

Appendix C3

ESEM/EDS Data for Test #3, Day-30 Drain Collar Fiberglass

Figures

- Figure C3-1. ESEM image magnified 100 times for a Test #3, Day-30 exterior fiberglass sample on the drain collar (adjacent to the drain screen). (t3DCSC16)..... C3-4
- Figure C3-2. ESEM image magnified 1000 times for a Test #3, Day-30 exterior fiberglass sample on the drain collar (adjacent to the drain screen). (t3dcsc17)..... C3-4
- Figure C3-3. EDS counting spectrum for the particulate deposits shown in Figure C3-2. (t3dcsc18)..... C3-5
- Figure C3-4. ESEM image magnified 70 times for a Test #3, Day-30 exterior fiberglass sample on the drain collar (adjacent to the drain screen). (t3dcsc19)..... C3-5
- Figure C3-5. ESEM image magnified 70 times for a Test #3, Day-30 exterior fiberglass sample on the drain collar (away from the drain screen). (t3dcEx20)..... C3-6
- Figure C3-6. ESEM image magnified 1000 times for a Test #3, Day-30 exterior fiberglass sample on the drain collar (away from the drain screen). (t3dcex21) C3-6
- Figure C3-7. EDS counting spectrum for the light particulate deposits (EDS1) shown in Figure C3-6. (t3dcex22) C3-7
- Figure C3-8. EDS counting spectrum for the dark deposits (EDS2) shown in Figure C3-6. (t3dcex23) C3-7
- Figure C3-9. Comparison of EDS counting spectra between Figure C3-7 (yellow) and Figure C3-8 (red). (t3dcex24) C3-8

Figure C3-10. ESEM image magnified 100 times for a Test #3, Day-30 exterior fiberglass sample on the drain collar (away from the drain screen). (t3dcex25) C3-8

Figure C3-11. ESEM image magnified 80 times for a Test #3, Day-30 interior fiberglass sample on the drain collar. (t3dcin26) C3-9

Figure C3-12. ESEM image magnified 1000 times for a Test #3, Day-30 interior fiberglass sample on the drain collar. (t3dcin27) C3-9

Figure C3-13. ESEM image magnified 100 times for a Test #3, Day-30 interior fiberglass sample on the drain collar. (t3dcin28) C3-10

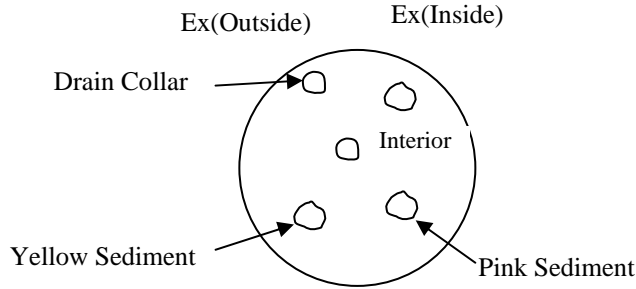
As mentioned before, the debris accumulated on fiberglass during ICET tests is of great concern because such debris may cause significant head loss for the recirculation of coolant during a LOCA. The ICET tank drain collar was used to simulate the sump screen used in nuclear reactor containment systems. Therefore, it is very important to perform SEM/EDS examinations of the fiberglass samples within the drain collar submerged in the tank.

In this appendix, the fiberglass samples within the drain collar were extracted on the date that Test #3 was shut down (May 5, 2005). The fiberglass samples located at the outside exterior (away from the drain screen), the inside exterior (next to the drain screen), and the interior were examined. ESEM was employed to analyze the wet fiberglass samples; it was performed without any coating on the samples and under low-vacuum conditions (i.e., 80 Pa). This evaluation technique minimizes the modification of the fiberglass that could occur through a drying process. EDS results provide an elemental composition analysis of the debris attached on the fiberglass. Available logbook entries for this laboratory session are included in this appendix as transcribed notes.

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Transcribed Laboratory Log

Laboratory session from May 6, 2005.
 Test #3, Day-30 Drain Collar Fiberglass.



Drain Collar Inside

Image: t3DCSC16	100 ×		Figure C3-1
t3dcsc17	1000 ×	Particles	Figure C3-2
EDS: t3dcsc18		EDS on particles	Figure C3-3
Image: t3dcsc19	70 ×		Figure C3-4

Drain Collar Outside

Image: t3dcEx20	70 ×		Figure C3-5
t3dcex21	1000 ×		Figure C3-6
EDS: t3dcex22		EDS on white bright particles shown in 21	Figure C3-7
t3dcex23		EDS on dark particles shown in 21	Figure C3-8
t3dcex24		Comparing t3dcex22 & t3dcex23	Figure C3-9
Image: t3ccex25	100 ×		Figure C3-10

Drain Collar Interior

Image: t3dcin26	80 ×		Figure C3-11
t3dcin27	1000 ×		Figure C3-12
t3dcin28	100 ×		Figure C3-13



Figure C3-1. ESEM image magnified 100 times for a Test #3, Day-30 exterior fiberglass sample on the drain collar (adjacent to the drain screen). (t3DCSC16)

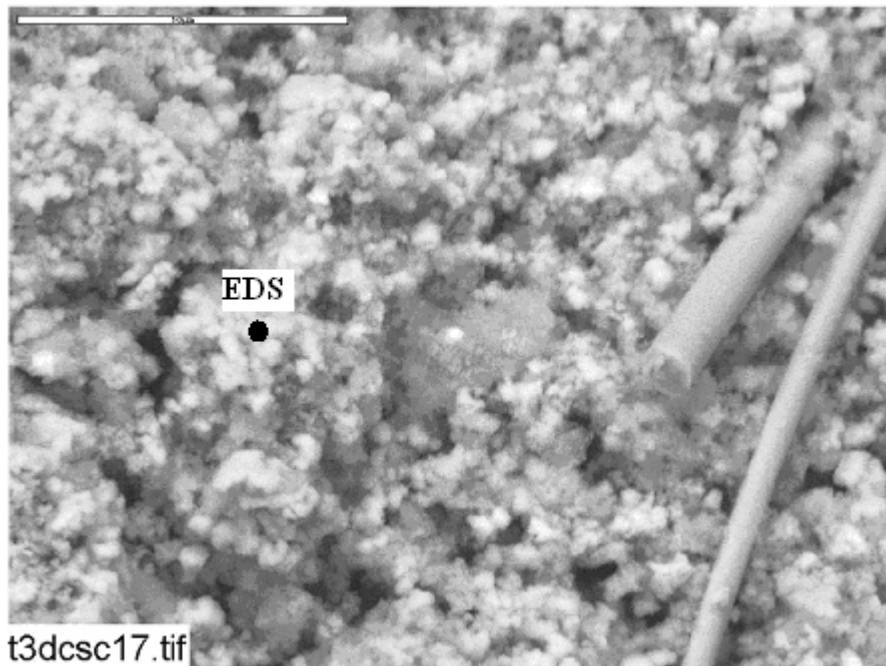


Figure C3-2. ESEM image magnified 1000 times for a Test #3, Day-30 exterior fiberglass sample on the drain collar (adjacent to the drain screen). (t3dcsc17)

