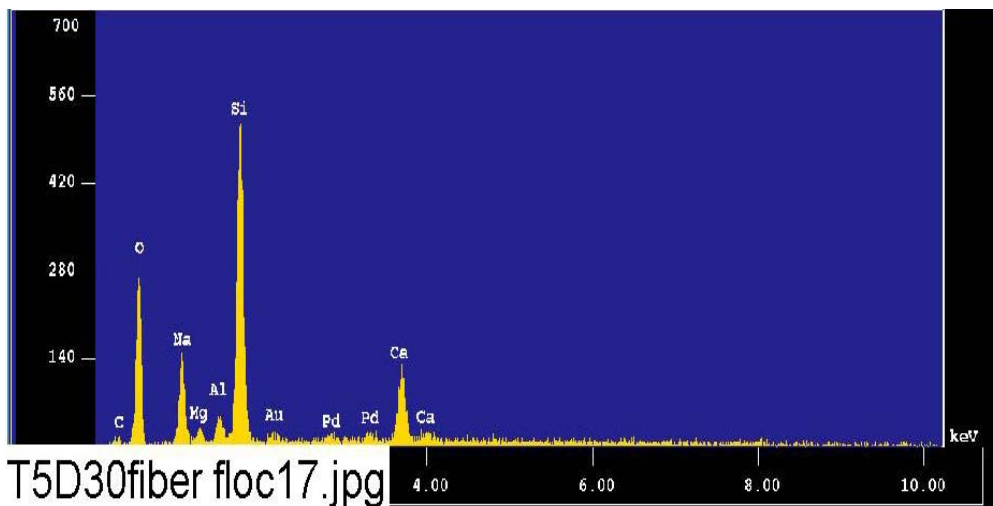


Figure C6-16. EDS counting spectrum by probe SEM for the flocculence deposits between fibers shown in Figure C6-15. (T5D30fiber flocc17.jpg)

The results from the chemical composition analysis for T5D30fiber floc17.jpg are given in Table C6-2.

**Table C6-2. Chemical Compositions for T5D30fiber floc17.jpg, Figure C6-16**

```

Group      : NRC
Sample     : T5D30 ID# : 23
Comment    : Floculence on draincollar interior
Condition  : Full Scale : 20KeV(10eV/ch,2Kch)
            Live Time  : 96.780 sec Aperture # : 1
            Acc. Volt  : 15.0 KV Probe Current : 1.003E-09 A
            Stage Point : X=76.455 Y=54.980 Z=11.000
            Acq. Date  : Tue Aug 30 18:19:56 2005
  
```

Element	Mode	ROI (KeV)	K-ratio(%)	+/-	Net/Background
Na K	Normal	0.83- 1.28	0.9051	0.0053	1078 / 18
Mg K	Normal	1.00- 1.53	0.1687	0.0003	171 / 53
Al K	Normal	1.26- 1.78	0.1798	0.0004	323 / 152
Si K	Normal	1.50- 2.07	2.4443	0.0007	4815 / 36
Ca K	Normal	3.40- 4.30	1.4547	0.0064	1380 / 14
O K	Normal	0.31- 0.74	5.4142	0.0068	8214 / 4
C K	Normal	0.11- 0.47	3.3646	0.0061	55 / 46

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Chi\_square = 3.5353

Element	Mass%	Atomic%	ZAF	Z	A	F
Na	6.733	5.4856	1.0942	0.9931	1.1011	1.0007
Mg	1.737	1.3379	1.5143	0.9825	1.5445	0.9979
Al	1.396	0.9688	1.1419	1.0012	1.1470	0.9944
Si	19.786	13.1947	1.1906	0.9932	1.1990	0.9998
Ca	9.803	4.5812	0.9912	1.0027	0.9884	1.0001
O	51.409	60.1836	1.3966	1.0008	1.3954	1.0000
C	9.137	14.2483	0.3994	1.0042	0.3978	0.9999

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Total 100.000 100.0000  
 Normalization factor = 6.7987