FAS Sample Exposed for 1500 Hours

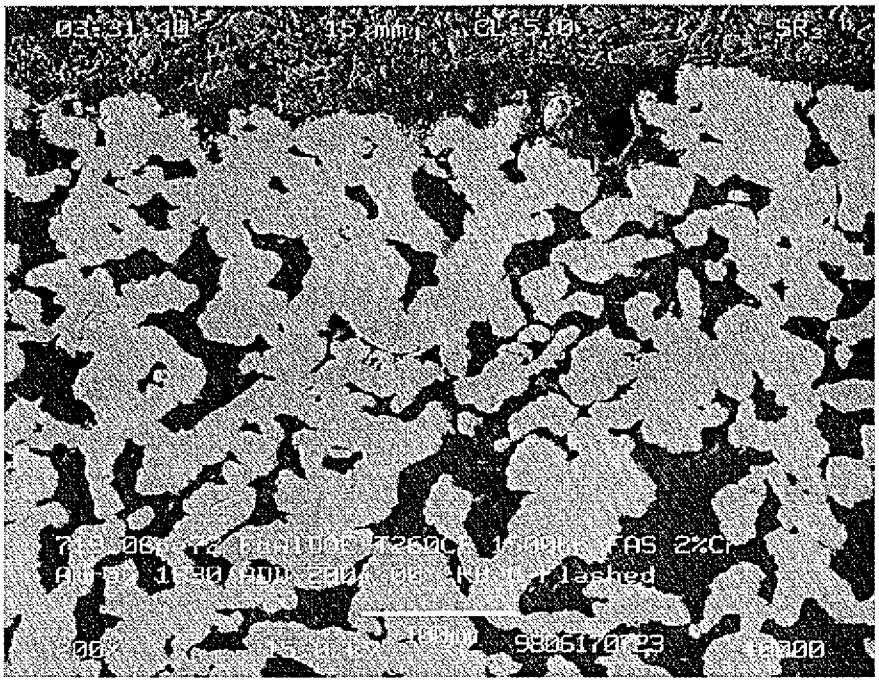

Figure 209: FAS cross-section. Upstream edge shown. Exposed for 1500 hours. Iron sulfide crystals on upstream edge are barely visible at this magnification.

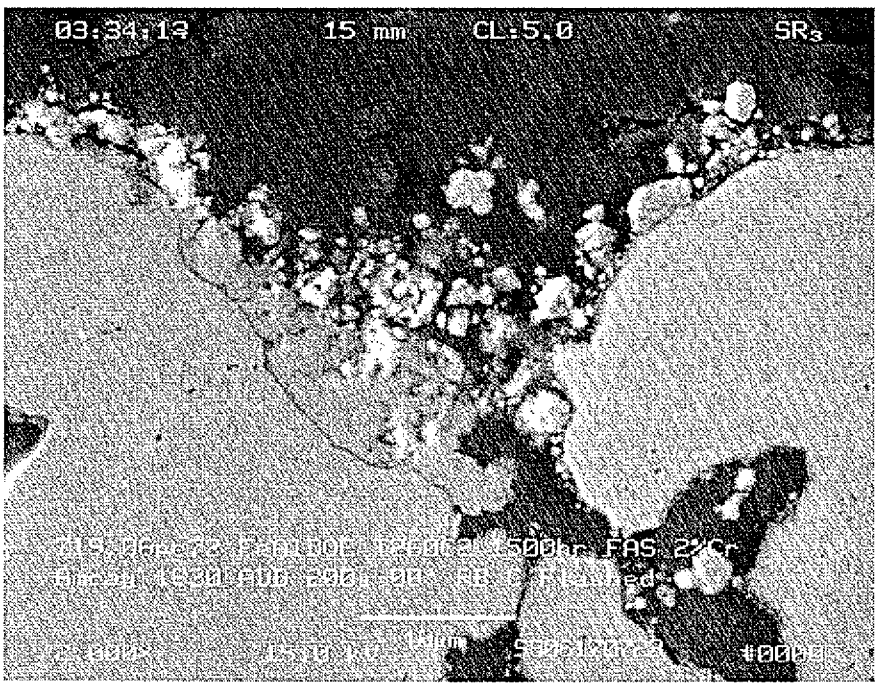

Figure 210: FAS cross-section. Upstream edge shown. Exposed for 1500 hours. Amount of crystals are similar to Figure 189. No increase in sulfide formation over time, after 500 hours of exposure.

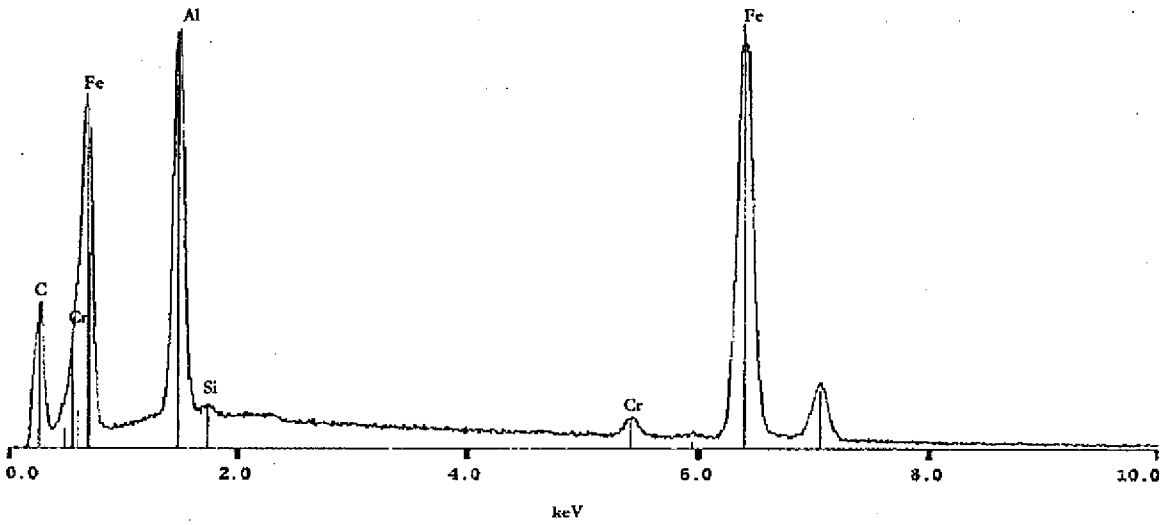

Figure 211: Spectrum of base metal on Figure 210. Typical iron aluminide signature.

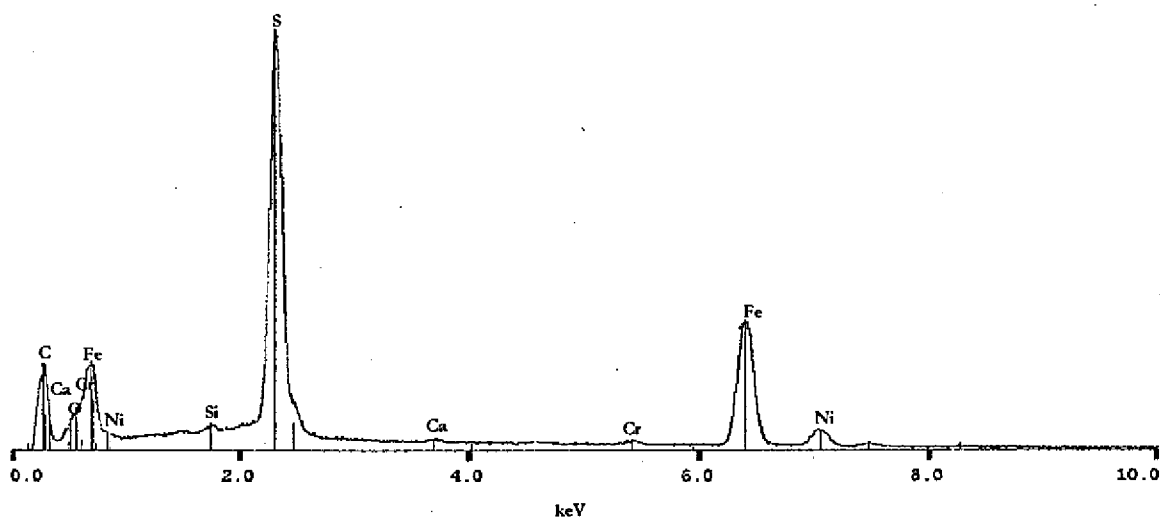

Figure 212: Spectrum of upstream edge of Figure 210. High sulfur and iron. Strong indication of iron sulfides.

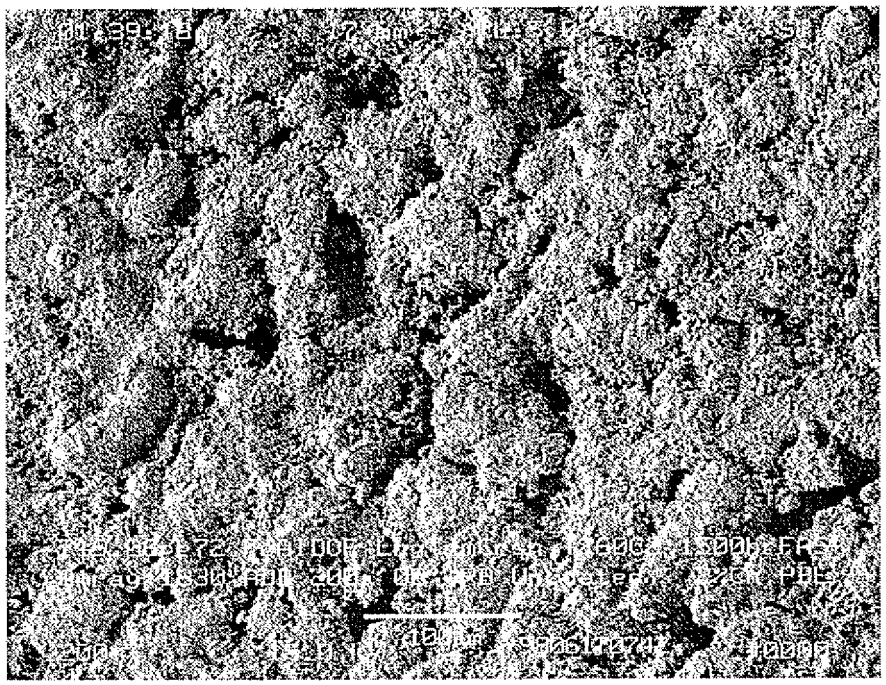

Figure 213: FAS upstream surface. Exposed for 1500 hours. Covered in iron sulfide crystals.

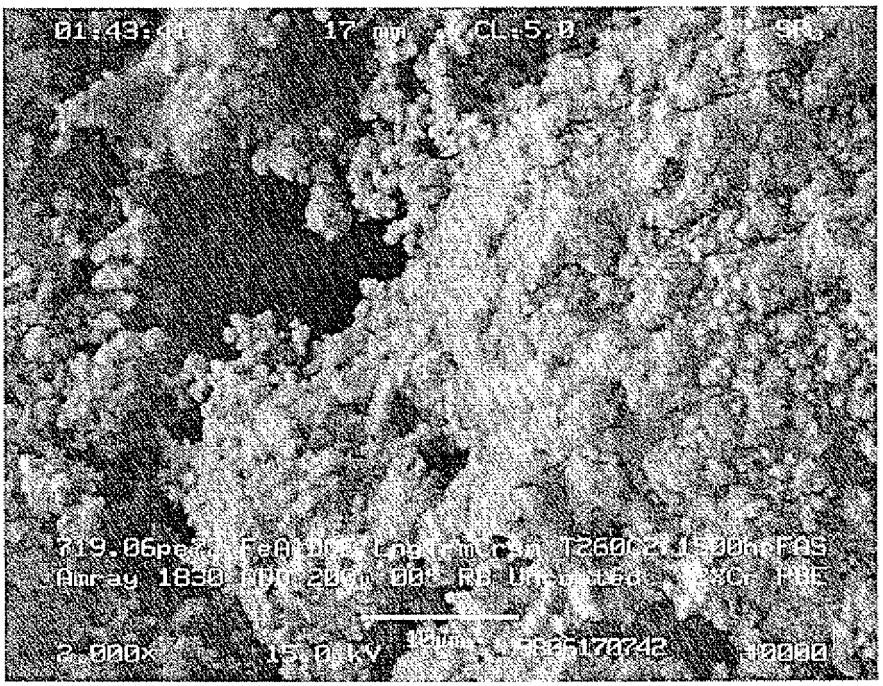

Figure 214: FAS upstream surface. Exposed for 1500 hours.

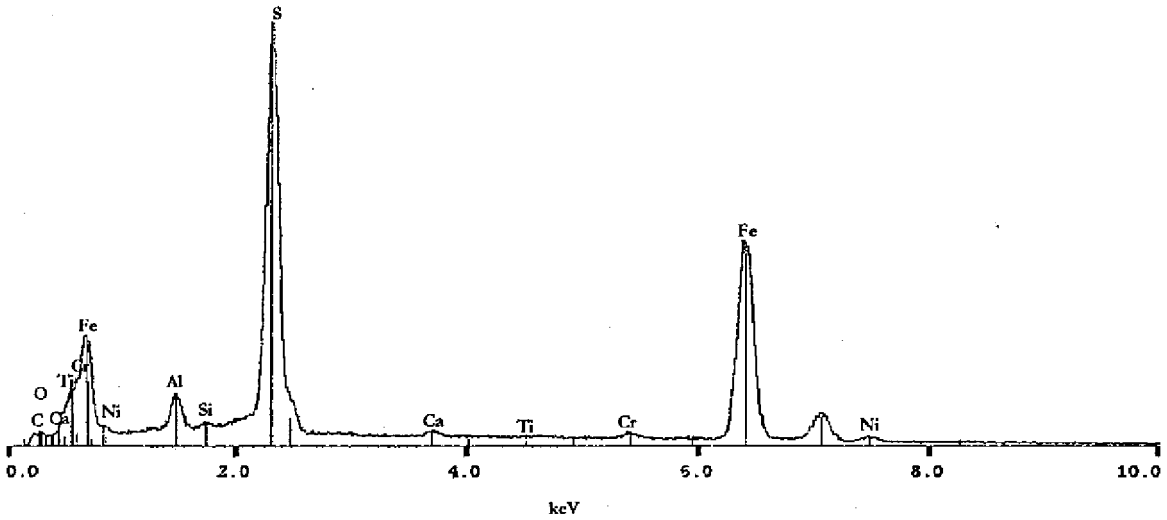

Figure 215: Full screen spectrum of Figure 214. High sulfur and iron. Strong indication of iron sulfides.

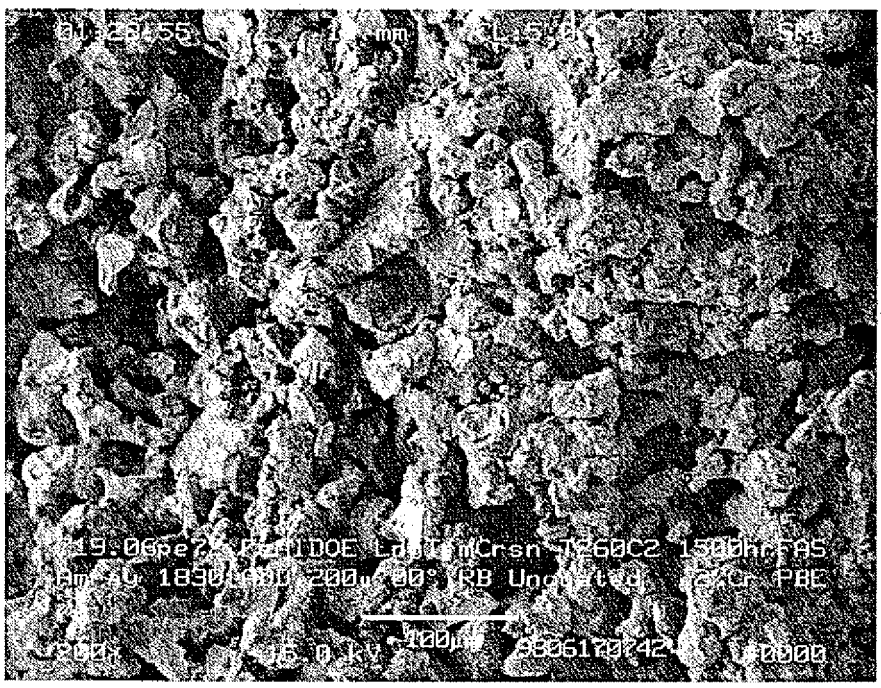

Figure 216: FAS fracture surface. Exposed for 1500 hours.

Figure 217: FAS fracture surface. Exposed for 1500 hours. Typical unexposed iron aluminide fracture surface with some porosity at sinter bond, zirconium/zirconia nodules on surface. Brittle transgranular fracture.

