APPENDIX V:SEM IMAGES AND SPECTRA OF SHORT-TERM EXPOSURE SAMPLES

Powder Images

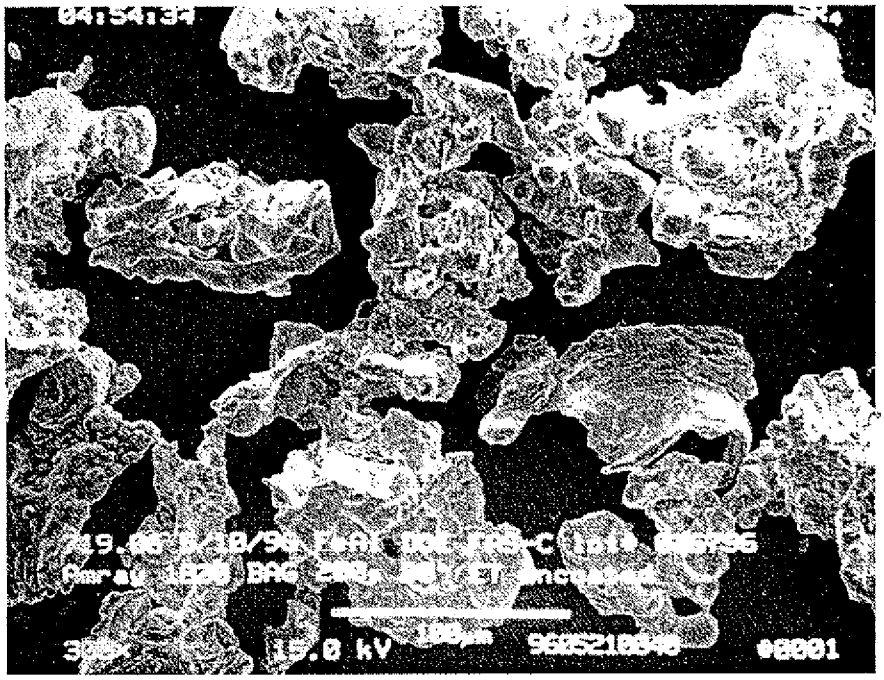

Figure 58: SEM image of FAS water-atomized powder. (300X)

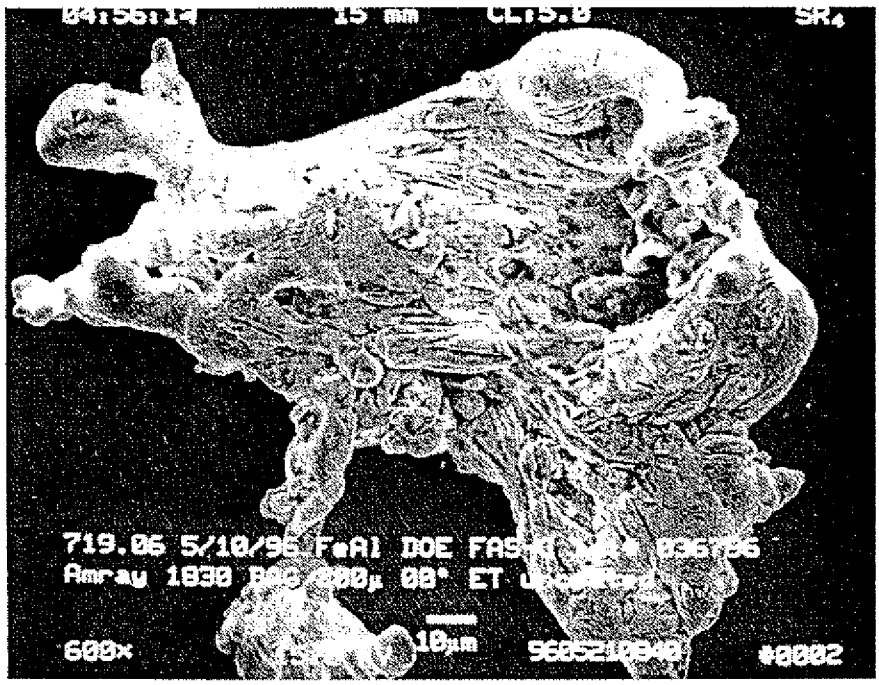

Figure 59: SEM image of FAS water-atomized powder. FAL powder has a similar morphology. (600X)