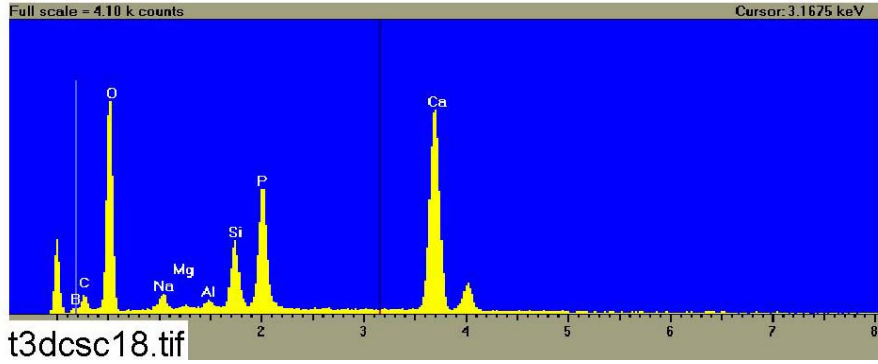


Figure C3-3. EDS counting spectrum for the particulate deposits shown in Figure C3-2. (t3dcsc18)

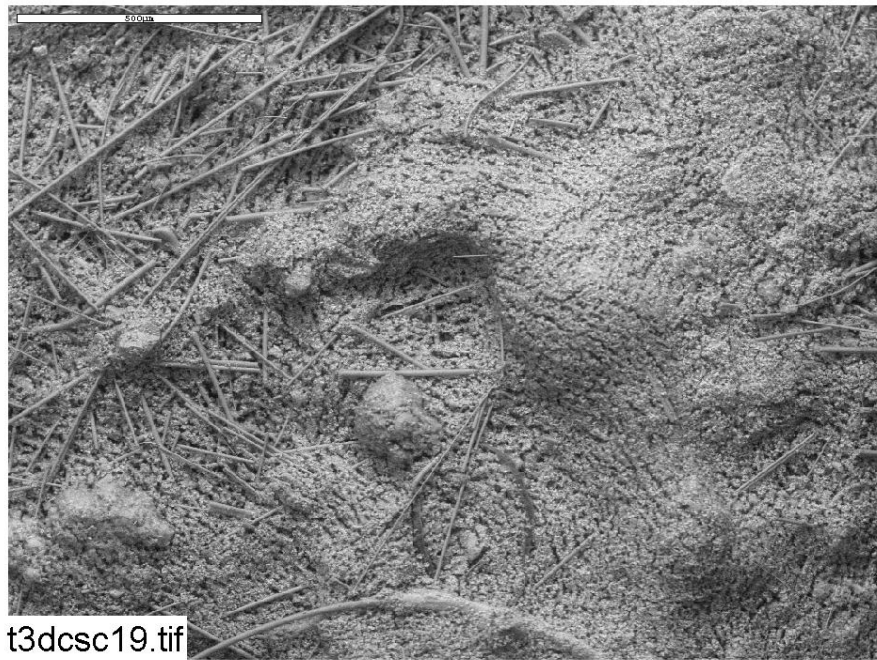


Figure C3-4. ESEM image magnified 70 times for a Test #3, Day-30 exterior fiberglass sample on the drain collar (adjacent to the drain screen). (t3dcsc19)

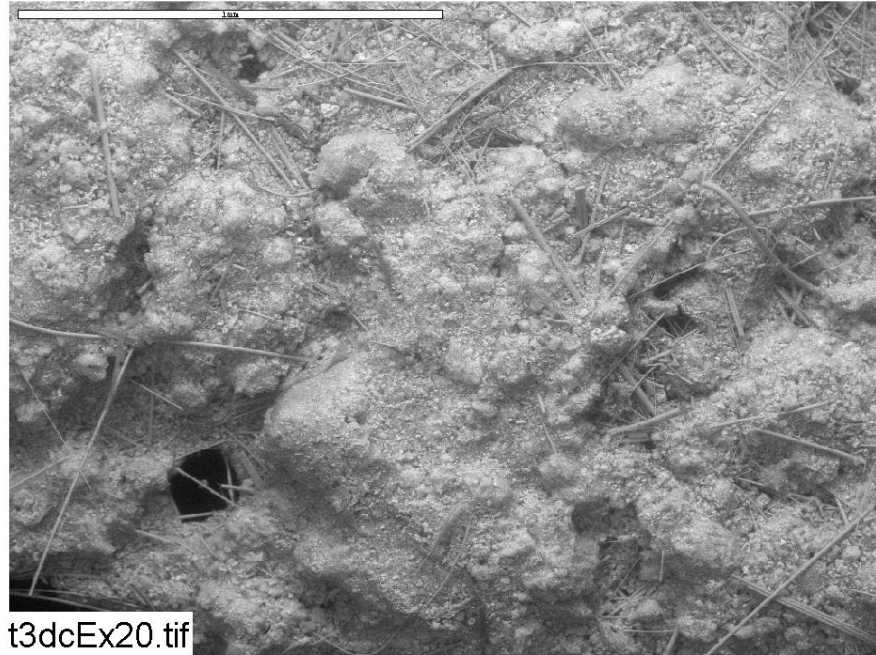


Figure C3-5. ESEM image magnified 70 times for a Test #3, Day-30 exterior fiberglass sample on the drain collar (away from the drain screen). (t3dcEx20)

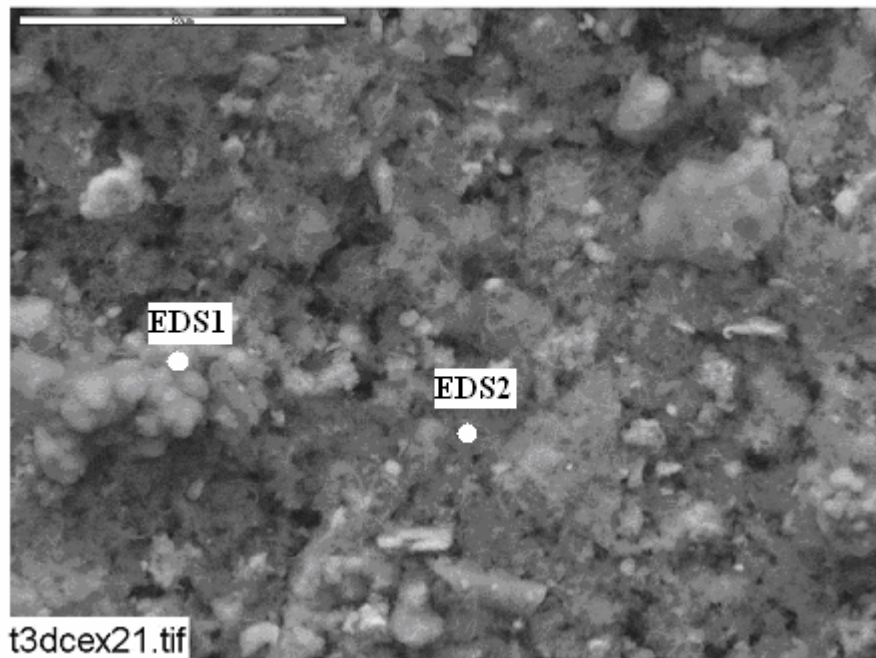


Figure C3-6. ESEM image magnified 1000 times for a Test #3, Day-30 exterior fiberglass sample on the drain collar (away from the drain screen). (t3dcex21)