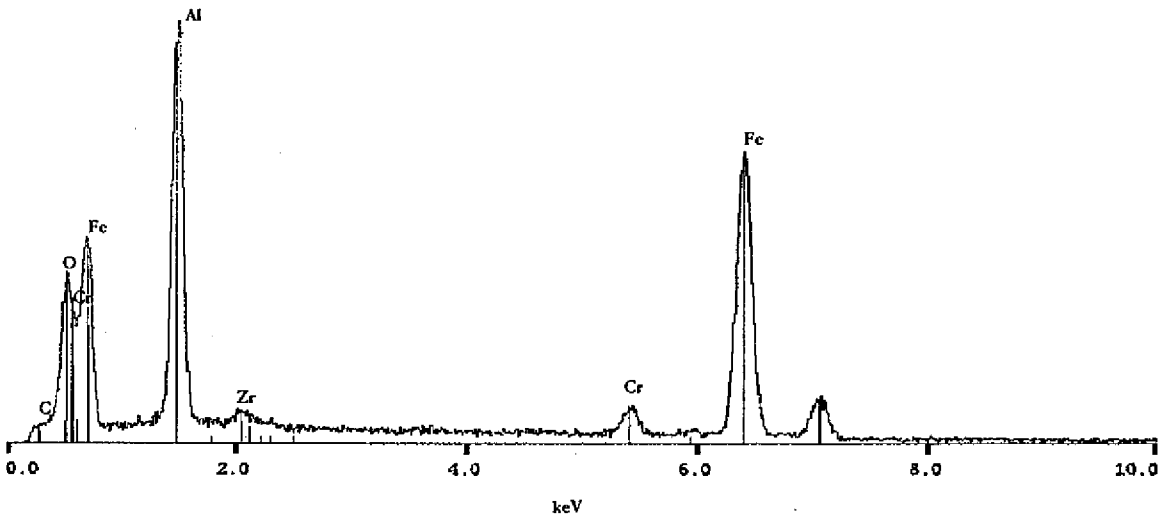

Figure 218: Full screen spectrum of Figure 217. Typical iron aluminide signature.

FAL Control Sample

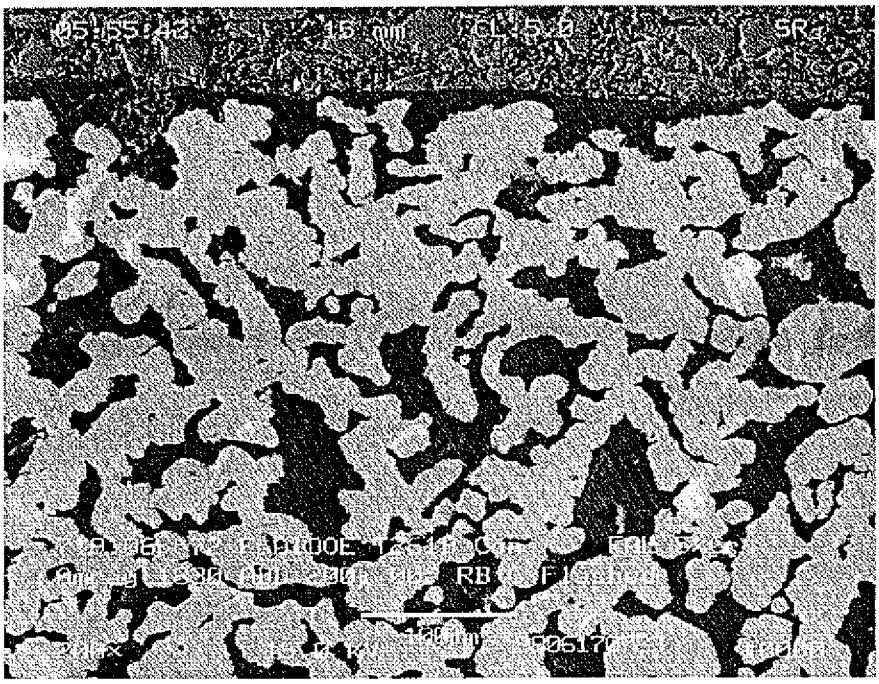

Figure 219: Cross-section of FAL control sample. Preoxidized at 800°C.

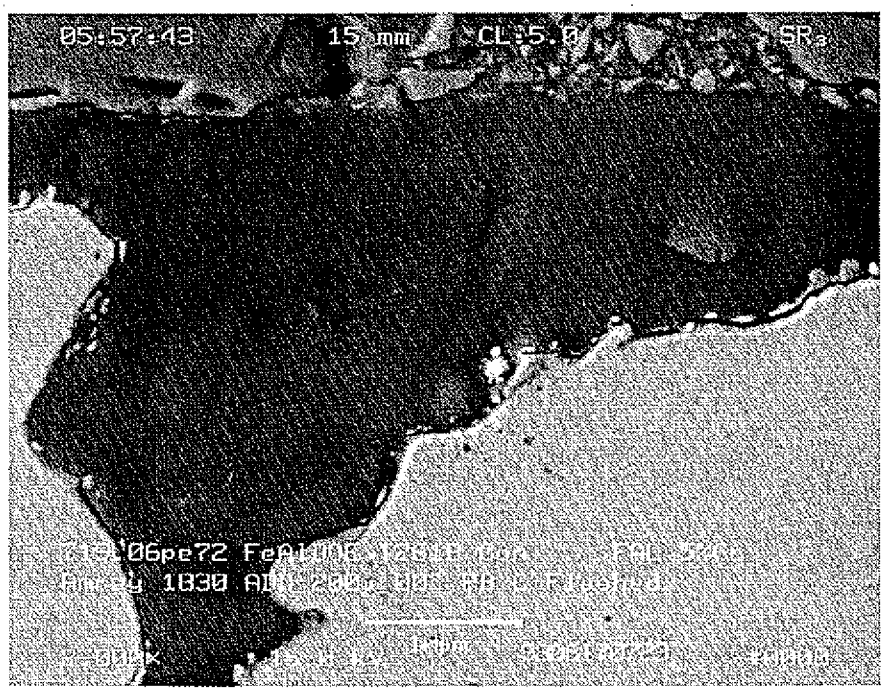

Figure 220: Cross-section of FAL control sample. Preoxidized at 800°C.

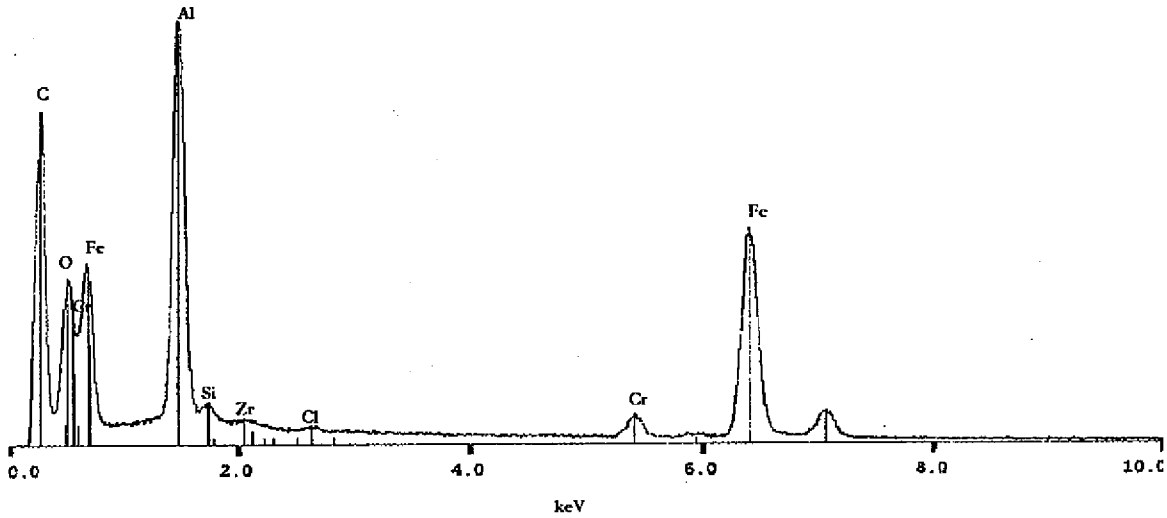

Figure 221: Partial field spectrum of base metal of Figure 220. High carbon is from carbon flashing.

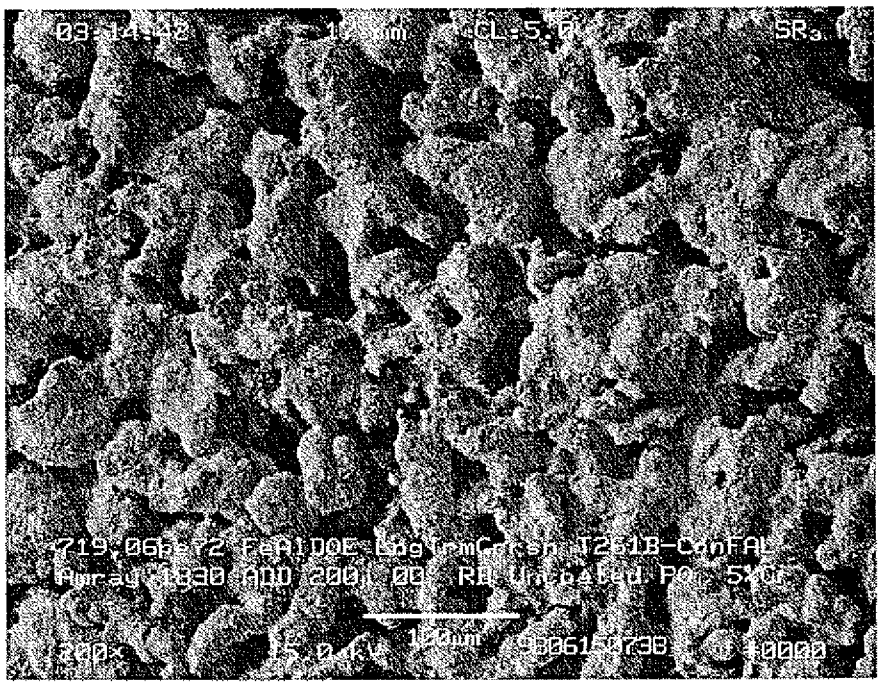

Figure 222: Upstream surface of FAL control sample. Preoxidized at 800°C.

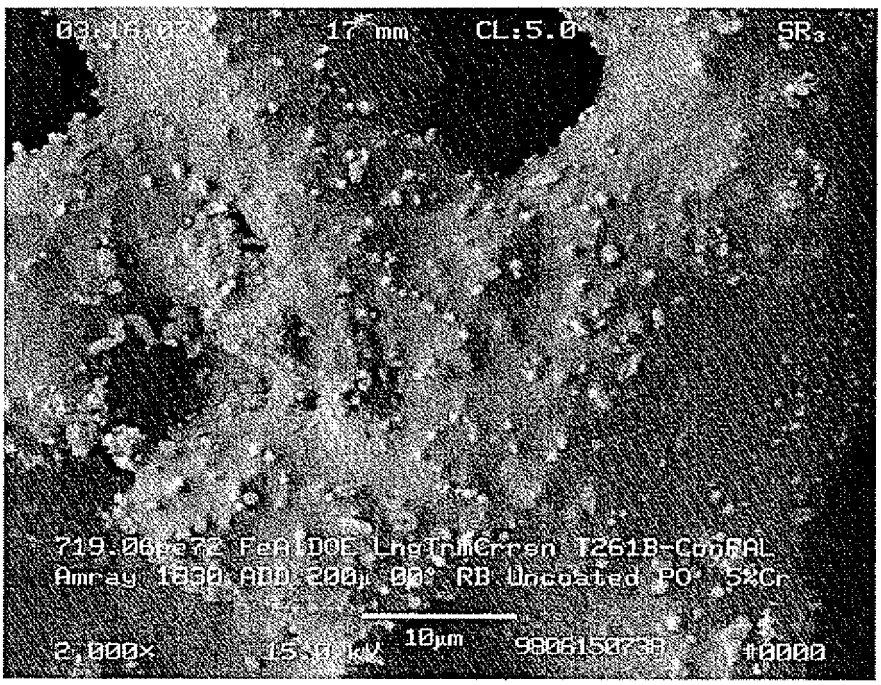

Figure 223: Upstream surface of FAL control sample. Preoxidized at 800°C.

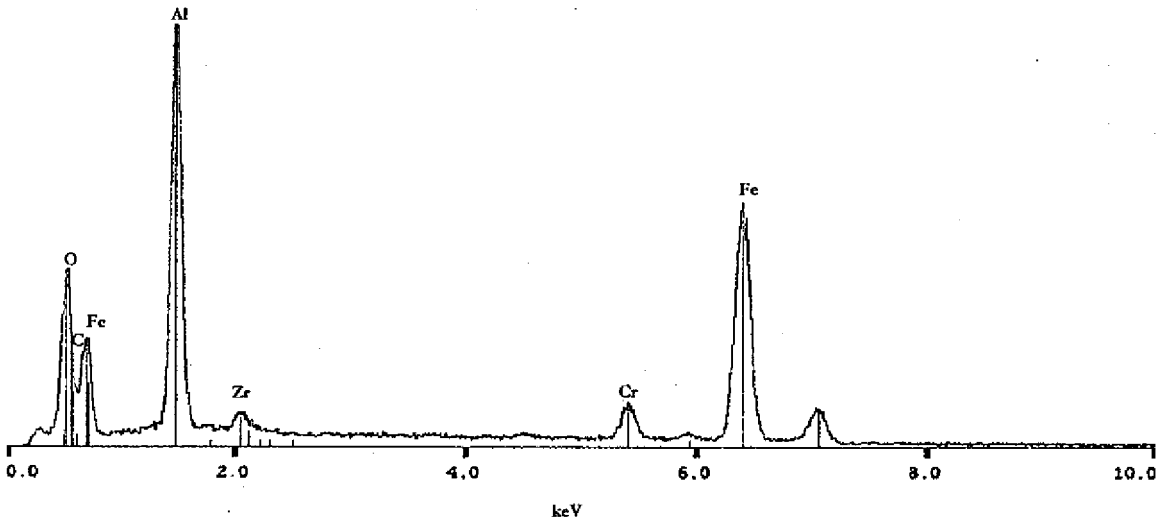

Figure 224: Full screen spectrum of Figure 223. Typical iron aluminide signature.

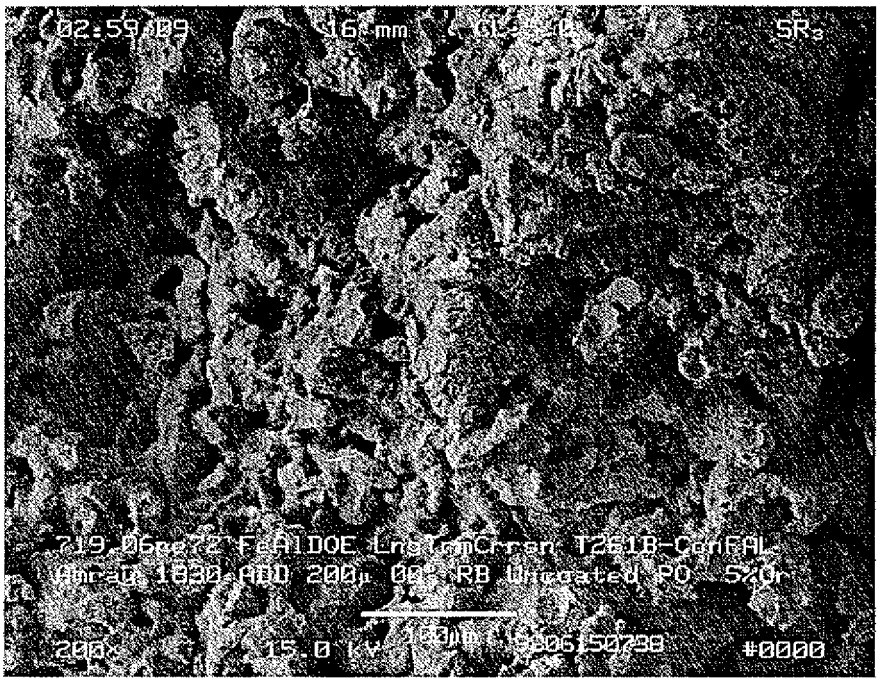

Figure 225: Fracture surface of FAL control sample. Preoxidized at 800°C.