Control Samples for Exposure Runs 1 - 4

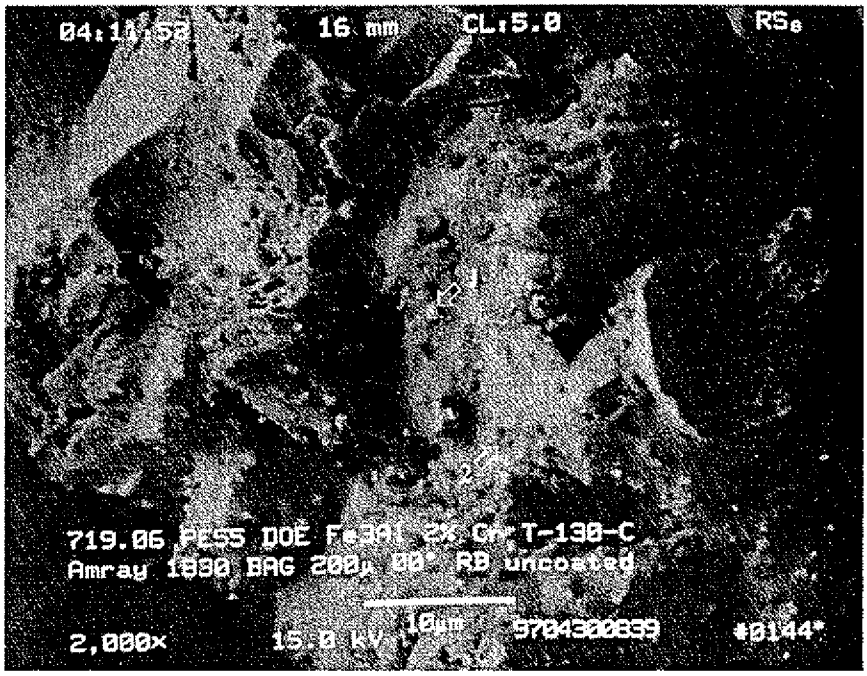

Figure 60: FAS control sample. As-sintered media. Fracture surface of the interior of the media. Bright areas (1) are zirconia and dark areas (2) are alumina. (T-130-C) (2,000X)

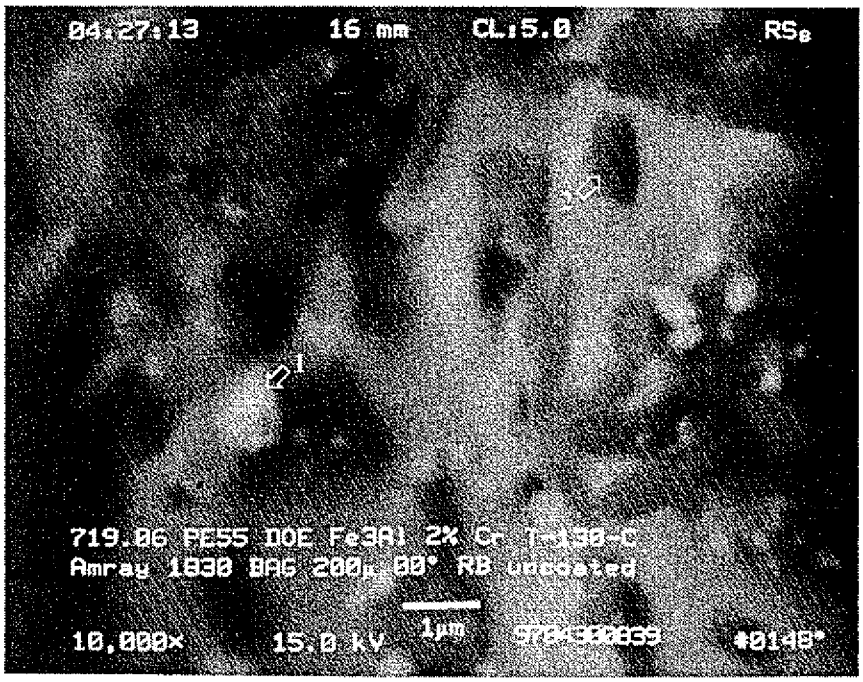

Figure 61: FAS control sample. As-sintered media. Fracture surface of the interior of the media. Bright areas (1) are zirconia and dark areas (2) are alumina. (T-130-C) (10,000X)