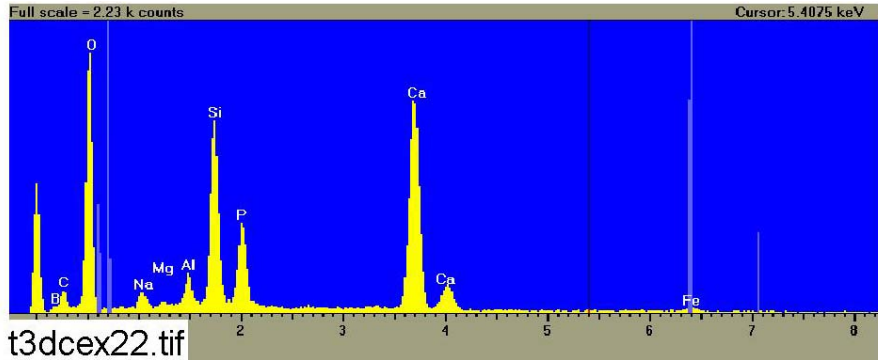


Figure C3-7. EDS counting spectrum for the light particulate deposits (EDS1) shown in Figure C3-6. (t3dcex22)

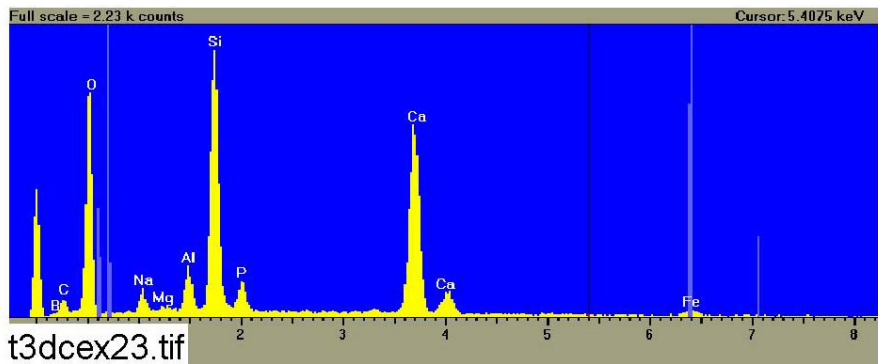


Figure C3-8. EDS counting spectrum for the dark deposits (EDS2) shown in Figure C3-6. (t3dcex23)

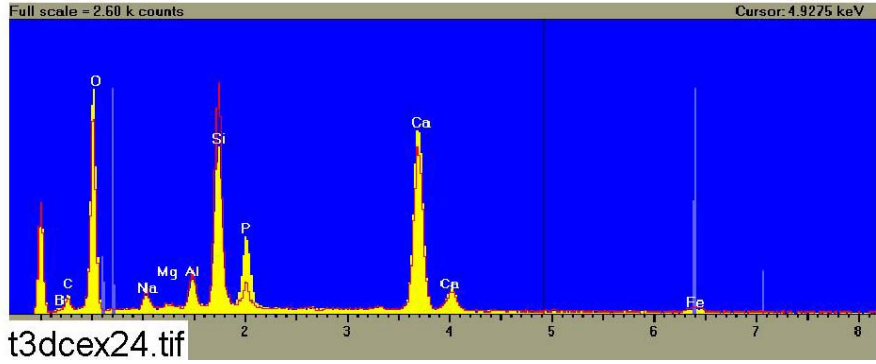


Figure C3-9. Comparison of EDS counting spectra between Figure C3-7 (yellow) and Figure C3-8 (red). (t3dcex24)

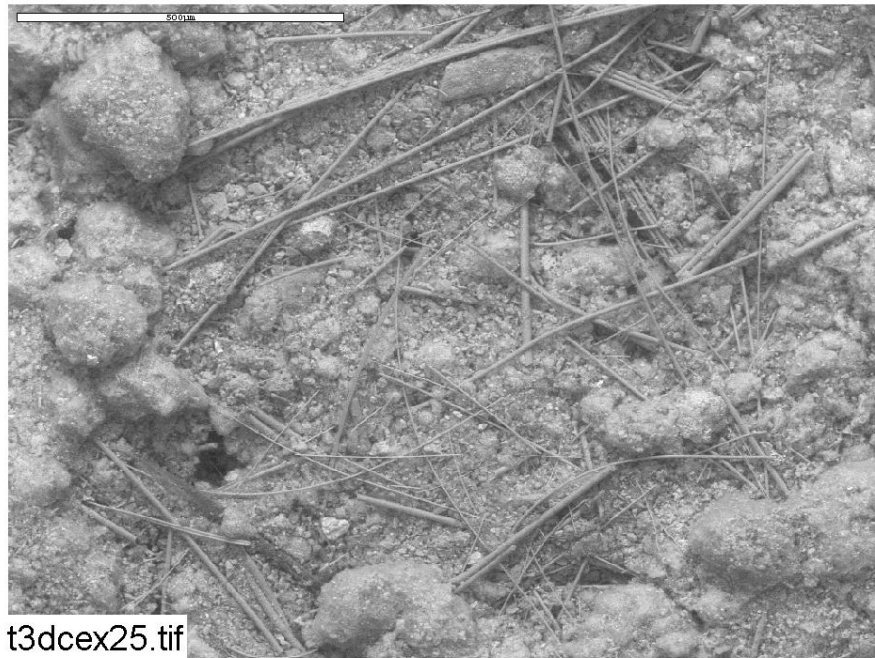


Figure C3-10. ESEM image magnified 100 times for a Test #3, Day-30 exterior fiberglass sample on the drain collar (away from the drain screen). (t3dcex25)

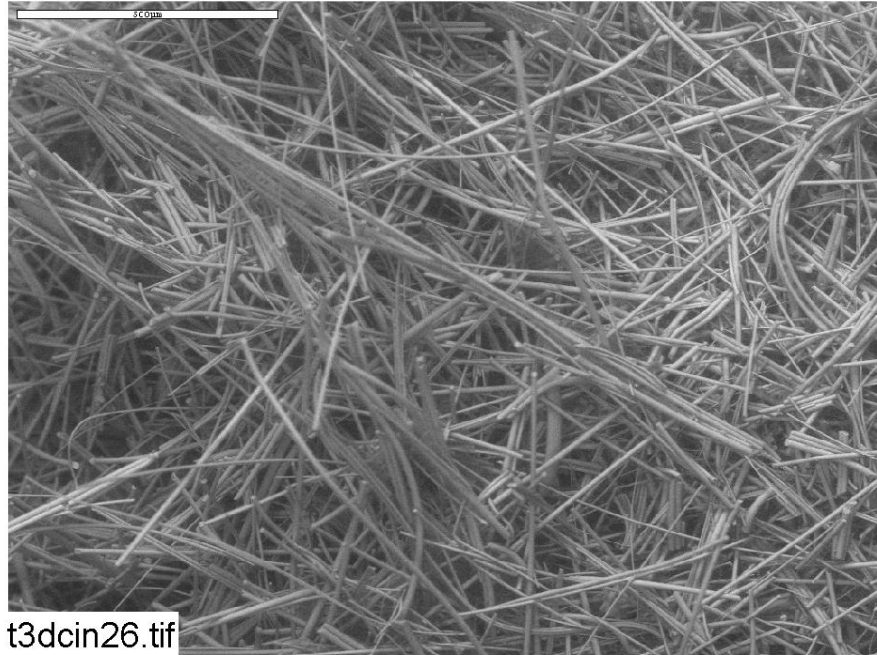


Figure C3-11. ESEM image magnified 80 times for a Test #3, Day-30 interior fiberglass sample on the drain collar. (t3dcin26)