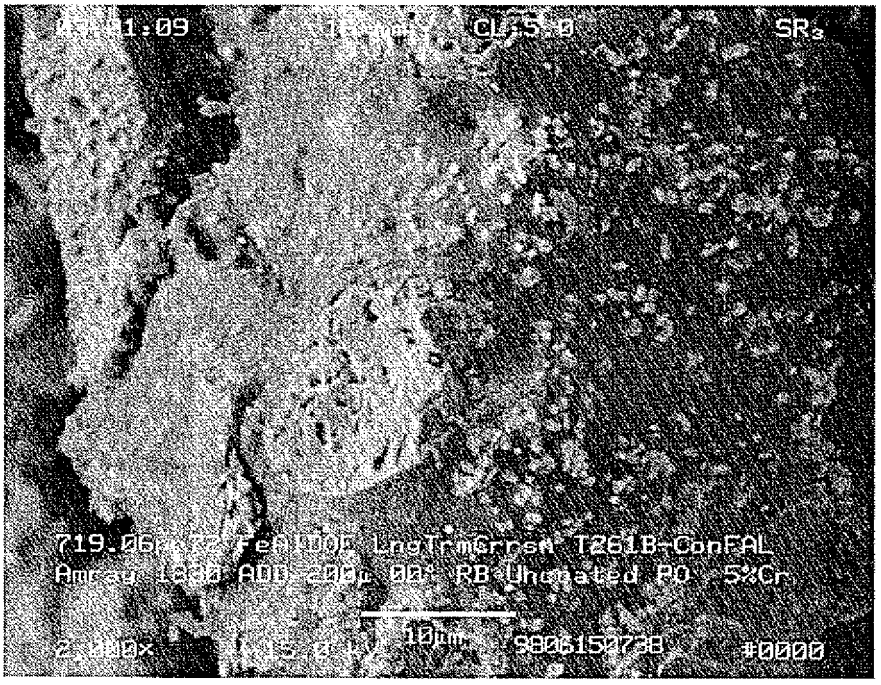

Figure 226: Fracture surface of FAL control sample. Preoxidized at 800°C.

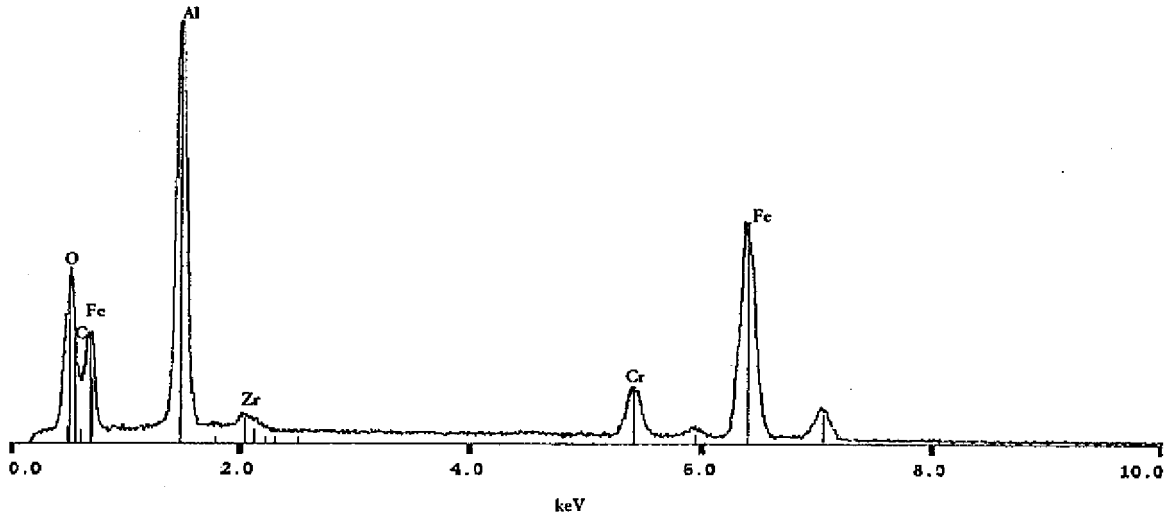

Figure 227: Full screen spectrum of Figure 226. Typical iron aluminide signature. Alumina layer is detected by the presence of oxygen.

FAL Sample Exposed for 500 Hours

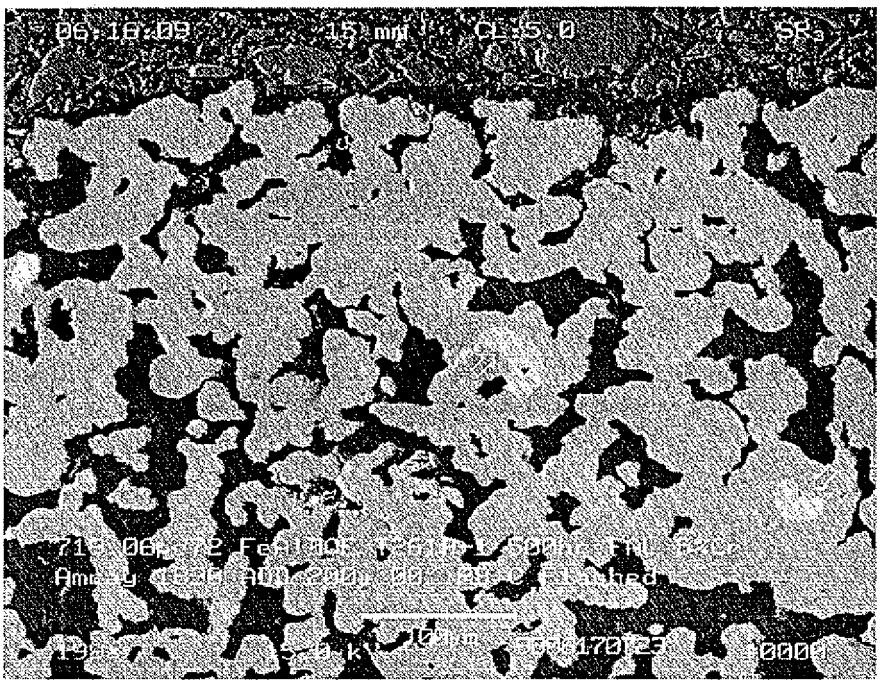

Figure 228: FAL cross-section. Upstream edge shown. Exposed for 500 hours. Lighter areas are from the carbon flashing peeling off (arrows).

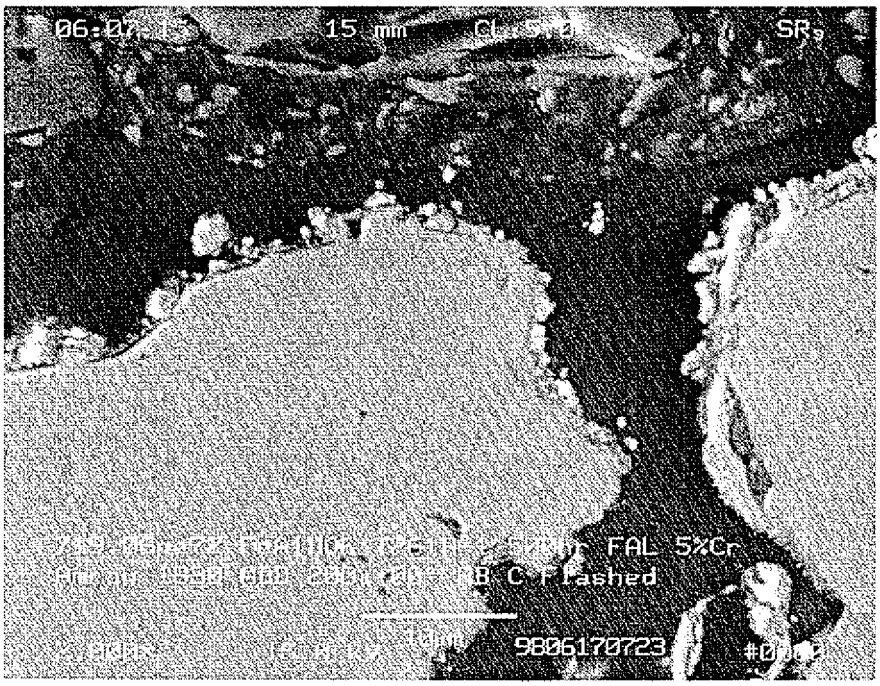

Figure 229: FAL cross-section. Upstream edge shown. Exposed for 500 hours. Some iron sulfide crystals on the upstream surface.

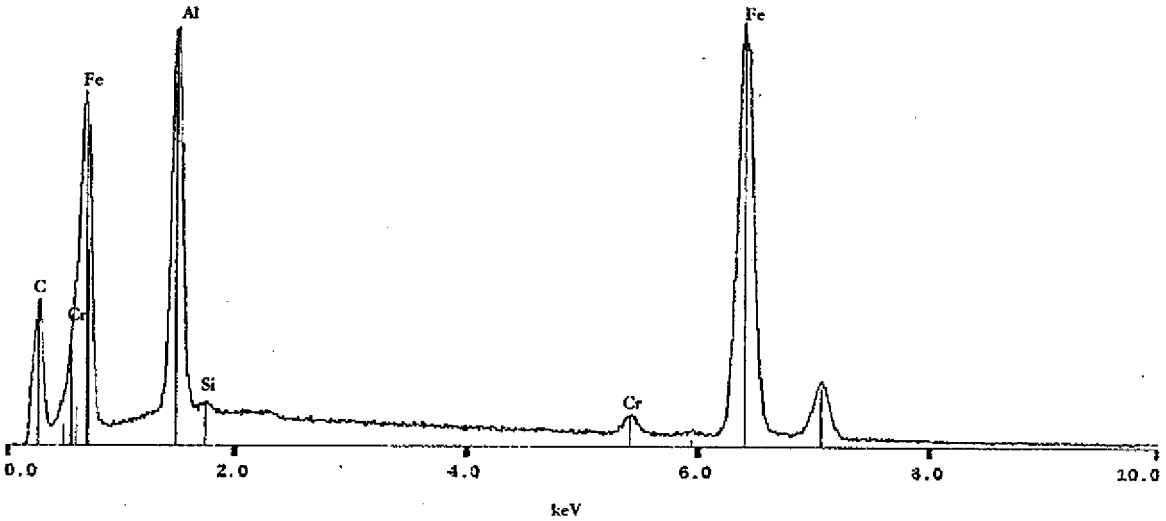

Figure 230: Spectrum of the base metal of Figure 229. Typical iron aluminide signature.

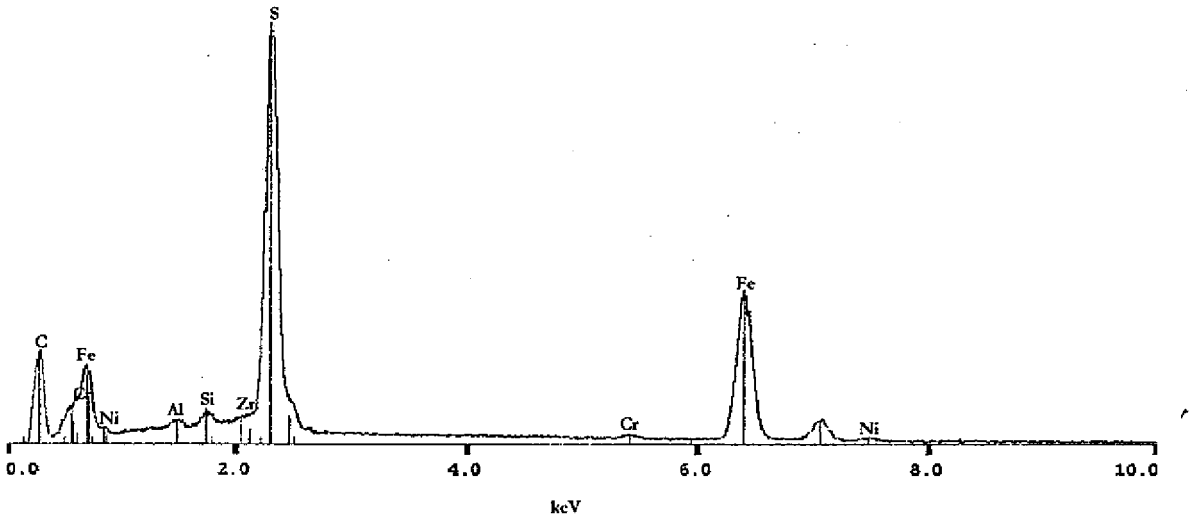

Figure 231: Spectrum of the upstream edge of Figure 229. High sulfur and iron. Strong indication of iron sulfides.

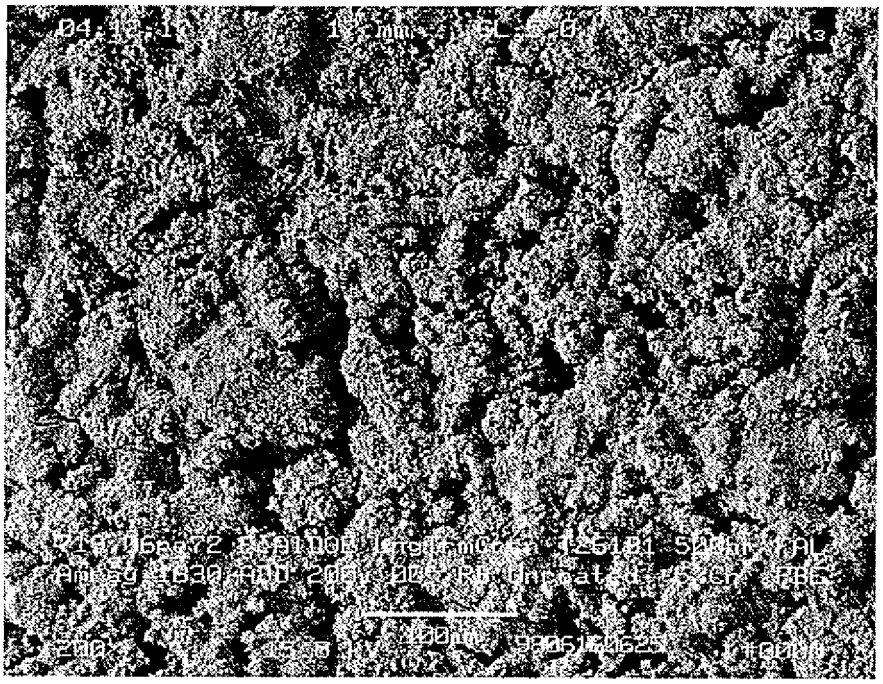

Figure 232: FAL upstream surface. Exposed for 500 hours.

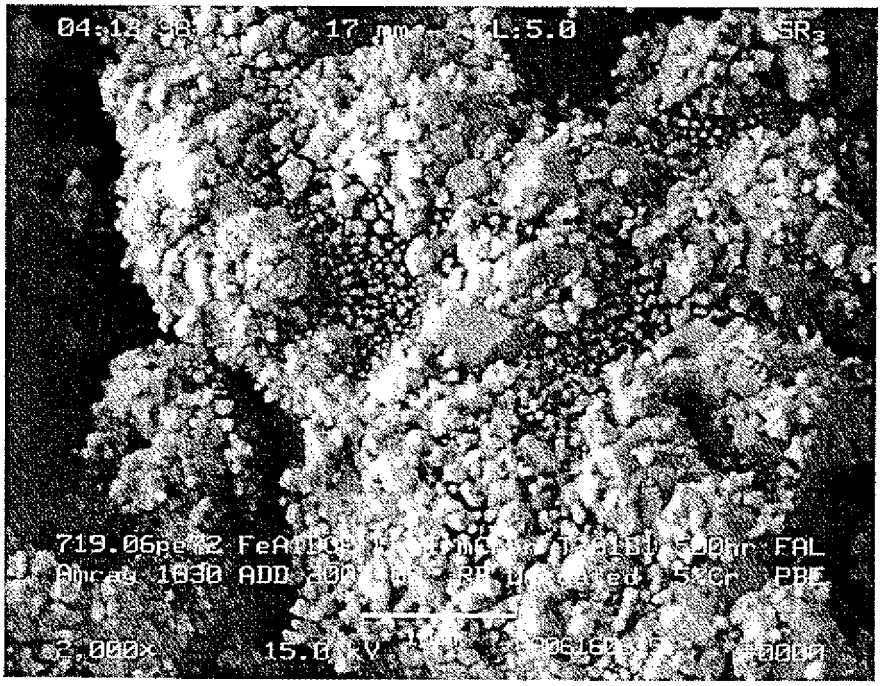

Figure 233: FAL upstream surface. Exposed for 500 hours.

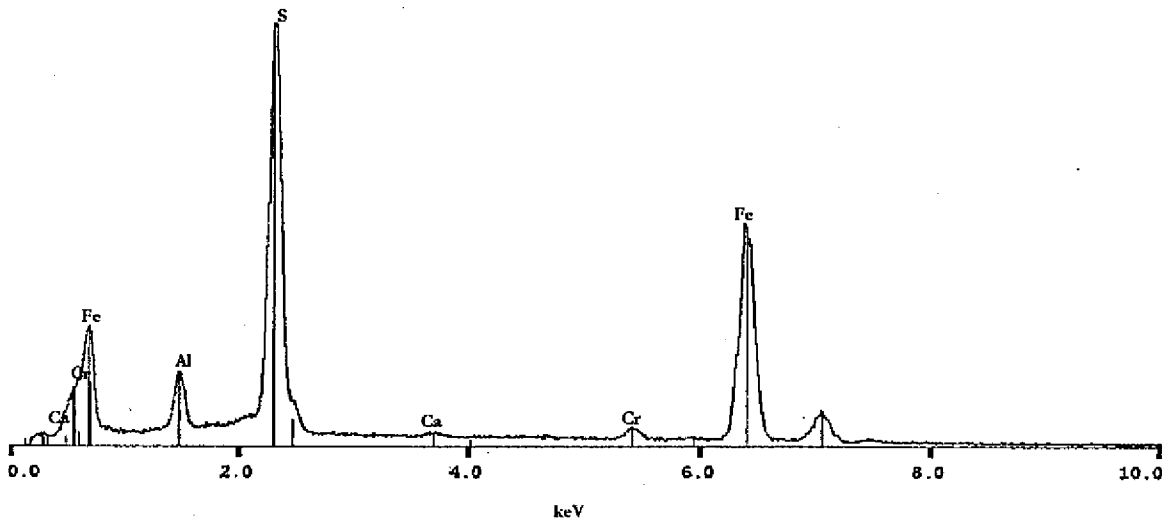

Figure 234: Full screen spectrum of Figure 233. Upstream surface of FAL sample exposed for 500 hours. Sample is probably covered with iron sulfides.