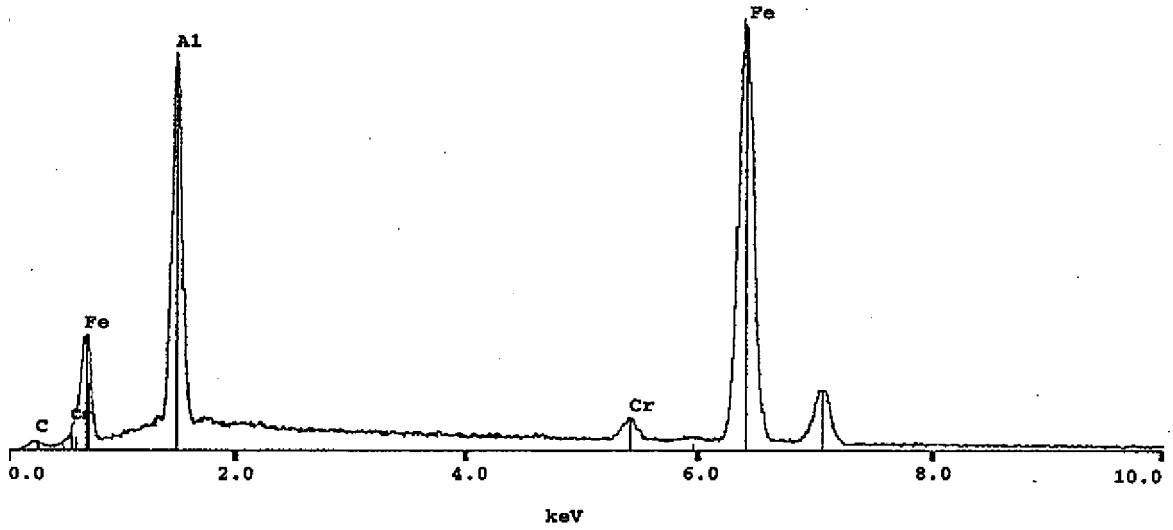

Figure 62: Spot spectrum of fracture surface of Figure 60. Typical iron aluminide signature.

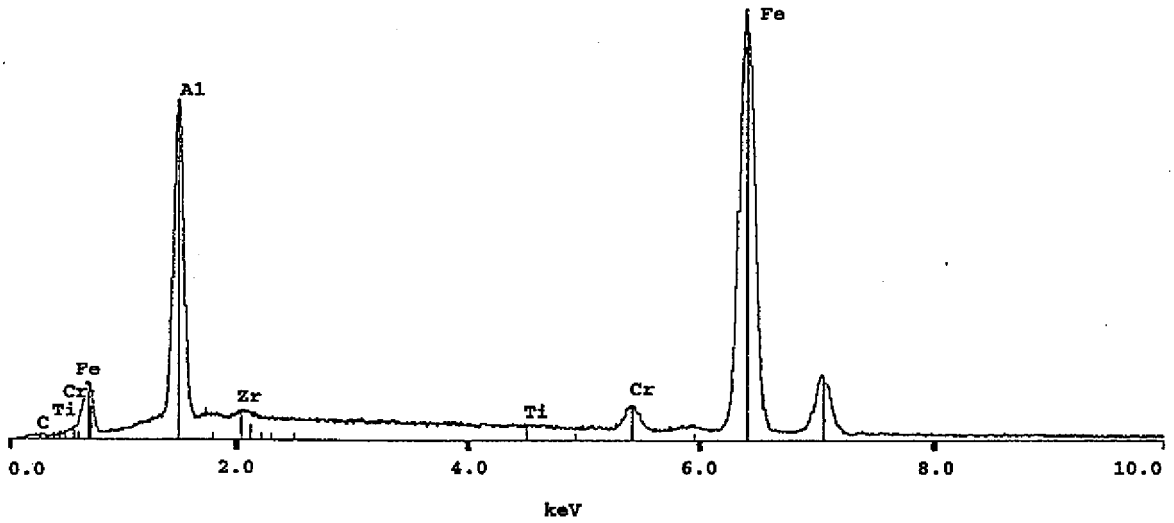

Figure 63: Spot spectrum of the base metal of Figure 61. Typical iron aluminide spectrum.