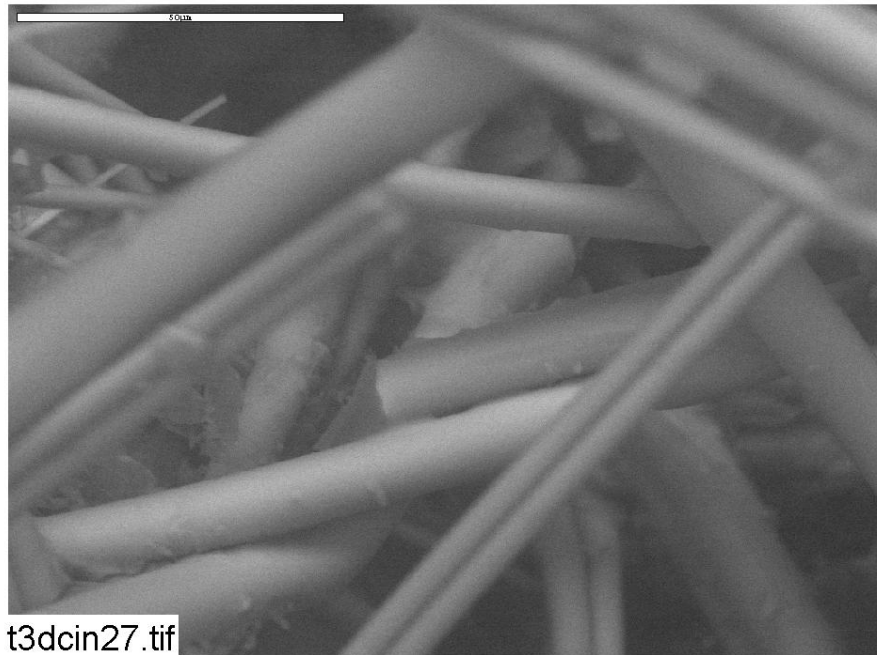


Figure C3-12. ESEM image magnified 1000 times for a Test #3, Day-30 interior fiberglass sample on the drain collar. (t3dcin27)

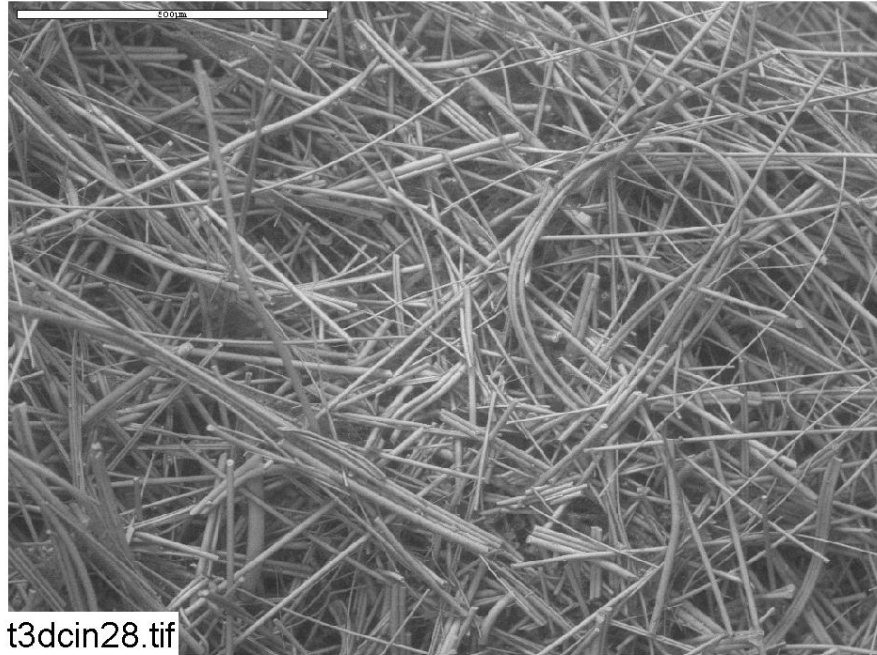


Figure C3-13. ESEM image magnified 100 times for a Test #3, Day-30 interior fiberglass sample on the drain collar. (t3dcin28)

Appendix C4

SEM/EDS and ESEM/EDS Data for Test #3, Day-30 Birdcage Fiberglass

Figures

Figure C4-1. SEM image magnified 100 times for a Test #3, Day-30 exterior fiberglass sample within a birdcage. (T3D30BirdExt001)	C4-6
Figure C4-2. SEM image magnified 550 times for a Test #3, Day-30 exterior fiberglass sample within a birdcage. (T3D30BirdExt002)	C4-6
Figure C4-3. EDS counting spectrum for the large masses of particulate deposits shown in Figure C4-2. (T3D30BirdExtPt01).....	C4-7
Figure C4-4. ESEM image magnified 80 times for a Test #3, Day-30 exterior fiberglass sample within a birdcage. (T3BCEX01)	C4-7
Figure C4-5. EDS counting spectrum for the the large deposits shown in Figure C4-4. (t3bcexe2).....	C4-8
Figure C4-6. ESEM image magnified 80 times for a Test #3, Day-30 exterior fiberglass sample within a birdcage. (t3bcex02).....	C4-8
Figure C4-7. ESEM image magnified 500 times for a Test #3, Day-30 exterior fiberglass sample within a birdcage. (t3bcex03).....	C4-9
Figure C4-8. EDS counting spectrum for the deposits shown in Figure C4-7. (T3BCExE1)	C4-9
Figure C4-9. Comparison of EDS counting spectra of Figure C4-5 (yellow) and Figure C4-8 (red). (t3bcexe3)	C4-10
Figure C4-10. ESEM image magnified 1000 times for a Test #3, Day-30 exterior fiberglass sample within a birdcage. (t3bcex04).....	C4-10
Figure C4-11. ESEM image magnified 80 times for a Test #3, Day-30 interior fiberglass sample within a birdcage. (t3bcin05)	C4-11
Figure C4-12. ESEM image magnified 950 times for a Test #3, Day-30 interior fiberglass sample within a birdcage. (t3bcin06)	C4-11

Figure C4-13. ESEM image magnified 1000 times for a Test #3, Day-30 interior
fiberglass sample within a birdcage. (t3bcin07) C4-12