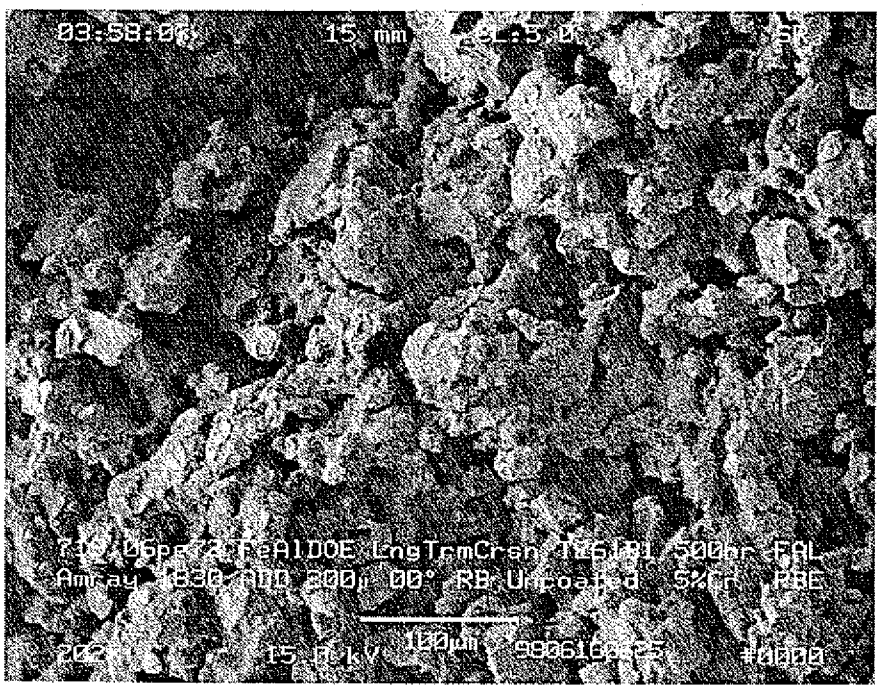

Figure 235: FAL fracture surface. Exposed for 500 hours.

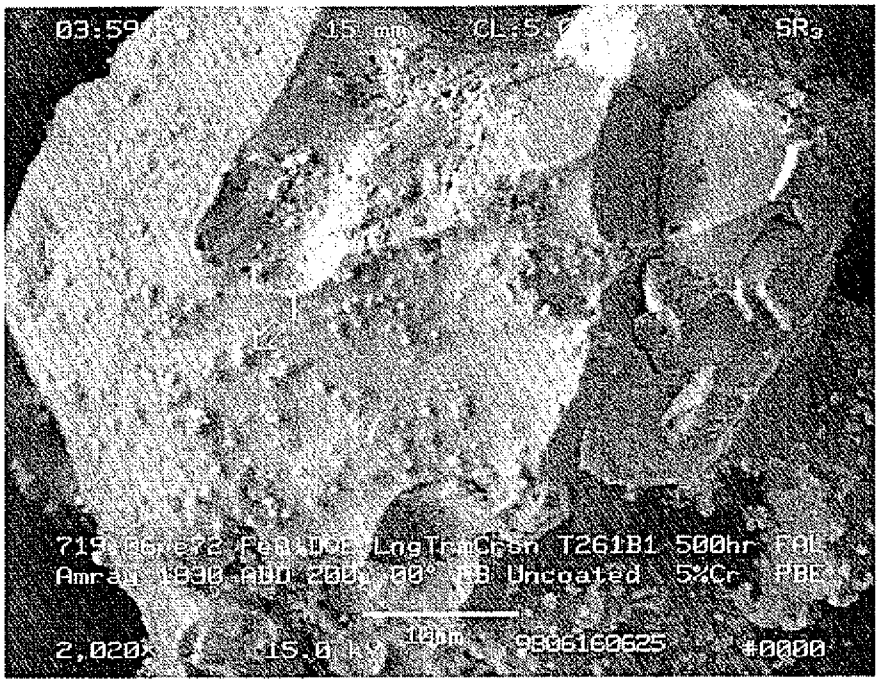

Figure 236: FAL fracture surface. Exposed for 500 hours. Typical unexposed iron aluminide fracture surface with some porosity at sinter bond, zirconium/zirconia nodules on surface. Brittle transgranular fracture. Spectrum of areas (1) and (2) presented in the following figures.

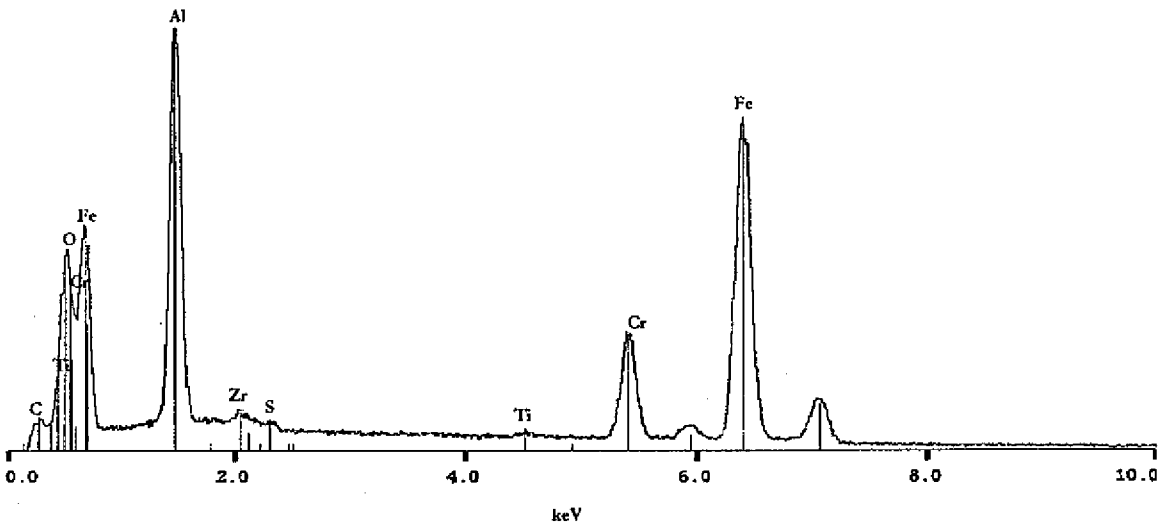

Figure 237: Full screen spectrum of Figure 236. Upstream surface of FAL sample exposed for 500 hours at 2000X. Typical iron aluminide spectrum with a small amount of sulfur.

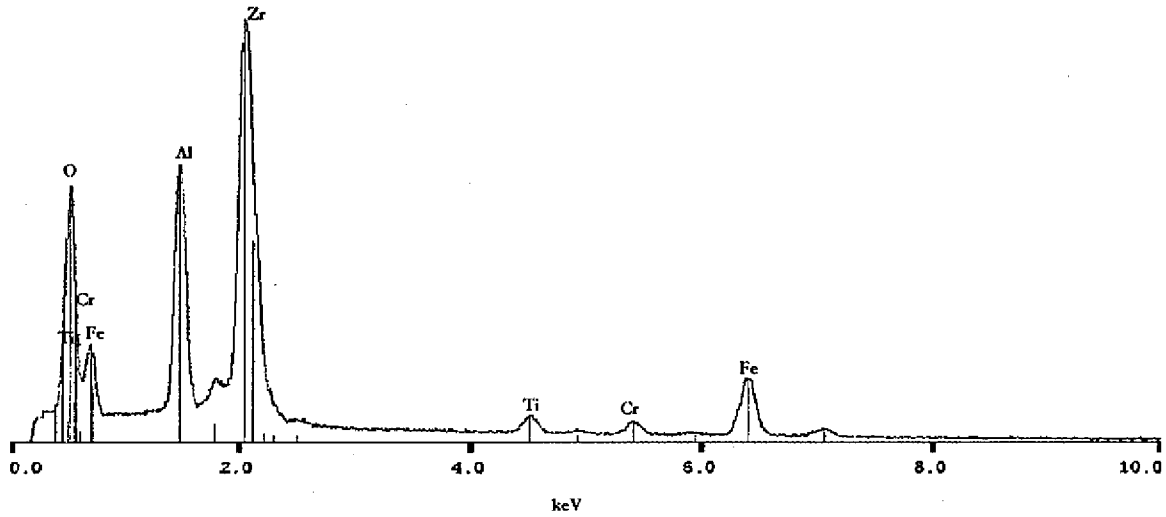

Figure 238: Spot spectrum of bright nodules (1) on Figure 236. Bright nodules are probably zirconium/zirconia.

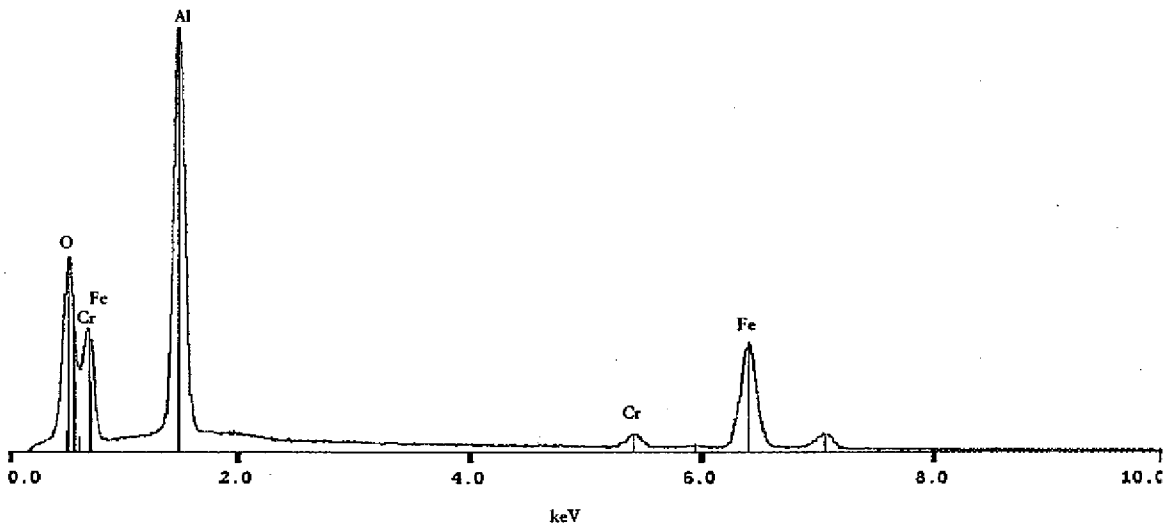

Figure 239: Spot spectrum of dark clusters (2) on Figure 236. The dark clusters are probably alumina crystals.

FAL Sample Exposed for 1000 Hours

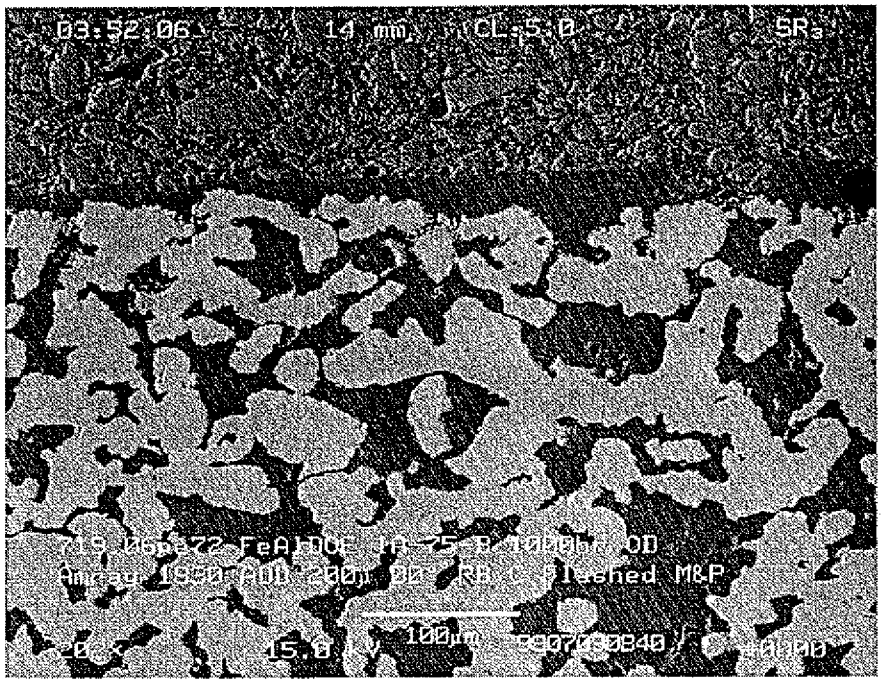

Figure 240: FAL cross-section. Upstream edge shown. Exposed for 1000 hours.

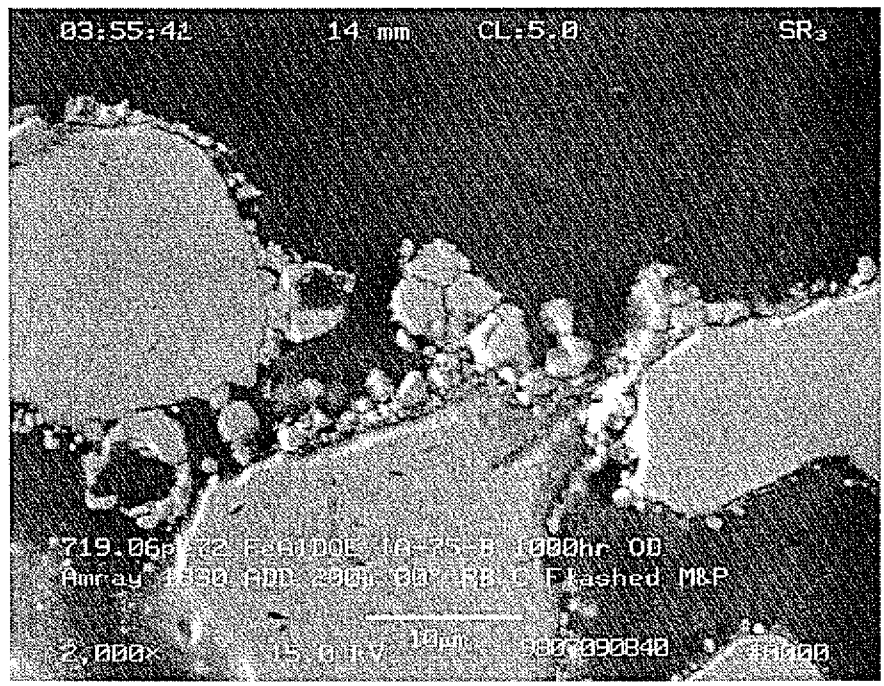

Figure 241: FAL cross-section. Upstream edge shown. Exposed for 1000 hours. Iron sulfide crystals on the upstream surface.

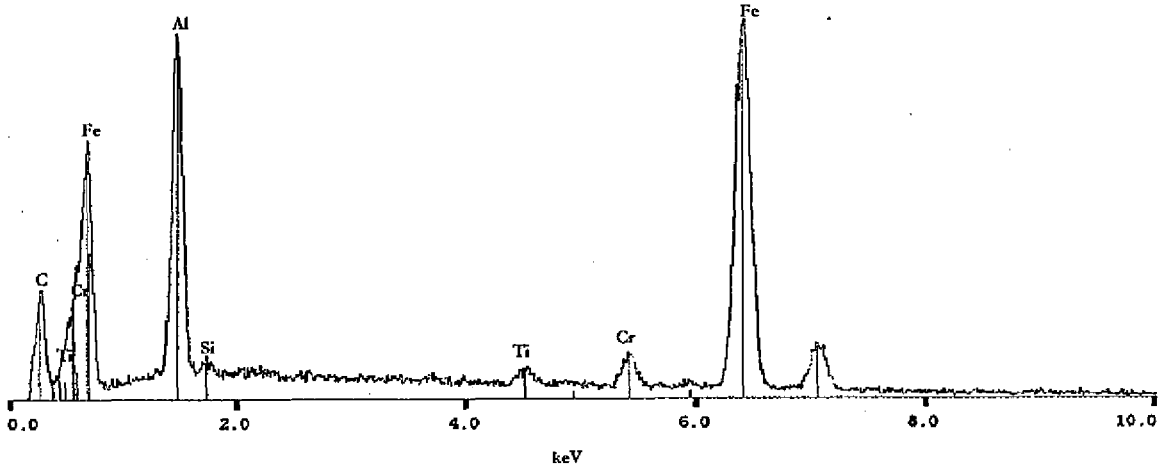

Figure 242: Partial field spectrum of base metal in Figure 241. Typical iron aluminide spectrum.