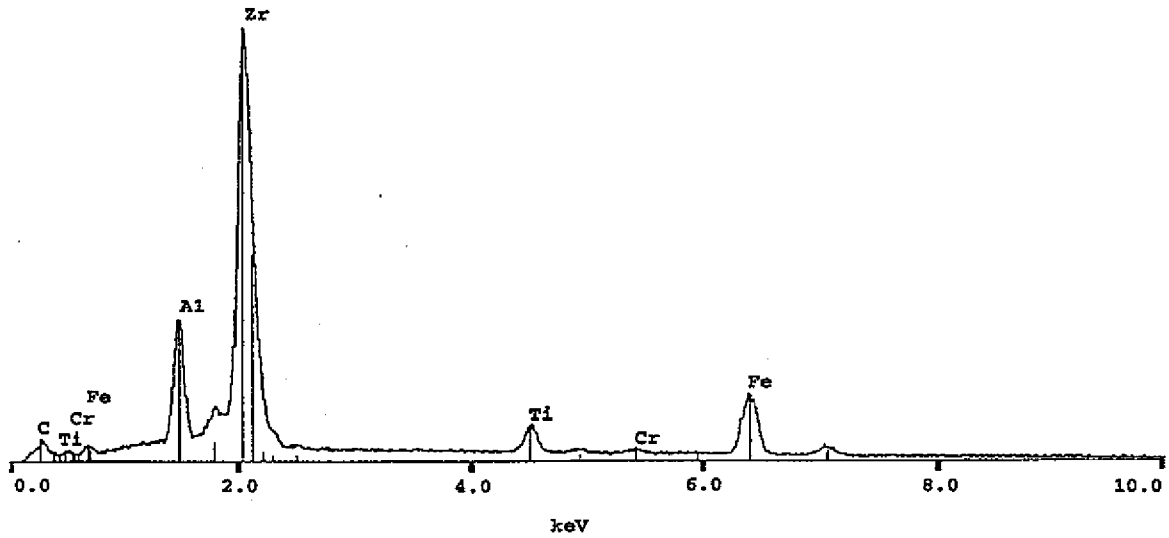

Figure 64: Spot spectrum of bright nodule (1) on the surface of Figure 61. Mainly composed of zirconium that has diffused to the surface during sintering.

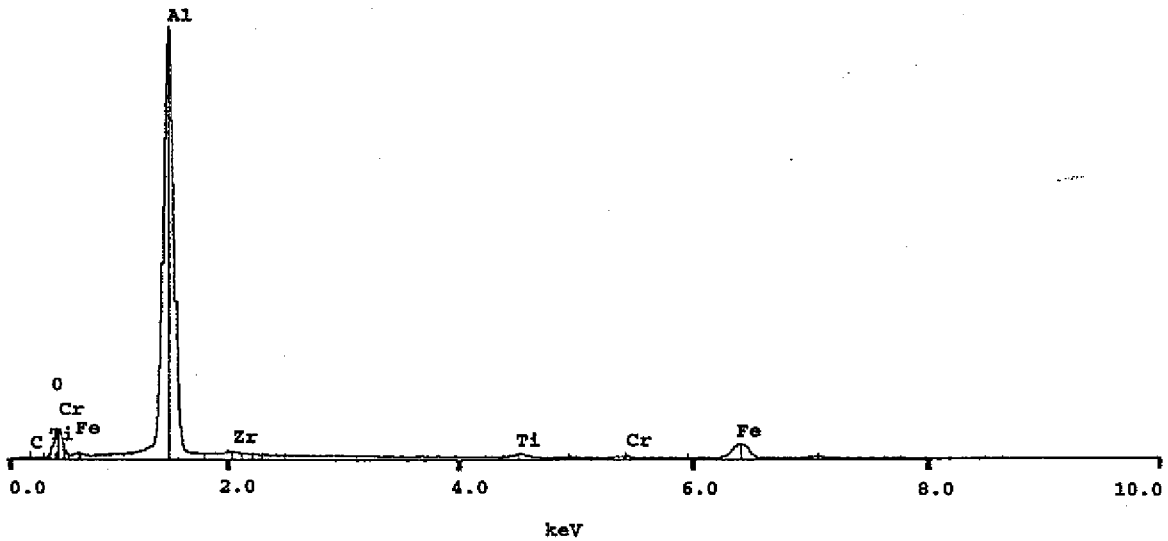

Figure 65: Spot spectrum of alumina dark spots (2) of the surface of Figure 61.