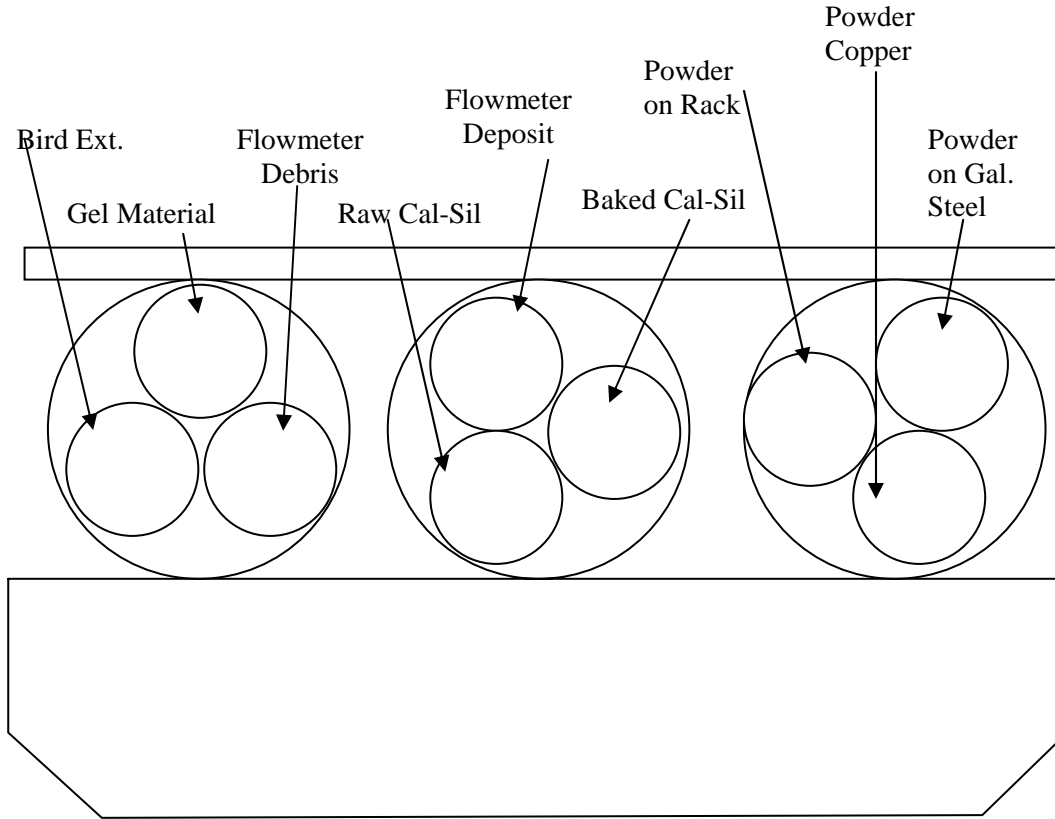
This appendix lists the ESEM/SEM/EDS results for the fiberglass samples within a birdcage submerged in the testing solution. The purpose of this analysis was to determine the degree and the extent of particulate debris that migrated and attached on fiberglass. In this appendix, the fiberglass samples within the birdcage were extracted on the shutdown date of Test #3 (May 5, 2005). Both exterior and interior fiberglass samples were examined. Probe SEM was used to examine the fiberglass samples after drying at room temperature followed by being coated with Au/Pd. In addition to probe SEM, ESEM was employed to analyze the uncoated, wet fiberglass samples under a low-vacuum condition (i.e., 80 Pa) to minimize the potential for modification of the fiberglass samples that might occur through the drying process. Available logbook entries for this laboratory session are included in this appendix as transcribed notes.

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Transcribed Laboratory Log

Laboratory session from May 9, 2005.

Test #3, Day-30 Birdcage



Birdcage Exterior

Image: T3D30BirdExt001 100 ×

Figure C4-1

T3D30BirdExt002 550 ×

Figure C4-2

EDS: T3D30BirdExtPt01

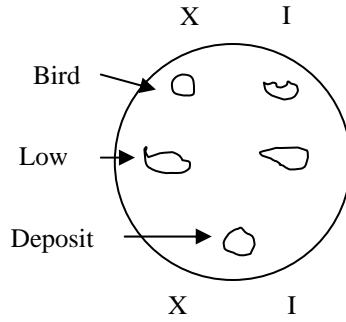
Particles on fiberglass, image 002 Figure C4-3

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Transcribed Laboratory Log

Laboratory session from May 6, 2005.

Test #3, Day-30 Birdcage Fiberglass.



Birdcage Exterior

Image:	T3BCEX01	80 ×		Figure C4-4
EDS:	t3bcexe2		EDS on particles-T3BCEXE2	Figure C4-5
Image:	t3bcex02	80 ×		Figure C4-6
	t3bcex03	500 ×		Figure C4-7
EDS:	T3BCExE1		EDS on particles in t3bcex03	Figure C4-8
	t3bcexe3		Comparing t3bcexe2 & T3BCExE1	Figure C4-9
Image:	t3bcex04	1000 ×		Figure C4-10

Birdcage Interior

Image:	t3bcin05	80 ×		Figure C4-11
	t3bcin06	950 ×		Figure C4-12
	t3bcin07	1000 ×		Figure C4-13

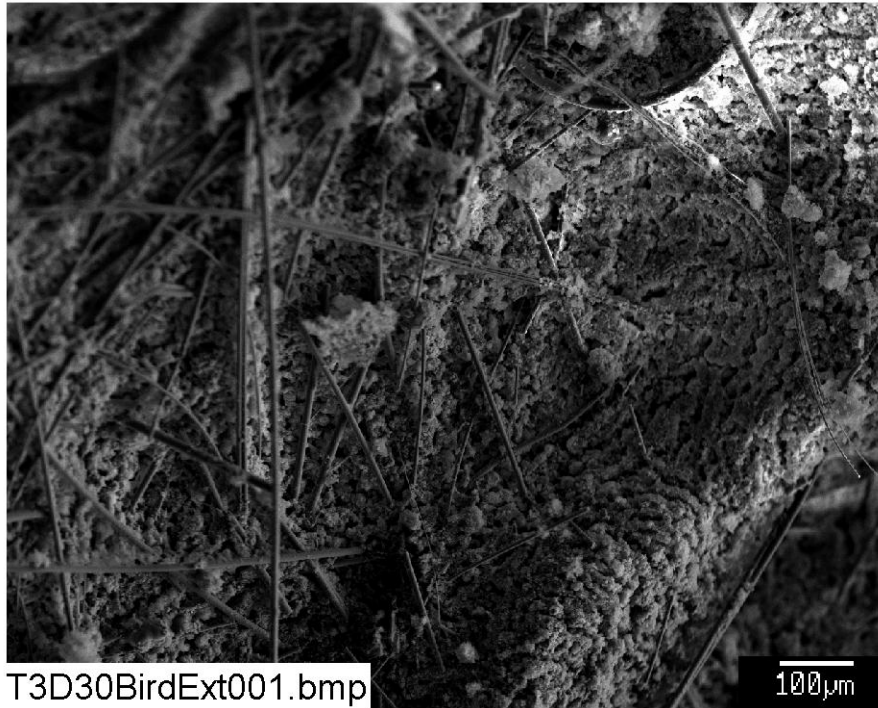


Figure C4-1. SEM image magnified 100 times for a Test #3, Day-30 exterior fiberglass sample within a birdcage. (T3D30BirdExt001)