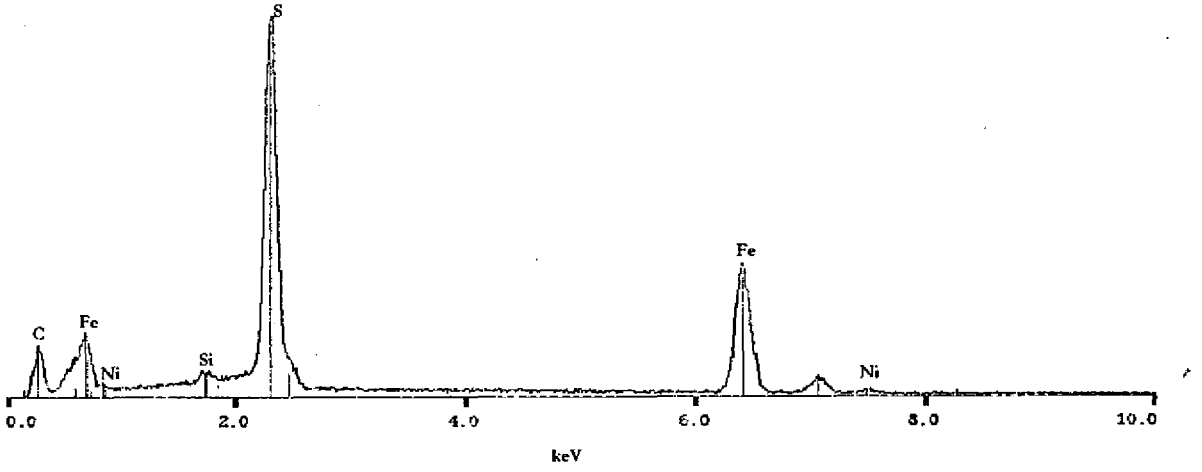

Figure 243: Partial field spectrum of upstream edge in Figure 241. High sulfur and iron. Strong indication of iron sulfides.

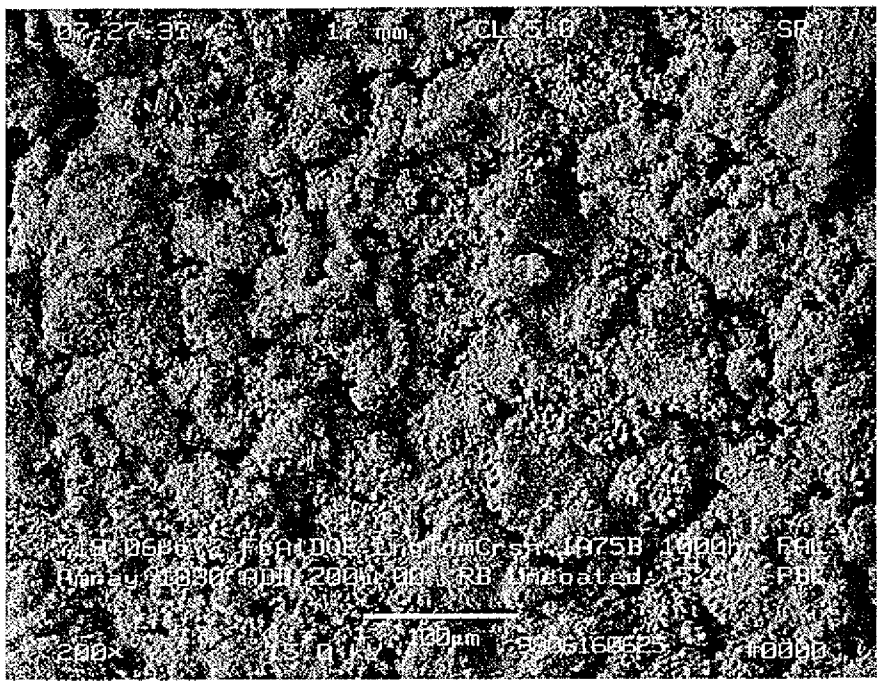

Figure 244: Upstream surface of FAL sample exposed for 1000 hours.

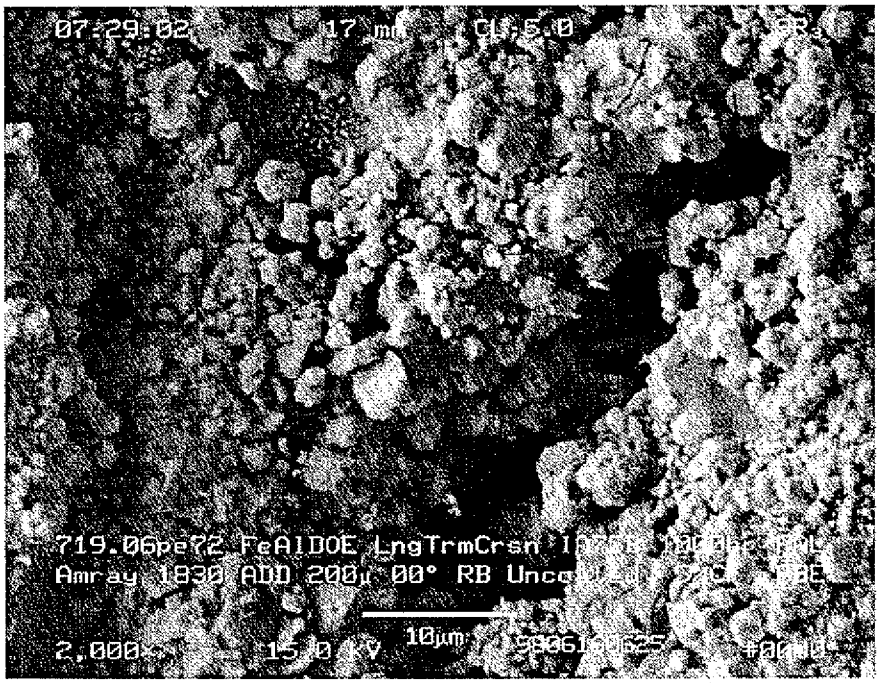

Figure 245: Upstream surface of FAL sample exposed for 1000 hours.
Samples surface is covered with iron sulfide crystals.

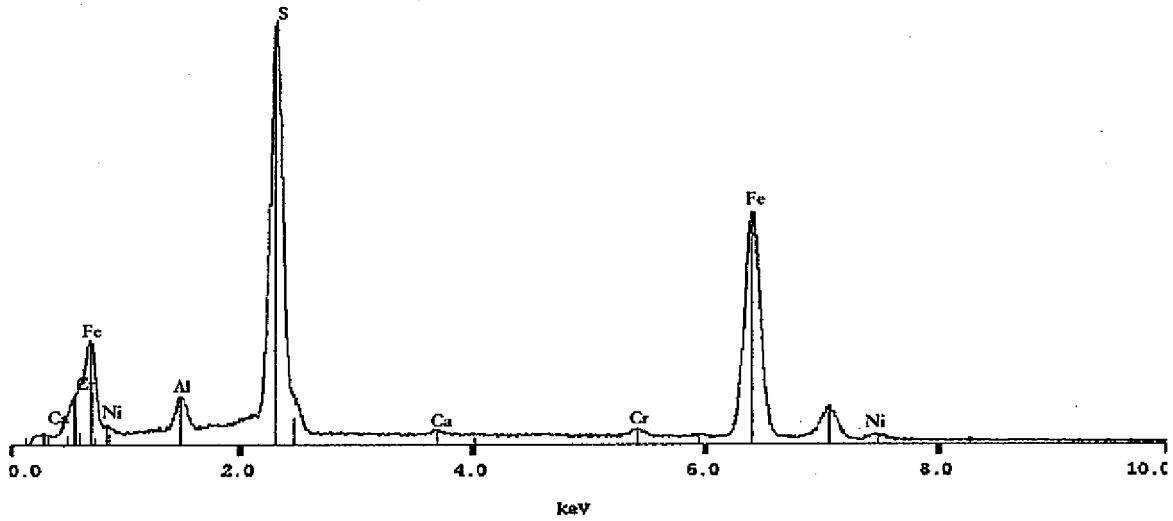

Figure 246: Full screen spectra of Figure 245. The crystals on the upstream surface are most likely iron sulfides.

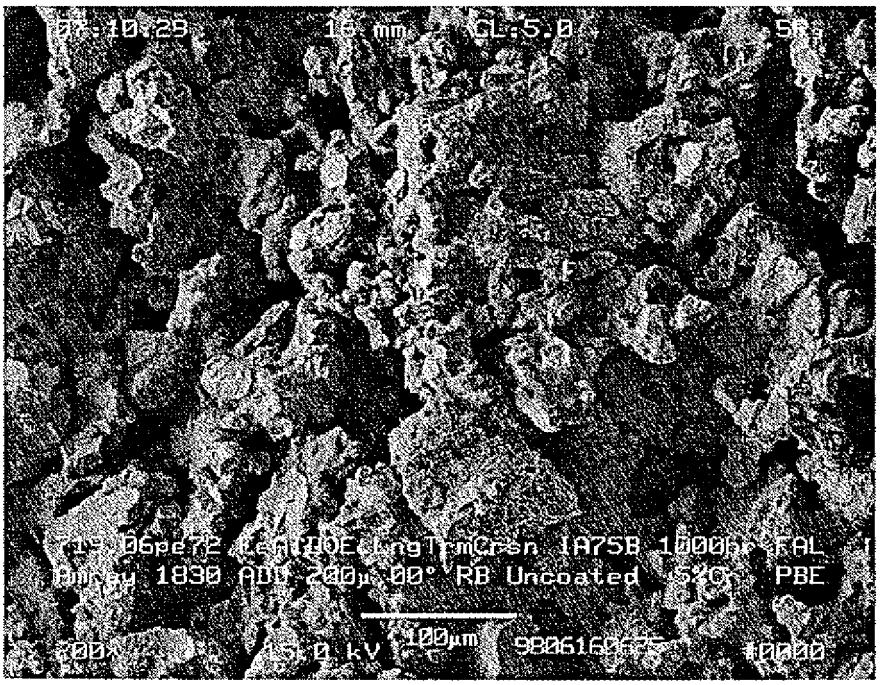

Figure 247: Fracture surface of FAL sample exposed for 1000 hours.

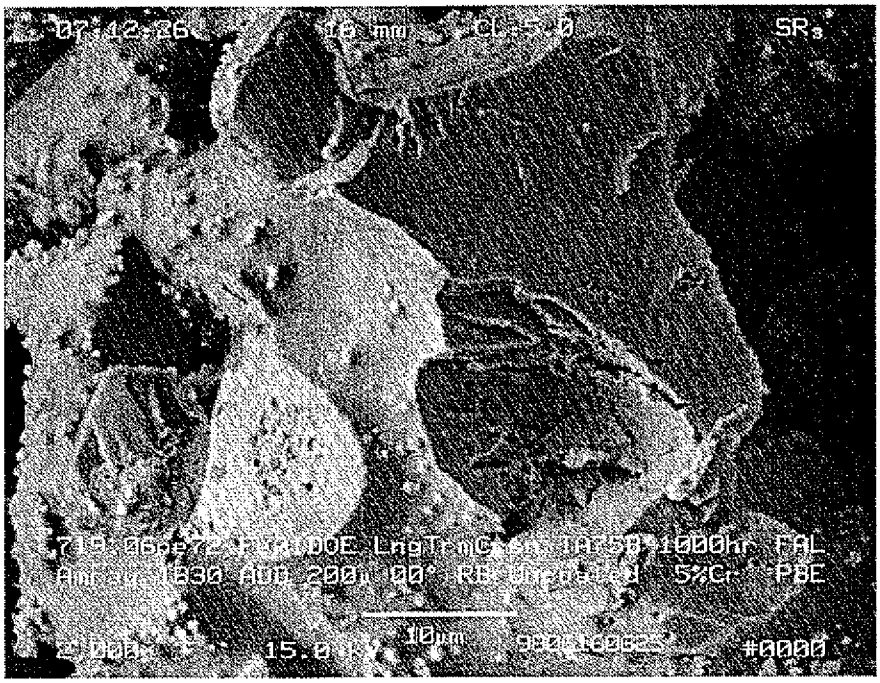

Figure 248: Fracture surface of FAL sample exposed for 1000 hours. Multiple brittle fracture surfaces with some porosity. Zirconium/zirconia nodules on particle surfaces.

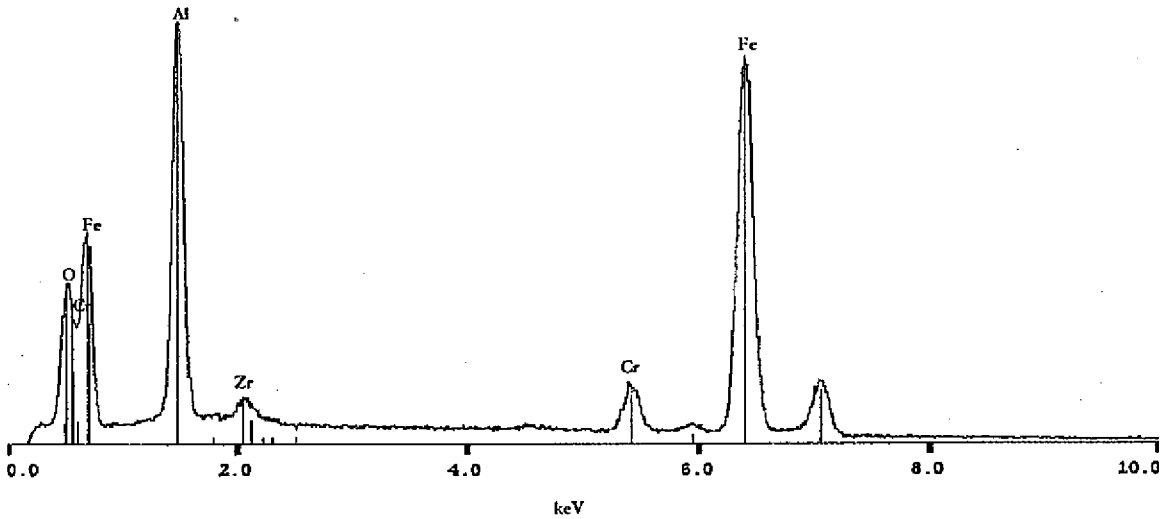

Figure 249: Full screen spectrum of Figure 248. Typical iron aluminide signature.

FAL Sample Exposed for 1000 Hours

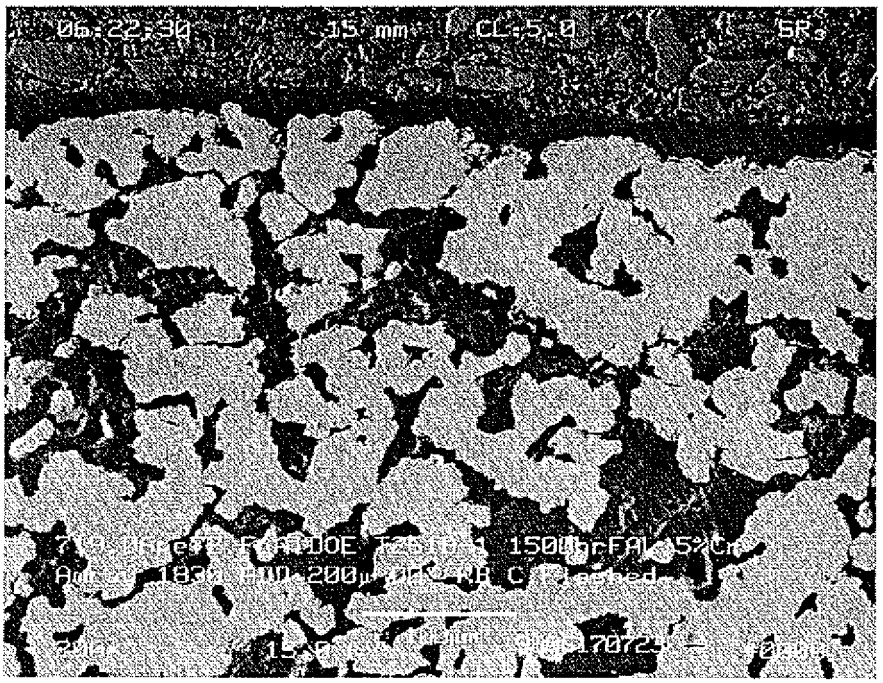

Figure 250: FAL cross-section. Upstream edge shown. Exposed for 1500 hours.