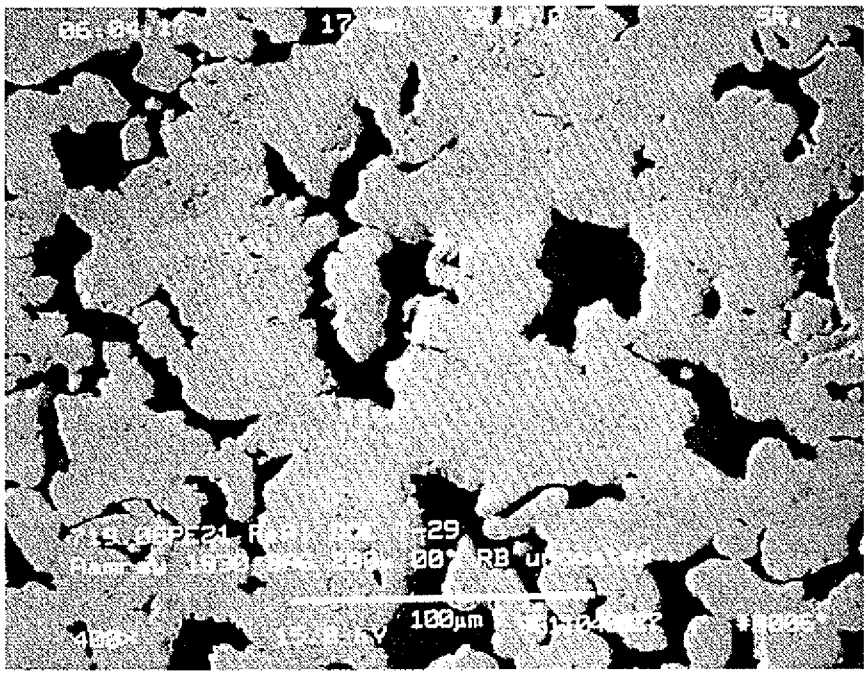

Figure 66: FAS, cross section of as-sintered control sample. (T-29) (400X)

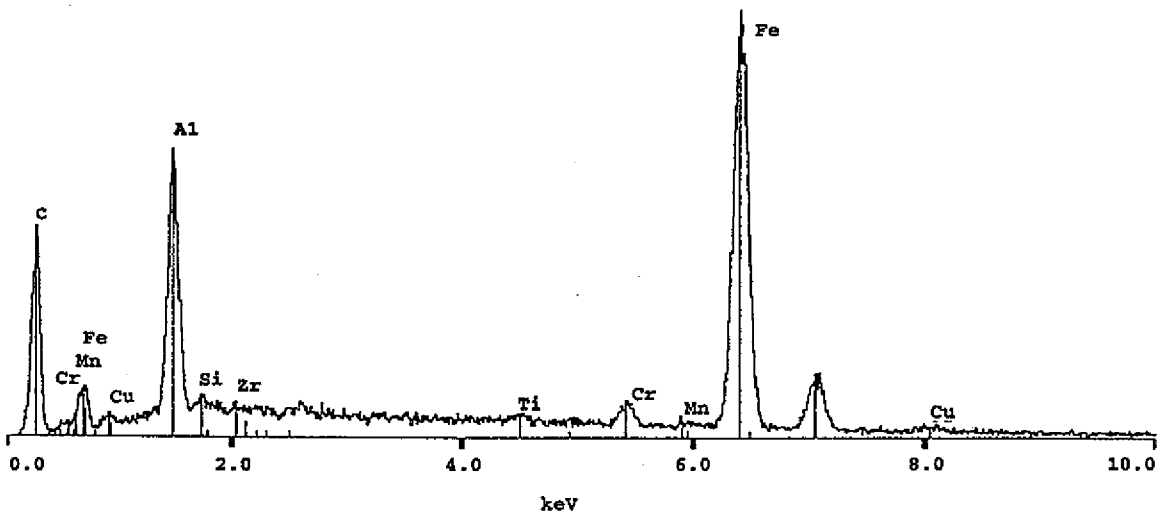

Figure 67: Spot spectrum of the particle surface through the epoxy of Figure 66.