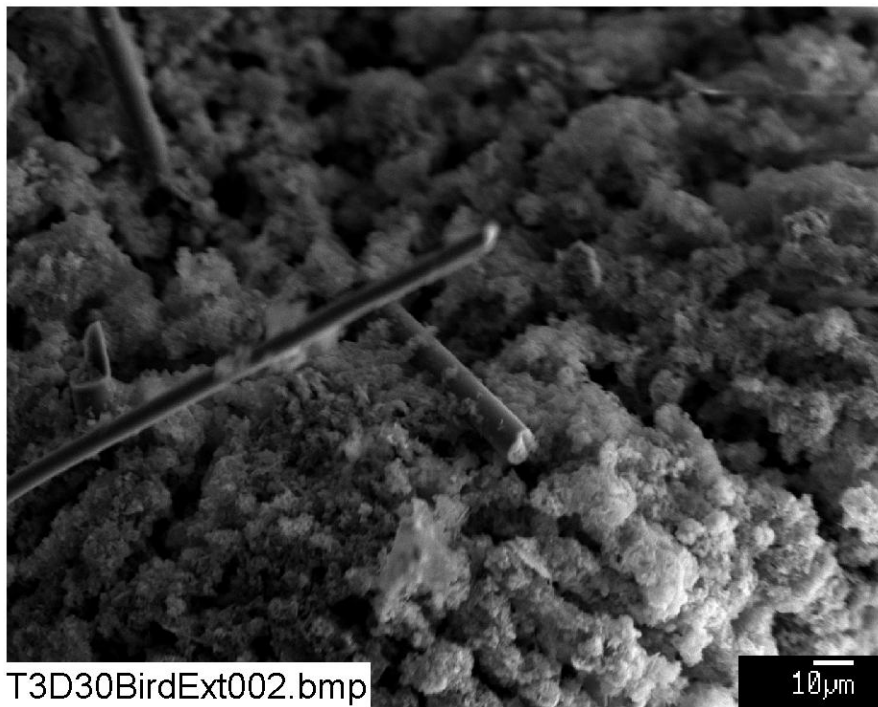


Figure C4-2. SEM image magnified 550 times for a Test #3, Day-30 exterior fiberglass sample within a birdcage. (T3D30BirdExt002)

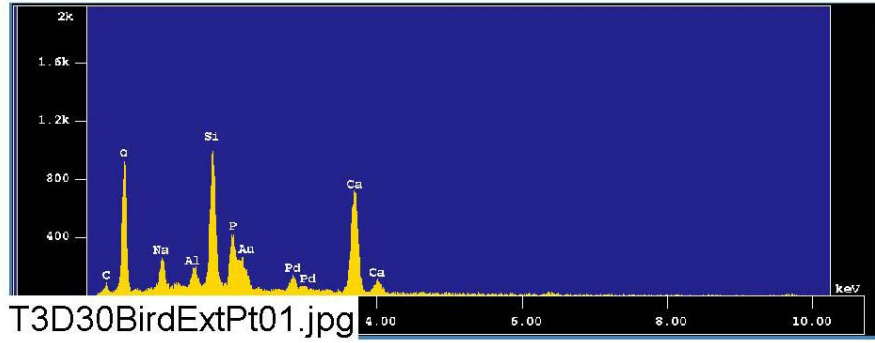


Figure C4-3. EDS counting spectrum for the large masses of particulate deposits shown in Figure C4-2. (T3D30BirdExtPt01)

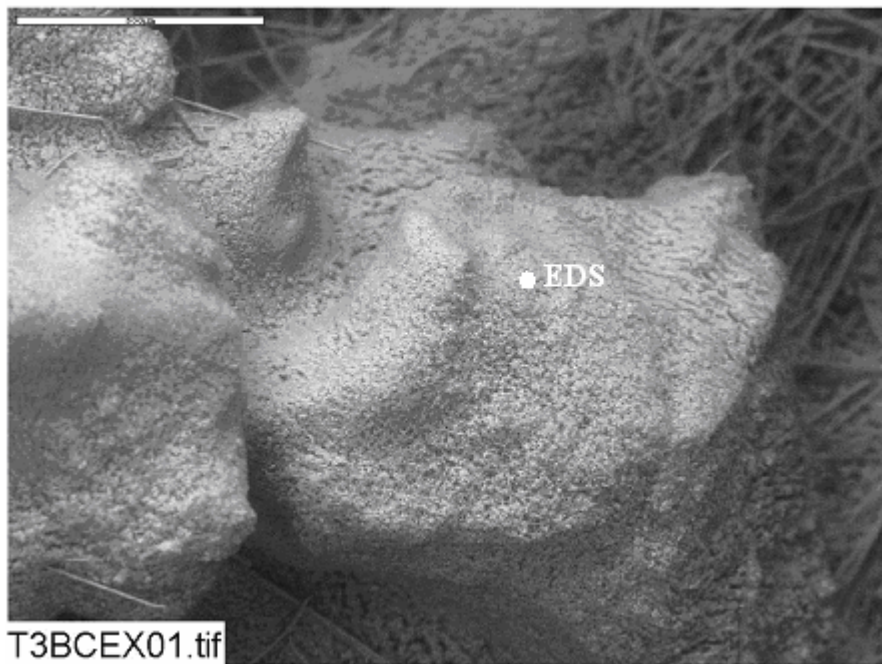


Figure C4-4. ESEM image magnified 80 times for a Test #3, Day-30 exterior fiberglass sample within a birdcage. (T3BCEX01)

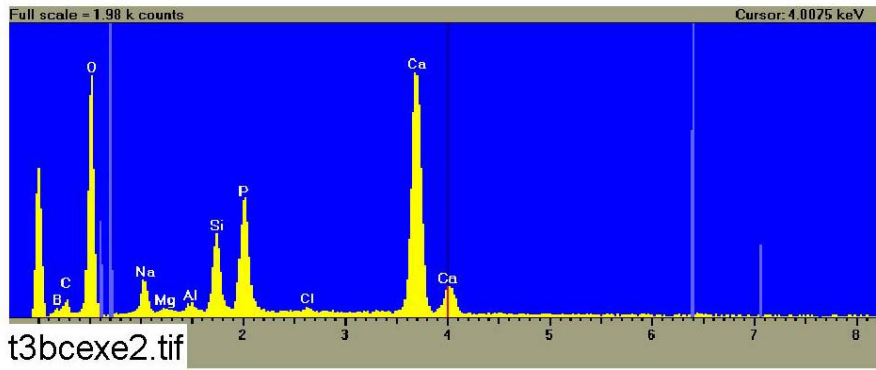


Figure C4-5. EDS counting spectrum for the the large deposits shown in Figure C4-4. (t3bcexe2)