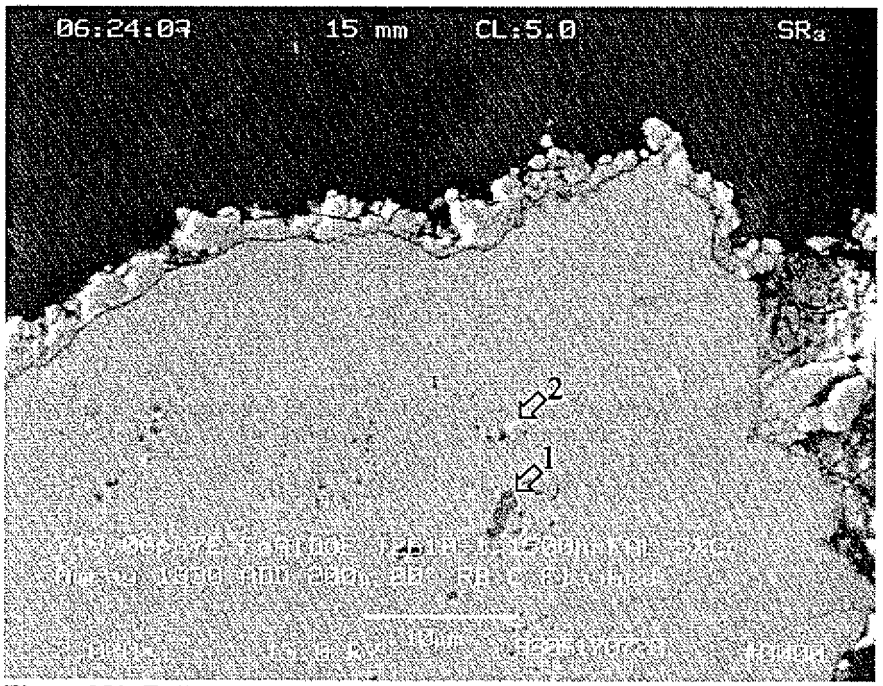

Figure 251: FAL cross-section. Upstream edge shown. Exposed for 1500 hours. Uniform layer of iron sulfide crystals on the upstream surface. Spectrum of areas (1) and (2) presented in the following figures.

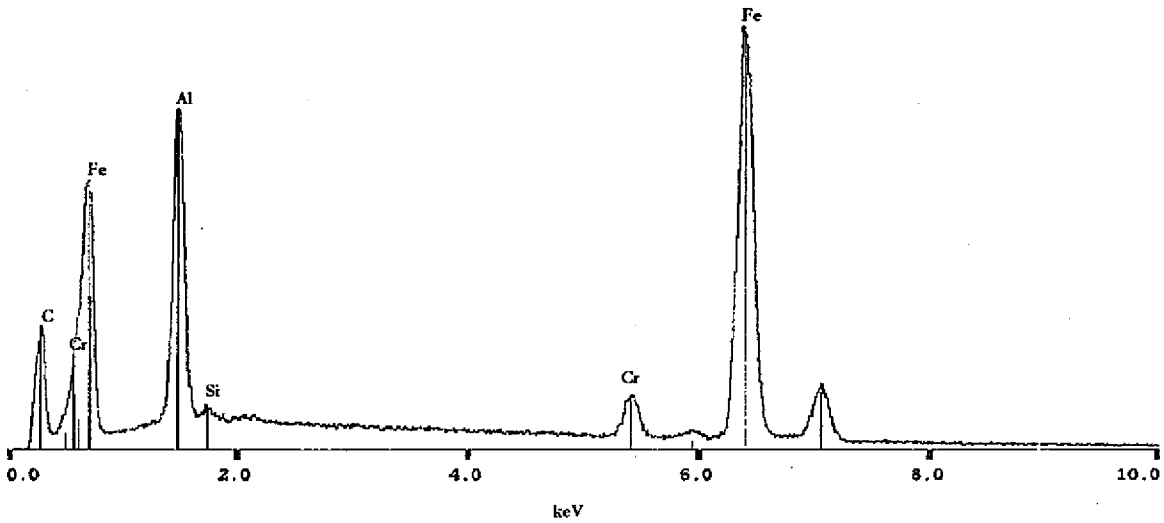

Figure 252: Partial field spectrum of the base metal of Figure 251. Typical iron aluminide signature.

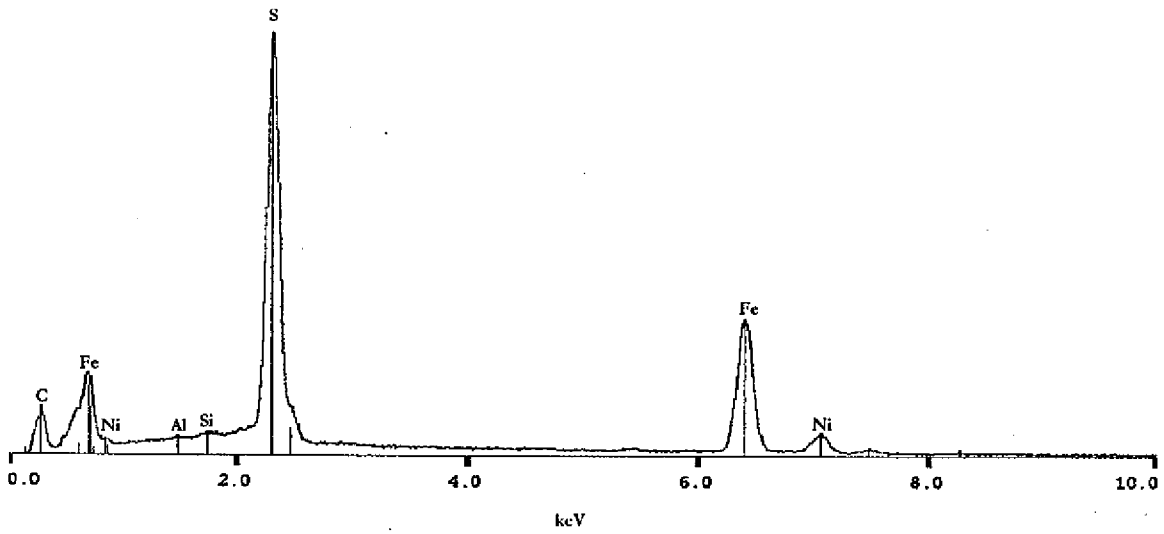

Figure 253: Upstream edge of the filter media of Figure 251. High sulfur and iron. Strong indication of iron sulfides.

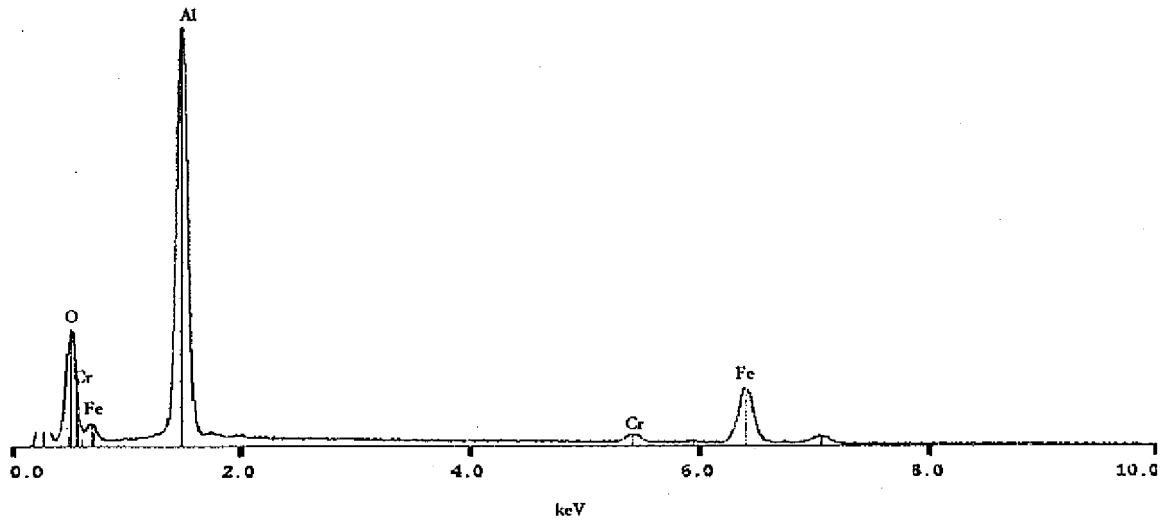

Figure 254: Spot spectrum of dark inclusions (1) in Figure 251. Alumina inclusion from the water atomization of the powdered metal.

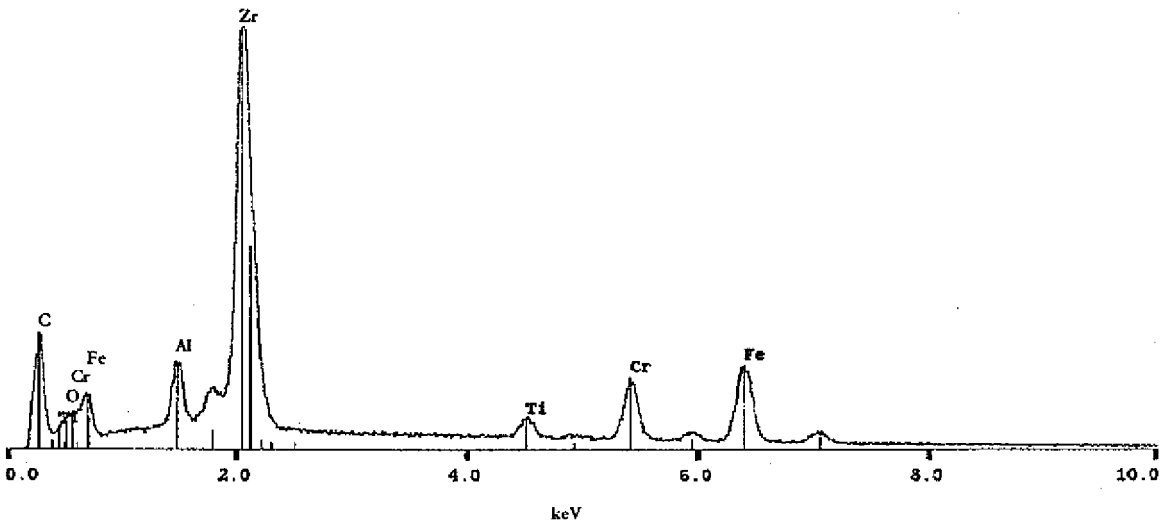

Figure 255: Spot spectrum of light inclusion (2) of Figure 251. Appears to be a zirconia inclusion.

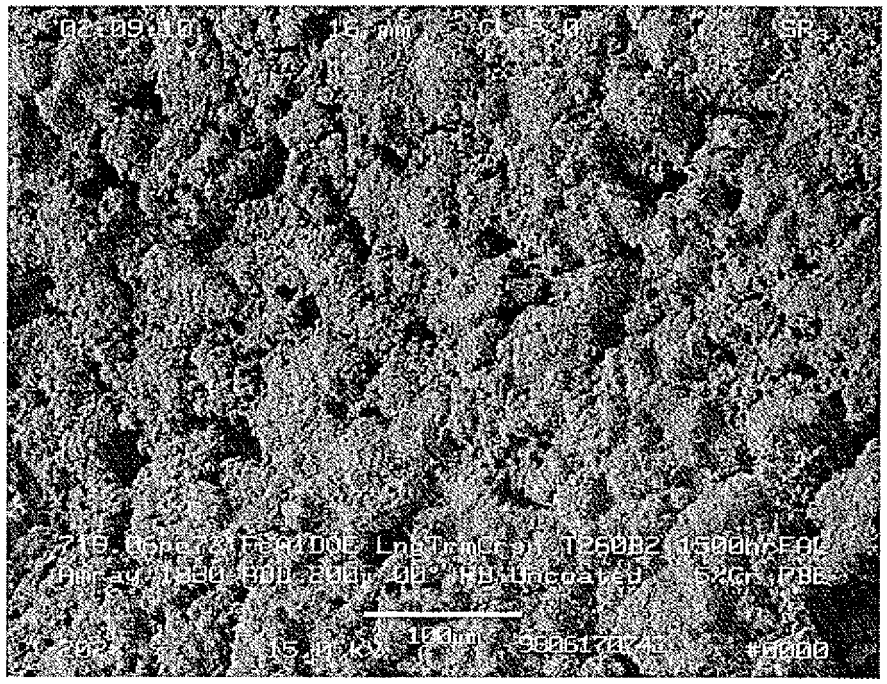

Figure 256: FAL upstream surface. Exposed for 1500 hours. Covered in a layer of crystals.

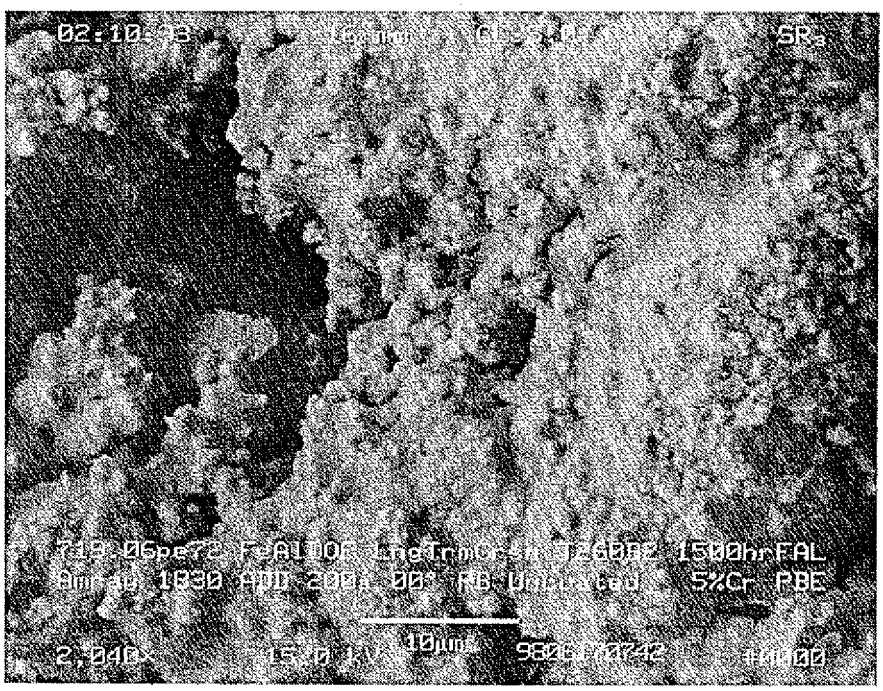

Figure 257: FAL upstream surface. Exposed for 1500 hours.

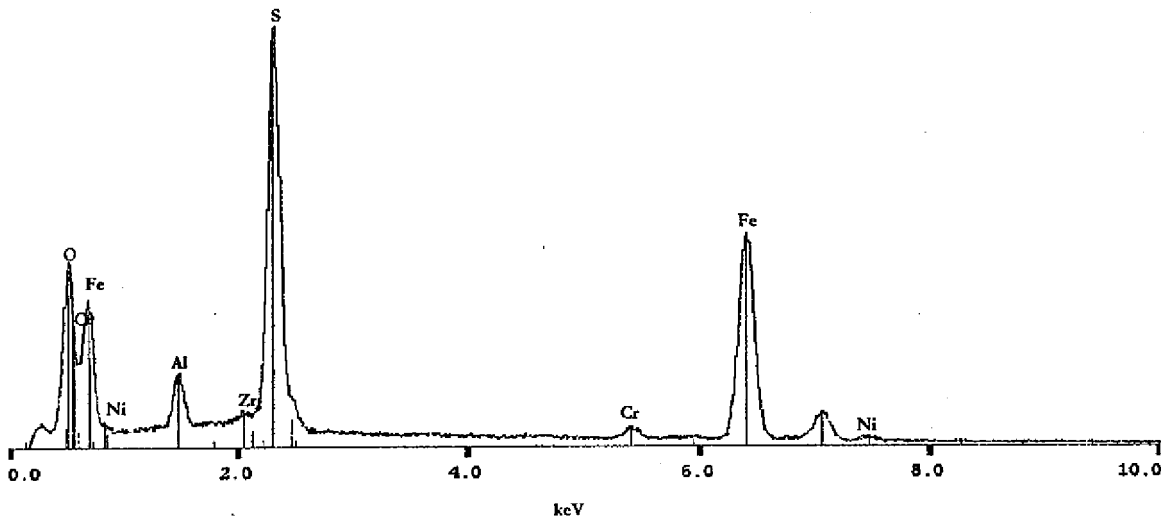

Figure 258: Full screen spectrum of Figure 257. Upstream surface of FAL sample exposed for 1,500 hours at 2000X. High sulfur and iron. Indication of iron sulfides.