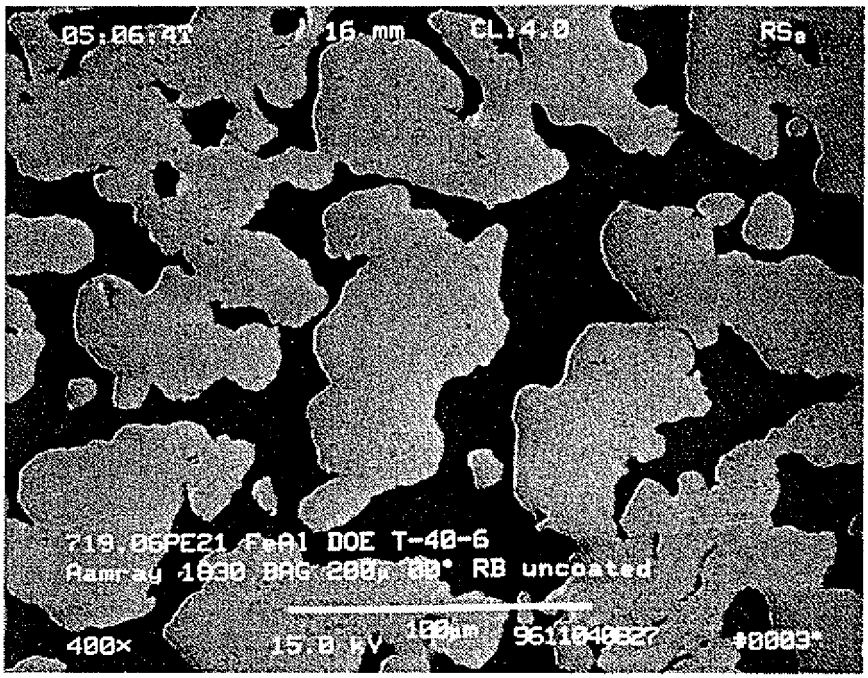

Figure 68: FAL, cross section of as-sintered control sample. (T-40-6) (400X)

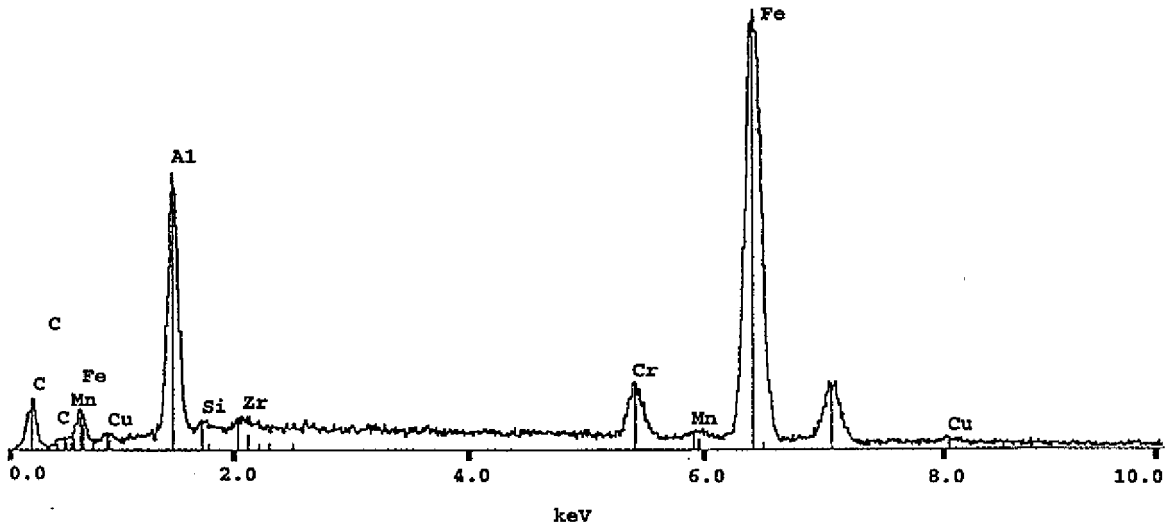

Figure 69: Spot spectrum of the particle surface through the epoxy of Figure 68.