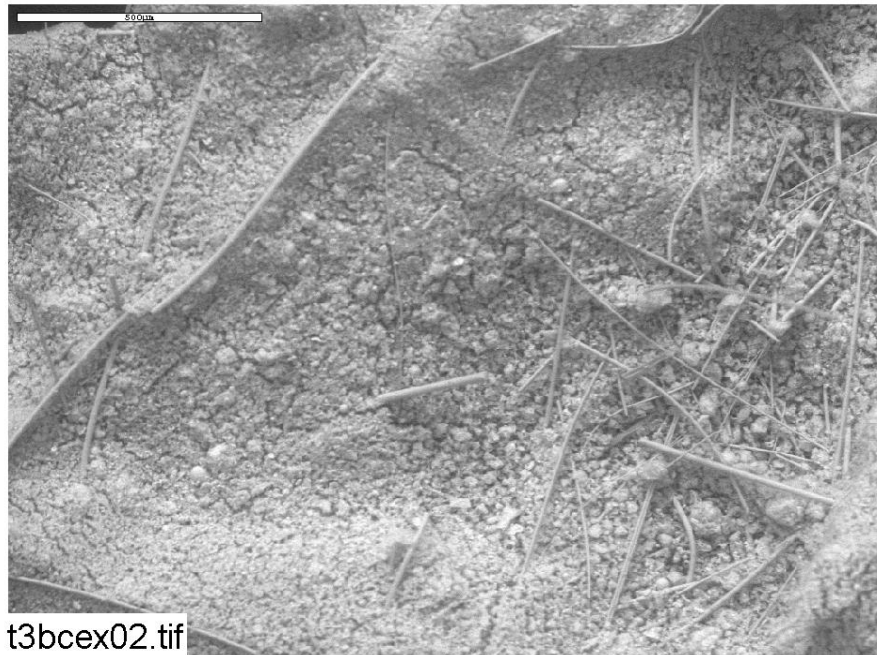


Figure C4-6. ESEM image magnified 80 times for a Test #3, Day-30 exterior fiberglass sample within a birdcage. (t3bcex02)

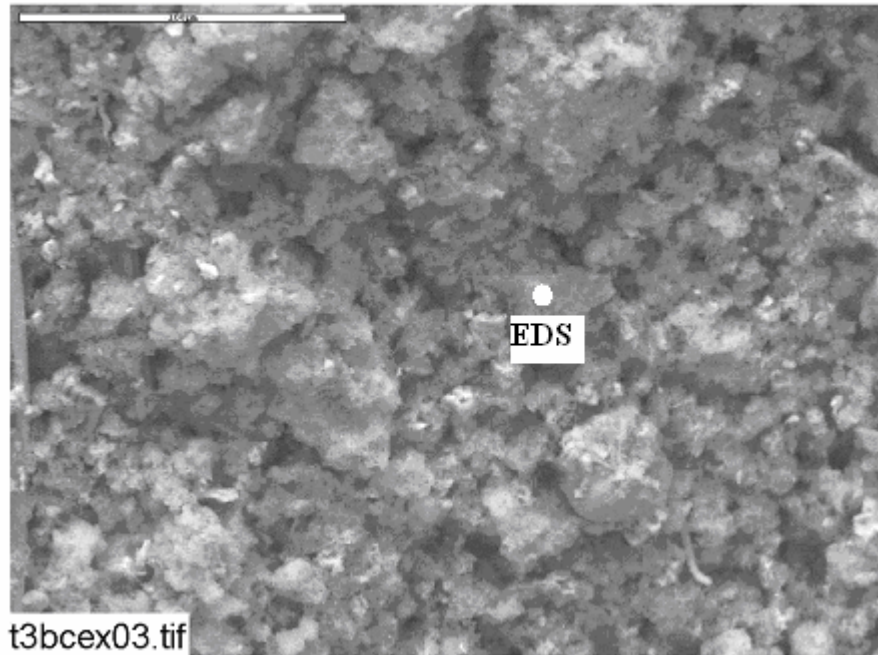


Figure C4-7. ESEM image magnified 500 times for a Test #3, Day-30 exterior fiberglass sample within a birdcage. (t3bcex03)

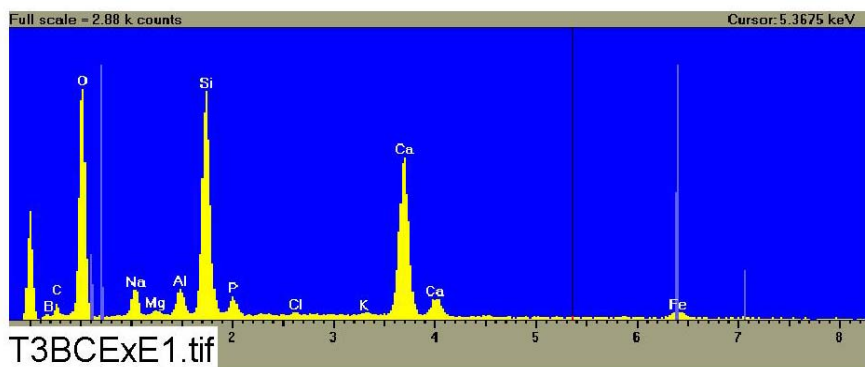


Figure C4-8. EDS counting spectrum for the deposits shown in Figure C4-7. (T3BCExE1)

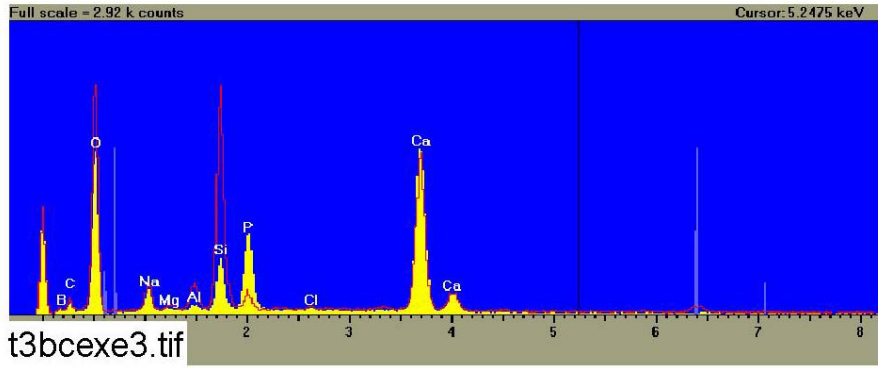


Figure C4-9. Comparison of EDS counting spectra of Figure C4-5 (yellow) and Figure C4-8 (red). (t3bcexe3)

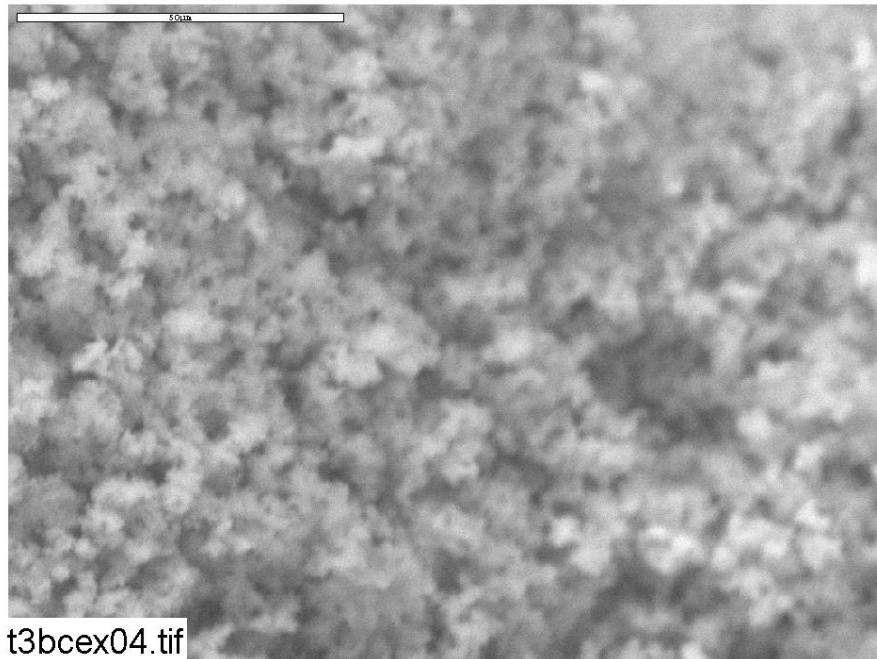


Figure C4-10. ESEM image magnified 1000 times for a Test #3, Day-30 exterior fiberglass sample within a birdcage. (t3bcex04)