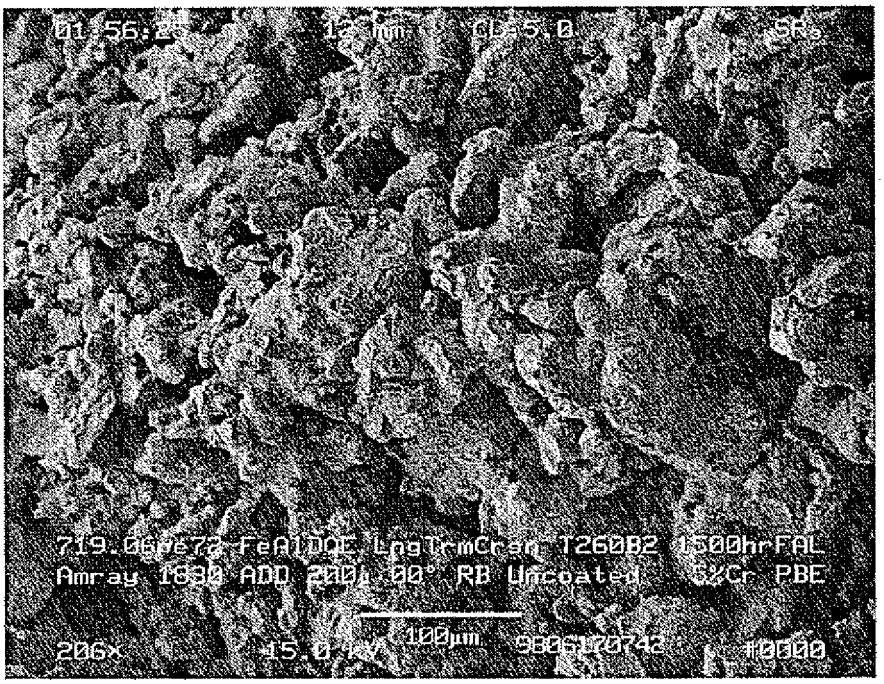

Figure 259: FAL fracture surface. Exposed for 1500 hours.

Figure 260: FAL fracture surface. Exposed for 1500 hours.

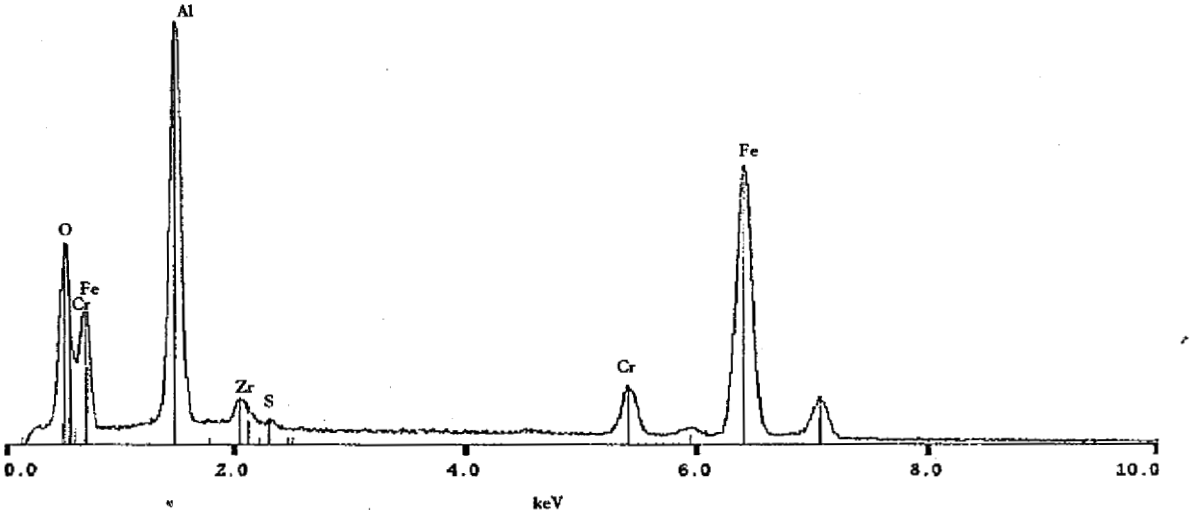

Figure 261: Full screen spectrum of Figure 260. Fracture surface of FAL sample exposed for 1,500 hours at 2000X.

APPENDIX VIII: IRON ALUMINIDE PRODUCT SPECIFICATION SHEET

PRODUCT NAME: Iron Aluminide Hot Gas Filter

PRODUCT DESCRIPTION: Iron aluminide porous metal filter element for hot gas blowback applications.

1.0 MATERIALS OF CONSTRUCTION:

1.1 Filter: the media is constructed from sintered iron aluminide metal powder. Material for the hardware is generally 310 stainless steel, but it may differ depending on application requirements.

1.2 Gaskets: vary according to application. Gasketing / sealing methods will generally be identical to other Pall porous metal filter products.

FILTER ELEMENT TYPE: cleanable

3.0 DIMENSIONS:

3.1 Overall Length: variable. Filter modules are 19.25 inches long. Up to 5 modules can be welded together to assemble elements up to 100 inches in length.

3.2 Filter Body OD: 2.38 inch (60mm)

3.3 Media Wall Thickness: .08 inch, nominal (2 mm)

4.0 FILTER FLOW CHARACTERISTICS: normal forward flow is from outside to inside. Flow is reversed (inside to outside) for reverse pulse cleaning.

5.0 FILTER GRADE: iron aluminide

6.0 FILTRATION PROPERTIES:

6.1 REMOVAL EFFICIENCY: > 99.9% removal by weight

6.2 REMOVAL RATING : 1 micron (Taken from modified F-2 test data)

7.0 FLOW PROPERTIES:

7.1 MAXIMUM RECCOMENDED FLOW RATE: 8 to 12 feet per minute

7.2 AIRFLOW ΔP: .033 psi/acfm/ft^2

8.0 MAXIMUM OPERATING TEMPERATURE: application dependent

9.0 MATERIAL PROPERTIES:

9.1 HOOP STRENGTH: 6000 psi (minimum).

APPENDIX IX: RAW DATA

Short-term Raw Data

Table 14: Raw Data - Exposure Run Number One

(925°F with 0.0783 vol.% H_2S, No Blowback, No Chlorides)

Hours	ΔP (in. H_2O)				Change in ΔP (%)			
(Days)	T-29-2	T-29-7	T-40-2	T-43-2	T-29-2	T-29-7	T-40-2	T-43-2
0 (0)	26.4	23.5	23.2	17.1	0.00	0.00	0.00	0.00
24 (1)	26.6	24.4	23.8	18.8	0.76	3.83	2.59	9.94
72 (3)	26.2	24.1	23.7	18.2	-0.76	2.55	2.16	6.43
168 (7)	27.7	25.0	24.5	20.2	4.92	6.38	5.60	18.13
(IPA) 14	26.9	24.2	24.1	18.6	1.89	2.98	3.88	8.77

Hours	Mass Filters (grams)				Change in Mass of Filters (%)			
(Days)	T-29-2	T-29-7	T-40-2	T-43-2	T-29-2	T-29-7	T-40-2	T-43-2
0 (0)	555.60	555.90	561.50	528.00	0.000	0.000	0.000	0.000
24 (1)	555.50	556.00	561.50	528.10	-0.083	0.079	0.000	0.102
72 (3)	555.60	556.01	561.52	528.17	0.000	0.087	0.015	0.173
168 (7)	555.62	556.04	561.58	528.21	0.017	0.110	0.062	0.213
(IPA) 14	555.59	555.99	561.54	528.19	-0.008	0.071	0.031	0.193

Hours	Open Bubble Point (in. H_2O)				Change in Open Bubble Point (%)			
(Days)	T-29-2	T-29-7	T-40-2	T-43-2	T-29-2	T-29-7	T-40-2	T-43-2
0 (0)	30.2	29.9	31.5	25.8	0.00	0.00	0.00	0.00
24 (1)	31.9	32.0	33.7	27.1	5.63	7.02	6.98	5.04
72 (3)	33.0	32.3	35.3	26.8	9.27	8.03	12.06	3.88
168 (7)	33.6	32.5	36.0	29.9	11.26	8.70	14.29	15.89
(IPA) 14	30.0	32.0	34.3	26.7	-0.66	7.02	8.89	3.49

Hours	First Bubble Point (in. H_2O)				Change in First Bubble Point (%)			
(Days)	T-29-2	T-29-7	T-40-2	T-43-2	T-29-2	T-29-7	T-40-2	T-43-2
0 (0)	22.6	24.1	21.9	22.5	0.00	0.00	0.00	0.00
24 (1)	21.1	24.2	20.7	23.9	-6.64	0.41	-5.48	6.22
72 (3)	20.7	23.5	26.2	22.7	-8.41	-2.89	19.63	0.89
168 (7)	26.3	26.0	25.7	25.0	16.37	7.44	17.35	11.11

Hours	Tenth Bubble Point (in. H_2O)				Change in Tenth Bubble Point (%)			
(Days)	T-29-2	T-29-7	T-40-2	T-43-2	T-29-2	T-29-7	T-40-2	T-43-2
0 (0)	26.0	26.0	24.6	24.4	0.00	0.00	0.00	0.00
24 (1)	23.0	25.5	23.7	24.2	-11.54	-1.93	-3.66	-0.82
72 (3)	24.9	25.0	27.3	23.4	-4.23	-1.96	10.98	-4.10
168 (7)	27.7	26.5	29.1	26.1	6.54	3.92	18.29	6.97

T-29-2: FAS preoxidized
T-29-7: FAS non-oxidized
T-40-2: FAL preoxidized
T-43-2: FAS-0%Cr preoxidized
(IPA): Samples cleaned in isopropyl alcohol

Table 15: Raw Data - Exposure Run Number Two

(1200°F with 0.783 vol.% H_2S, Blowback and Chrorides)

Hours	ΔP (in. H_2O)				Change in ΔP (%)			
(Days)	T-29-8	T-29-9	T-40-8	T-43-9	T-29-8	T-29-9	T-40-8	T-43-9
0 (0)	24.1	24.2	24.7	16.3	0.00	0.00	0.00	0.00
24 (1)	25.0	25.6		17.9	3.73	5.79		9.82
72 (3)	25.5	27.1	24.6	18.7	5.81	11.98	-0.40	14.72
168 (7)	27.3	28.0	24.9	20.6	13.28	15.70	0.81	26.38
336 (14)	27.8	30.5	26.6	23.9	15.35	26.03	7.69	46.63
(IPA) 14	27.0	29.4	25.7	20.6	12.03	21.49	4.05	26.38

Hours	Mass Filters (grams)				Change in Mass of Filters (%)			
(Days)	T-29-8	T-29-9	T-40-8	T-43-9	T-29-8	T-29-9	T-40-8	T-43-9
0 (0)	557.03	553.14	567.15	530.19	0.000	0.000		0.000
24 (1)	557.51	553.87		530.73	0.381	0.577		0.543
72 (3)	557.81	554.11	567.70	531.00	0.619	0.767	0.406	0.815
168 (7)	558.07	554.41	567.80	531.13	0.825	1.004	0.480	0.946
336 (14)	558.42	554.82	567.99	531.26	1.103	1.329	0.620	1.077
(IPA) 14	558.21	554.62	567.65	531.14	0.936	1.171	0.369	0.956

Hours	Open Bubble Point (in. H_2O)				Change in Open Bubble Point (%)			
(Days)	T-29-8	T-29-9	T-40-8	T-43-9	T-29-8	T-29-9	T-40-8	T-43-9
0 (0)	31.8	31.7	35.8	25.8	0.00	0.00	0.00	0.00
24 (1)	32.2	32.6		26.4	1.26	2.84		2.33
72 (3)	32.6	33.6	34.2	27.2	2.52	5.99	-4.47	5.43
168 (7)	35.7	35.8	37.6	28.9	12.26	12.93	5.03	12.02
336 (14)	34.3	34.9	35.7	27.8	7.86	10.09	-0.28	7.75
(IPA) 14	33.7	34.0	35.3	26.8	5.97	7.26	-1.40	3.88

Hours	First Bubble Point (in. H_2O)				Change in First Bubble Point (%)			
(Days)	T-29-8	T-29-9	T-40-8	T-43-9	T-29-8	T-29-9	T-40-8	T-43-9
0 (0)	25.3	24.8	28.4	24.0	0.00	0.00	0.00	0.00
24 (1)	25.8	26.0		24.0	1.98	4.84		0.00
72 (3)	26.1	27.3	26.9	23.3	3.16	10.08	-5.28	-2.92
168 (7)	24.3	22.0	6.2	25.0	-3.95	-11.29	-78.17	4.17
336 (14)	24.1	21.3	20.6	22.9	-4.74	-14.11	-27.46	-4.58
(IPA) 14	26.8	22.2	26.0	23.8	5.93	-10.48	-8.45	-0.83

Hours	Tenth Bubble Point (in. H_2O)				Change in Tenth Bubble Point (%)			
(Days)	T-29-8	T-29-9	T-40-8	T-43-9	T-29-8	T-29-9	T-40-8	T-43-9
0 (0)	26.2	25.4	25.5	24.1	0.00	0.00	0.00	0.00
24 (1)	26.6	26.2		24.2	1.53	3.15		0.41
72 (3)	27.1	27.6	28.7	23.8	3.44	5.34	12.55	-1.24
168 (7)	25.4	24.9	26.8	25.5	-3.05	-4.96	5.10	5.81
336 (14)	26.0	23.2	24.0	23.9	-0.76	-11.45	-5.88	-0.83
(IPA) 14	27.3	25.8	26.3	24.0	4.20	-1.53	3.14	-0.41

T-29-8: FAS preoxidized
T-29-9: FAS non-oxidized
T-40-8: FAL preoxidized
T-43-9: FAS-0%Cr preoxidized
(IPA): Samples cleaned in isopropyl alcohol

Table 16: Raw Data - Exposure Run Number Three

(925°F with 7.83 vol.% H_2S, Blowback and Chlorides)

Hours	ΔP (in. H_2O)				Change in ΔP (%)			
(Days)	T-42-7	T-42-2	T-40-9	T-43-8	T-42-7	T-42-2	T-40-9	T-43-8
0 (0)	25.2	25.8	26.6	17.5	0.00	0.00	0.00	0.00
24 (1)	24.5	24.8	25.8	16.5	-2.78	-3.88	-3.01	-5.71
72 (3)	25.8	25.6	27.2	18.0	2.38	-0.78	2.26	2.86
168 (7)	26.9	27.1	28.7	19.8	6.75	5.04	7.89	13.14
336 (14)	28.9	27.7	29.8	23.0	14.68	7.36	12.03	31.43
(IPA) 14	26.4	27.0	27.9	20.0	4.76	4.65	4.89	14.29

Hours	Mass Filters (grams)				Change in Mass of Filters (%)			
(Days)	T-42-7	T-42-2	T-40-9	T-43-8	T-42-7	T-42-2	T-40-9	T-43-8
0 (0)	568.38	570.47	571.03	529.58	0.000	0.000	0.000	0.000
24 (1)	568.64	571.11	571.36	529.98	0.188	0.471	0.240	0.404
72 (3)	569.10	571.50	571.79	530.51	0.520	0.758	0.552	0.939
168 (7)	568.13	572.14	571.43	529.94	-0.181	1.228	0.291	0.364
336 (14)	567.83	571.98	570.46	529.53	-0.397	1.111	-0.414	-0.050
(IPA) 14	567.40	571.54	570.16	529.21	-0.708	0.787	-0.632	-0.374

Hours	Open Bubble Point (in. H_2O)				Change in Open Bubble Point (%)			
(Days)	T-42-7	T-42-2	T-40-9	T-43-8	T-42-7	T-42-2	T-40-9	T-43-8
0 (0)	30.1	29.0	34.4	26.6	0.00	0.00	0.00	0.00
24 (1)								
72 (3)	28.4	28.0	33.9	25.6	-5.65	-3.45	-1.45	-3.76
168 (7)	28.9	30.5	36.4	27.6	-3.99	5.17	5.81	3.76
336 (14)	32.7	30.7	37.3	28.2	8.64	5.86	8.43	6.02
(IPA) 14	30.7	29.5	34.0	27.3	1.99	1.72	-1.16	2.63

Hours	First Bubble Point (in. H_2O)				Change in First Bubble Point (%)			
(Days)	T-42-7	T-42-2	T-40-9	T-43-8	T-42-7	T-42-2	T-40-9	T-43-8
0 (0)	23.8	24.0	26.6	20.9	0.00	0.00	0.00	0.00
24 (1)								
72 (3)	20.9	20.1	17.1	21.8	-12.18	-16.25	-35.71	4.31
168 (7)	27.0	25.7	23.7	23.7	13.45	7.08	-10.90	13.40
336 (14)	24.7	25.2	25.8	24.5	3.78	5.00	-3.01	17.22
(IPA) 14	24.2	23.1	26.8	22.9	1.68	-3.75	0.75	9.57