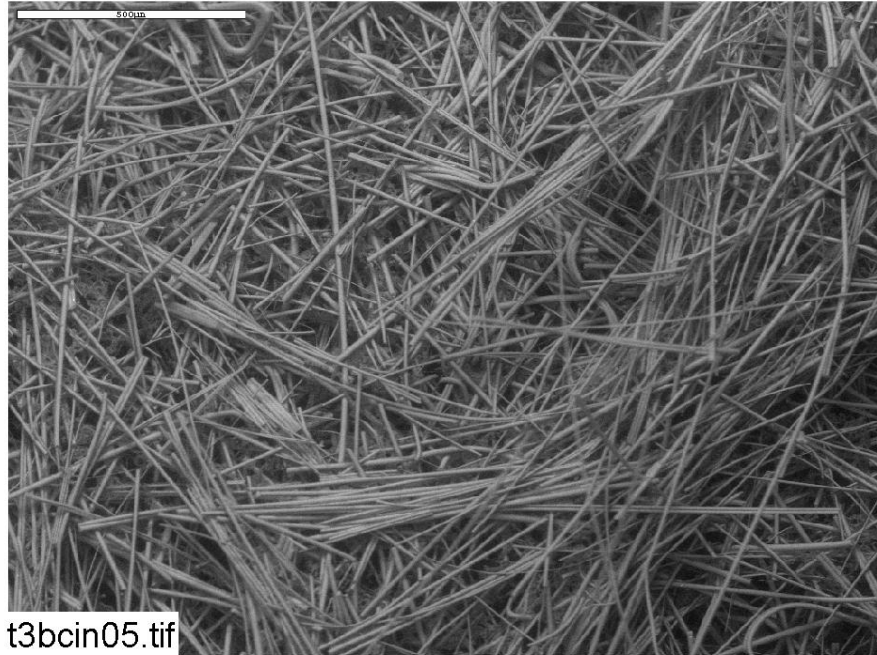


Figure C4-11. ESEM image magnified 80 times for a Test #3, Day-30 interior fiberglass sample within a birdcage. (t3bcin05)

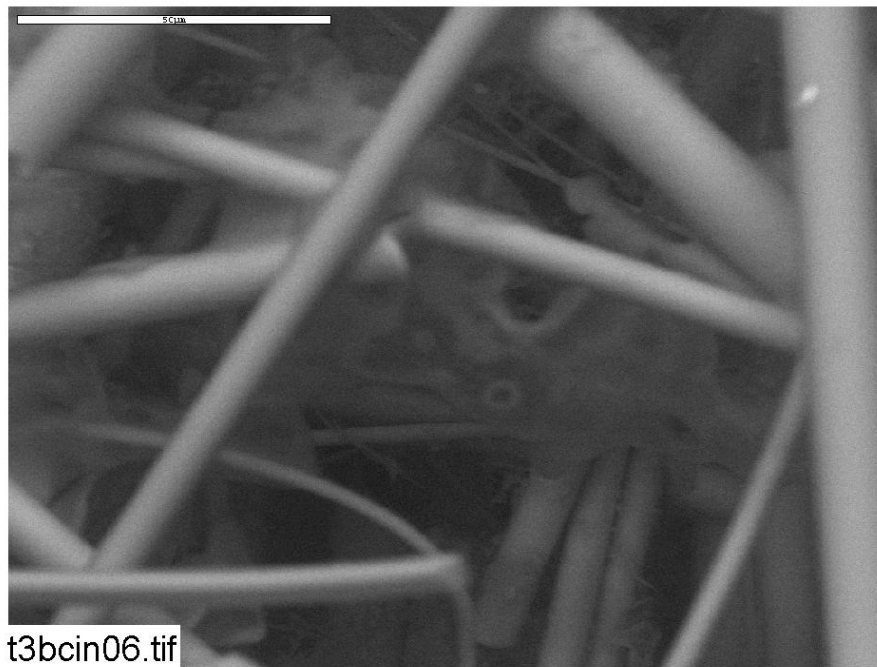


Figure C4-12. ESEM image magnified 950 times for a Test #3, Day-30 interior fiberglass sample within a birdcage. (t3bcin06)

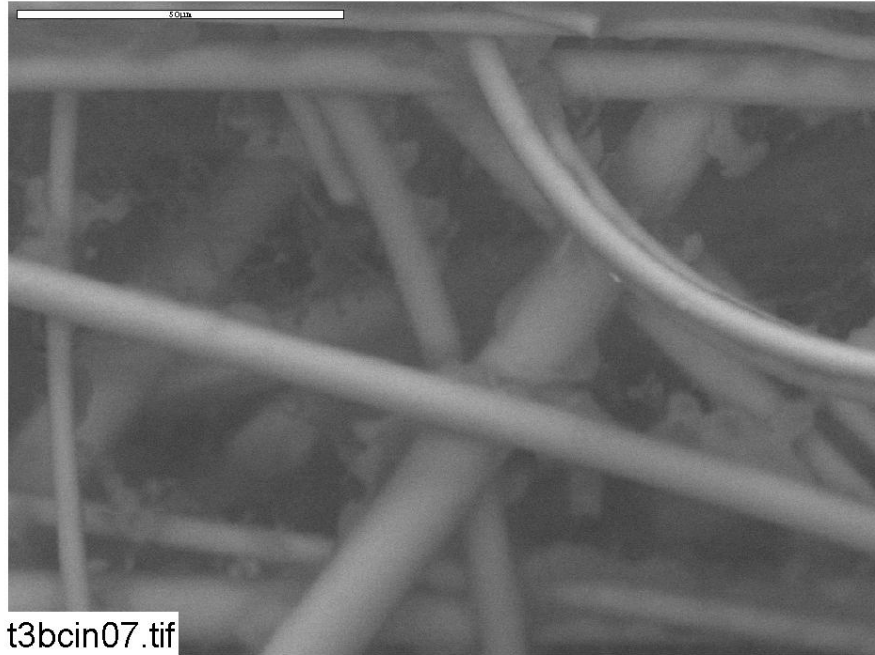


Figure C4-13. ESEM image magnified 1000 times for a Test #3, Day-30 interior fiberglass sample within a birdcage. (t3bcin07)