Hours	Tenth Bubble Point (in. H_2O)				Change in Tenth Bubble Point (%)			
(Days)	T-42-7	T-42-2	T-40-9	T-43-8	T-42-7	T-42-2	T-40-9	T-43-8
0 (0)	24.2	24.3	26.9	23.1	0.00	0.00	0.00	0.00
24 (1)								
72 (3)	22.6	22.3	25.0	22.4	-6.61	-8.23	-7.06	-3.03
168 (7)	27.6	26.2	27.4	24.6	14.05	7.82	1.86	6.49
336 (14)	25.8	25.5	26.5	24.6	6.61	4.94	-1.49	6.49
(IPA) 14	26.2	23.8	27.8	23.5	8.26	-2.06	3.35	1.73

T-42-7: FAS preoxidized
T-42-2: FAS non-oxidized
T-40-9: FAL preoxidized
T-43-8: FAS-0%Cr preoxidized
(IPA): Samples cleaned in isopropyl alcohol

Table 17: Raw Data - Exposure Run Number Four

(925°F with 0.783 vol.% H_2S, Blowback and Chlorides)

Hours	ΔP (in. H_2O)			Change in ΔP (%)		
(Days)	T-42-8	T-42-9	T-36-8	T-42-8	T-42-9	T-36-8
0 (0)	24.4	21.3	23.2	0.00	0.00	0.00
24 (1)	24.3	22.3	23.1	-0.41	4.69	-0.43
72 (3)	24.9	25.4	23.8	2.05	19.25	2.59
168 (7)	25.5	26.2	23.9	4.51	23.00	3.02
336 (14)	26.3	27.1	24.6	7.79	27.23	6.03
(IPA) 14	25.1	25.1	23.9	2.87	17.84	3.02

Hours	Mass Filters (grams)			Change in Mass of Filters (%)		
(Days)	T-42-8	T-42-9	T-36-8	T-42-8	T-42-9	T-36-8
0 (0)	568.38	564.71	556.39	0.000	0.000	0.000
24 (1)	568.81	565.01	556.45	0.312	0.218	0.047
72 (3)	568.86	566.11	556.54	0.348	1.016	0.118
168 (7)	569.14	565.94	556.69	0.551	0.893	0.236
336 (14)	569.34	566.10	556.95	0.695	1.009	0.441
(IPA) 14	569.15	565.87	556.83	0.558	0.842	0.346

Hours	Open Bubble Point (in. H_2O)			Change in Open Bubble Point (%)		
(Days)	T-42-8	T-42-9	T-36-8	T-42-8	T-42-9	T-36-8
0 (0)	30.9	29.4	33.6	0.00	0.00	0.00
24 (1)	29.0	28.5	33.4	-6.15	-3.06	-0.60
72 (3)	28.7	28.8	31.3	-7.12	-2.04	-6.85
168 (7)	29.8	29.8	33.9	-3.56	1.36	0.89
336 (14)	29.6	29.8	32.5	-4.21	1.36	-3.27
(IPA) 14	29.2	29.0	33.1	-5.50	-1.36	-1.49

Hours	First Bubble Point (in. H_2O)			Change in First Bubble Point (%)		
(Days)	T-42-8	T-42-9	T-36-8	T-42-8	T-42-9	T-36-8
0 (0)	21.9	24.7	22.3	0.00	0.00	0.00
24 (1)	23.3	23.7	22.7	6.39	-4.05	1.79
72 (3)	24.3	23.8	26.3	10.96	-3.64	17.94
168 (7)	25.1	25.2	27.1	14.61	2.02	21.52
336 (14)	22.7	9.5	20.8	3.65	-61.54	-6.73
(IPA) 14	22.8	13.4	23.0	4.11	-45.75	3.14

Hours	Tenth Bubble Point (in. H_2O)			Change in Tenth Bubble Point (%)		
(Days)	T-42-8	T-42-9	T-36-8	T-42-8	T-42-9	T-36-8
0 (0)	23.2	23.1	23.2	0.00	0.00	0.00
24 (1)	23.9	24.1	23.4	3.02	4.33	0.86
72 (3)	24.8	24.8	26.5	6.90	2.90	14.22
168 (7)	25.4	25.5	27.4	9.48	5.81	18.10
336 (14)	23.4	21.8	24.7	0.86	-9.54	6.47
(IPA) 14	23.7	21.3	25.0	2.16	-11.62	7.76

T-42-8: FAS preoxidized
T-42-9: FAS non-oxidized
T-36-8: FAL preoxidized
(IPA): Samples cleaned in isopropyl alcohol

Table 18 : Raw Data - Exposure Run Number Five

(1050°F with 0.0783 vol.% H_2S, Blowback and Chlorides)

Hours	ΔP (in. H_2O)				Change in ΔP (%)			
(Days)	T-77-1	T-78-1	T-92-1	T-55-1	T-77-1	T-78-1	T-92-1	T-55-1
0 (0)	21.3	20.7	21.7	41.4	0.00	0.00	0.00	0.00
24 (1)	21.3	21.0	21.7	42.2	0.00	1.45	0.00	1.93
72 (3)	22.0	21.9	22.4	43.8	3.29	5.80	3.23	5.80
168 (7)	25.6	26.1	25.9	46.8	20.19	26.09	19.35	13.04
336 (14)	23.4	23.3	23.1	44.5	9.86	12.56	6.45	7.49
(IPA) 14	21.1	21.2	21.2	41.8	-0.94	2.42	-2.30	0.97

Hours	Mass Filters (grams)				Change in Mass of Filters (%)			
(Days)	T-77-1	T-78-1	T-92-1	T-55-1	T-77-1	T-78-1	T-92-1	T-55-1
0 (0)	567.40	578.30	578.37	569.28	0.000	0.000	0.000	0.000
24 (1)	567.42	578.51	578.47	569.36	0.017	0.167	0.082	0.069
72 (3)	567.41	578.53	578.39	569.42	0.008	0.183	0.016	0.121
168 (7)	567.57	578.61	578.47	569.56	0.143	0.247	0.082	0.241
336 (14)	567.70	578.71	578.62	569.65	0.252	0.326	0.205	0.319
(IPA) 14	567.58	578.58	578.52	569.59	0.151	0.223	0.123	0.267

Hours	Open Bubble Point (in. H_2O)				Change in Open Bubble Point (%)			
(Days)	T-77-1	T-78-1	T-92-1	T-55-1	T-77-1	T-78-1	T-92-1	T-55-1
0 (0)	29.1	29.1	30.4	33.4	0.00	0.00	0.00	0.00
24 (1)	29.6	29.1	29.3	33.9	1.72	0.00	-3.62	1.50
72 (3)	29.2	29.8	29.7	33.4	0.34	2.41	-2.30	0.00
168 (7)	30.5	29.8	31.3	34.9	4.81	2.41	2.96	4.49
336 (14)	31.6	30.9	32.1	34.9	8.59	6.19	5.59	4.49
(IPA) 14	29.4	29.8	27.9	33.6	1.03	2.41	-8.22	0.60

Hours	First Bubble Point (in. H_2O)				Change in First Bubble Point (%)			
(Days)	T-77-1	T-78-1	T-92-1	T-55-1	T-77-1	T-78-1	T-92-1	T-55-1
0 (0)	19.4	19.6	21.9	25.2	0.00	0.00	0.00	0.00
24 (1)	24.4	24.2	23.2	25.9	25.77	23.47	5.94	2.78
72 (3)	25.1	25.1	22.6	26.9	29.38	28.06	3.20	6.75
168 (7)	25.6	22.1	23.2	26.6	31.96	12.76	5.94	5.56
336 (14)	21.6	24.4	22.4	27.2	11.34	24.49	2.28	7.94
(IPA) 14	22.5	20.9	22.5	24.9	15.98	6.63	2.74	-1.19

Hours	Tenth Bubble Point (in. H_2O)				Change in Tenth Bubble Point (%)			
(Days)	T-77-1	T-78-1	T-92-1	T-55-1	T-77-1	T-78-1	T-92-1	T-55-1
0 (0)	21.0	21.7	22.3	25.6	0.00	0.00	0.00	0.00
24 (1)	24.9	25.0	24.0	26.4	18.57	15.21	7.62	3.12
72 (3)	25.4	25.6	23.0	27.8	20.95	17.97	3.14	8.59
168 (7)	24.6	23.1	23.6	27.3	17.14	6.45	5.83	6.64
336 (14)	23.0	22.8	23.7	27.5	9.52	5.07	6.28	7.42
(IPA) 14	23.7	22.4	23.1	26.5	12.86	3.23	3.59	3.52

T-77-1: FAS preoxidized
T-78-1: FAS non-oxidized
T-92-1: FAL preoxidized
T-55-1: FAS-0%Cr preoxidized
(IPA): Samples cleaned in isopropyl alcohol

Table 19: Raw Data - Exposure Run Number Six

(1200°F with 7.83 vol.% H_2S, Blowback and Chlorides)

Hours	ΔP (in. H_2O)				Change in ΔP (%)			
(Days)	T-173-C-1	T-173-C-2	T-146-BB-1	T-146-BB-	T-173-C-1	T-173-C-2	T-146-BB-1	T-146-BB-2
0 (0)	22.3	28.1	11.7	14.8	0.00	0.00	0.00	0.00
24 (1)	22.4	28.1	11.9	15.8	0.45	0.00	1.71	6.76
72 (3)	22.3	33.4	11.9	18.4	0.00	18.86	1.71	24.32
168 (7)	23.8	91.4	13.0	30.2	6.73	225.27	11.11	104.05
336 (14)	24.4	440.0	13.4	60.9	9.42	1465.84	14.53	311.49
(IPA) 14	23.9	444.0	13.0	60.4	7.17	1480.07	11.11	308.11

Hours	Mass Filters (grams)				Change in Mass of Filters (%)			
(Days)	T-173-C-1	T-173-C-2	T-146-BB-1	T-146-BB-	T-173-C-1	T-173-C-2	T-146-BB-1	T-146-BB-2
0 (0)	138.75	136.25	139.48	140.35	0.000	0.000	0.000	0.000
24 (1)	138.83	136.40	139.57	140.47	0.059	0.110	0.065	0.090
72 (3)	138.93	136.74	139.66	140.70	0.130	0.356	0.130	0.251
168 (7)	139.13	138.55	139.84	141.43	0.272	1.684	0.258	0.773
336 (14)	139.50	150.05	140.05	143.35	0.545	10.126	0.413	2.140
(IPA) 14	139.44	149.93	140.03	143.37	0.501	10.037	0.398	2.153

Hours	Open Bubble Point (in. H_2O)				Change in Open Bubble Point (%)			
(Days)	T-173-C-1	T-173-C-2	T-146-BB-1	T-146-BB-	T-173-C-1	T-173-C-2	T-146-BB-1	T-146-BB-2
0 (0)	31.1	33.8	27.8	32.5	0.00	0.00	0.00	0.00
24 (1)	31.8	34.3	29.6	31.9	2.25	1.48	6.47	-1.85
72 (3)	31.2	35.7	29.2	36.1	0.32	5.62	5.04	11.08
168 (7)	31.9	52.6	29.9	38.4	2.57	55.62	7.55	18.15
336 (14)	30.2	60.0	30.2	48.0	-2.89	77.51	8.63	47.69
(IPA) 14	31.8		28.9	46.2	2.25		3.96	42.15

Hours	First Bubble Point (in. H_2O)				Change in First Bubble Point (%)			
(Days)	T-173-C-1	T-173-C-2	T-146-BB-1	T-146-BB-	T-173-C-1	T-173-C-2	T-146-BB-1	T-146-BB-2
0 (0)	22.8	22.9	20.5	25.0	0.00	---	0.00	0.00
24 (1)	17.3		23.2	25.4	-24.12	---	13.17	1.60
72 (3)	22.0		20.8	24.1	-3.51	---	1.46	-3.60
168 (7)	23.6		24.3	29.4	3.51	---	18.54	17.60
336 (14)	22.8		23.2	30.5	0.00	---	13.17	22.00
(IPA) 14	21.1		23.4	31.0	-7.46	---	14.15	24.00

Hours	Tenth Bubble Point (in. H_2O)				Change in Tenth Bubble Point (%)			
(Days)	T-173-C-1	T-173-C-2	T-146-BB-1	T-146-BB-	T-173-C-1	T-173-C-2	T-146-BB-1	T-146-BB-2
0 (0)	25.0	25.1	23.7	25.7	0.00	---	0.00	0.00
24 (1)	19.8		24.7	26.4	-20.80	---	4.22	2.72
72 (3)	22.7		22.6	26.5	-9.20	---	-4.64	3.11
168 (7)	24.1		24.4	29.9	-3.60	---	2.95	16.34
336 (14)	23.6		23.9	33.3	-5.60	---	0.84	29.57
(IPA) 14	25.0		24.0	35.0	0.00	---	1.27	36.19

T-173-C-1 FAS 800°C Preoxidation
T-173-C-2 FAS 1000°C Preoxidation
T-146-BB-1 FAL 800°C Preoxidation
T-146-BB-2 FAL 1000°C Preoxidation
(IPA): Samples cleaned in isopropyl alcohol

Long-Term Raw Data

Table 20: Mass (grams) of Iron Aluminide Filters (Raw Data)

Time (hours)	FAS sample #1	FAS sample #3	FAS sample #2	FAL sample #1	FAL sample #3	FAL sample #2
0	139.0473	139.3366	137.9868	143.7777	143.5160	141.4333
31	139.0808	139.3725		144.0290	143.5578	
62	139.1097	139.4025		144.0505	143.5758	
125	139.1352	139.4298		144.0723	143.6066	
250	139.2219	139.5179		144.1511	143.6911	
500	139.4493	139.7652		144.3741	143.9308	
750		139.7903	138.1535		143.9650	141.5879
1000		139.7869	138.2042		143.9349	141.6463
1250		139.8484	138.3036		144.0039	141.7374
1500		139.8864	138.3593		144.0649	141.8279
Cleaned	139.2686	139.7667		144.2034	143.9258	

Table 21: Pressure Drop (in. H_2O) of Iron Aluminide Filters (Raw Data)

Time (hours)	FAS sample #1	FAS sample #3	FAS sample #2	FAL sample #1	FAL sample #3	FAL sample #2
0	15.6	15.3	19.6	15.8	15.6	19.2
31	16.5	16.1		18.0	16.4	
62	16.1	15.9		17.5	16.0	
125	17.1	17.0		18.7	17.2	
250	18.2	18.0		19.9	18.2	
500	25.4	25.3		27.8	25.6	
750		26.3	21.7		26.7	21.6
1000		26.9	22.2		26.7	22.0
1250		30.7	25.6		31.4	25.2
1500		32.9	29.1		33.5	26.7
Cleaned	21.6	20.7	20.1	23.1	21.1	20.7

Table 22: First Bubble Point (in. H_2O) of Iron Aluminide Filters (Raw Data)

Time (hours)	FAS sample #1	FAS sample #3	FAS sample #2	FAL sample #1	FAL sample #3	FAL sample #2
0	20.5	20.5	20.5	22.5	22.0	22.5
31	18.9	19.0		23.0	24.1	
62	19.2	19.1		22.1	24.0	
125	20.8	18.1		23.6	17.8	
250	20.8	19.1		19.2	20.8	
500	12.4	21.5		20.0	25.3	
750		20.6	15.1		19.9	20.3
1000		22.7	21.8		24.5	19.9
1250		21.0	29.1		8.0	3.3
1500		8.9	4.8		21.2	7.9
Cleaned	19.5	17.7	18.2	23.0	21.7	5.0

Table 23: Tenth Bubble Point (in. H_2O) of Iron Aluminide Filters (Raw Data)

Time (hours)	FAS sample #1	FAS sample #3	FAS sample #2	FAL sample #1	FAL sample #3	FAL sample #2
0	21.9	21.0	21.9	23.6	22.9	22.8
31	22.9	20.6		23.1	24.5	
62	19.8	20.6		23.7	24.5	
125	21.9	19.2		24.4	23.8	
250	21.5	20.8		23.1	23.0	
500	24.7	21.9		26.0	26.0	
750		23.0	20.9		26.0	22.5
1000		23.0	22.6		25.8	22.0
1250		21.0	23.6		24.3	22.4
1500		21.7	20.5		25.7	20.8
Cleaned	23.1	19.6	19.2	25.2	23.4	22.0

Table 24: Open Bubble Point (in. H_2O) of Iron Aluminide Filter (Raw Data)

Time (hours)	FAS sample #1	FAS sample #3	FAS sample #2	FAL sample #1	FAL sample #3	FAL sample #2
0	25.3	25.0	28.3	25.9	26.5	27.5
31	24.2	26.9		30.0	31.0	
62	26.3	26.5		30.8	29.5	
125	26.1	25.9		29.2	29.0	
250	25.8	26.6		29.6	30.2	
500	32.7	34.7		36.2	36.0	
750		36.2	29.2		35.0	30.1
1000		35.3	29.0		34.9	29.3
1250		33.0	29.1		36.0	30.0
1500		39.0	33.0		35.0	35.0
Cleaned	28.5	26.6	25.4	33.0	30.2	26.1