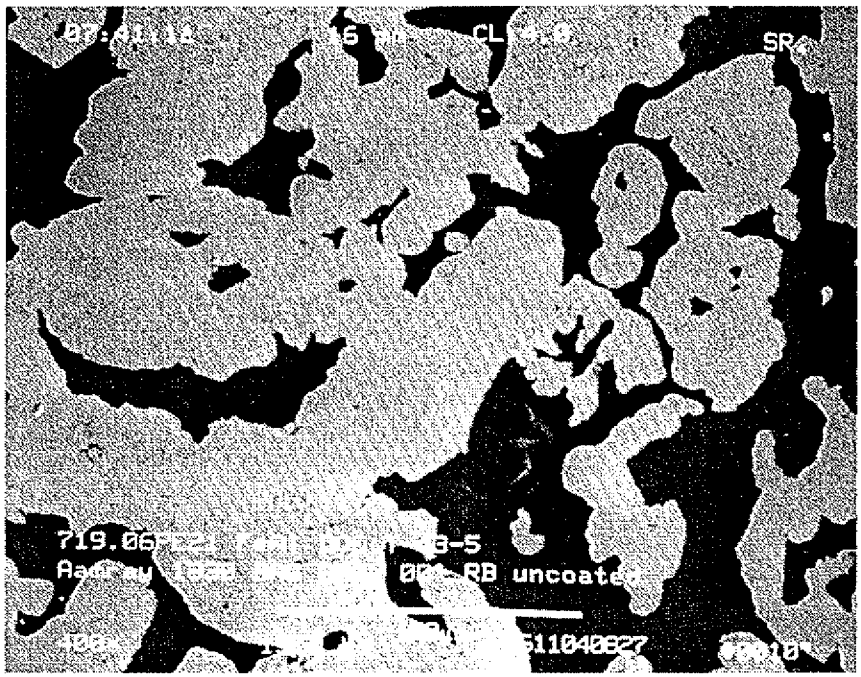

Figure 70: FAS-0%Cr, cross section of as-sintered control sample. (T-43-5) (400X)

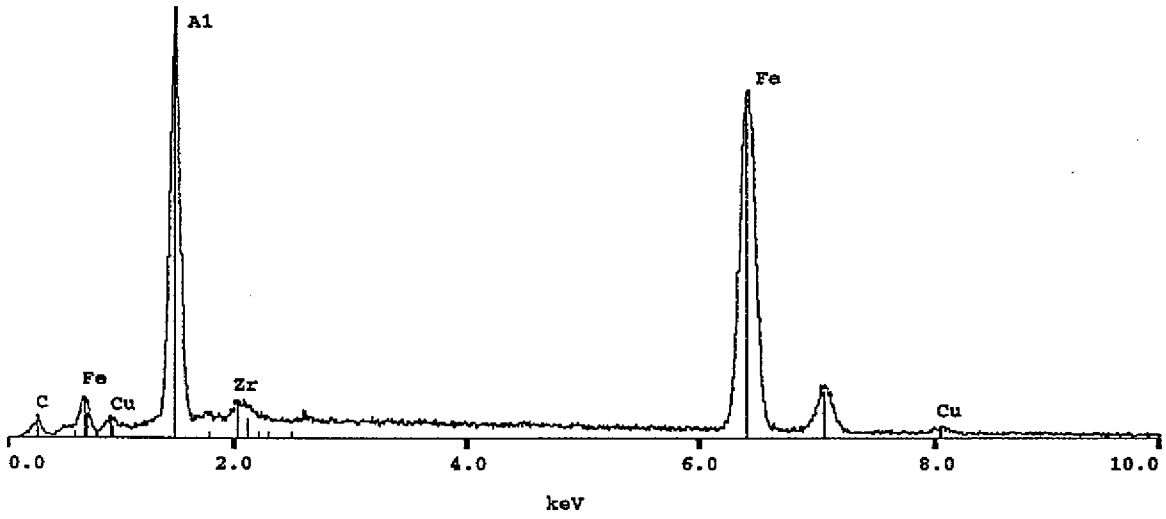

Figure 71: Spot spectrum of the particle surface through the epoxy of Figure 70.

Control Samples for Exposure Run 6

Cross-Sections

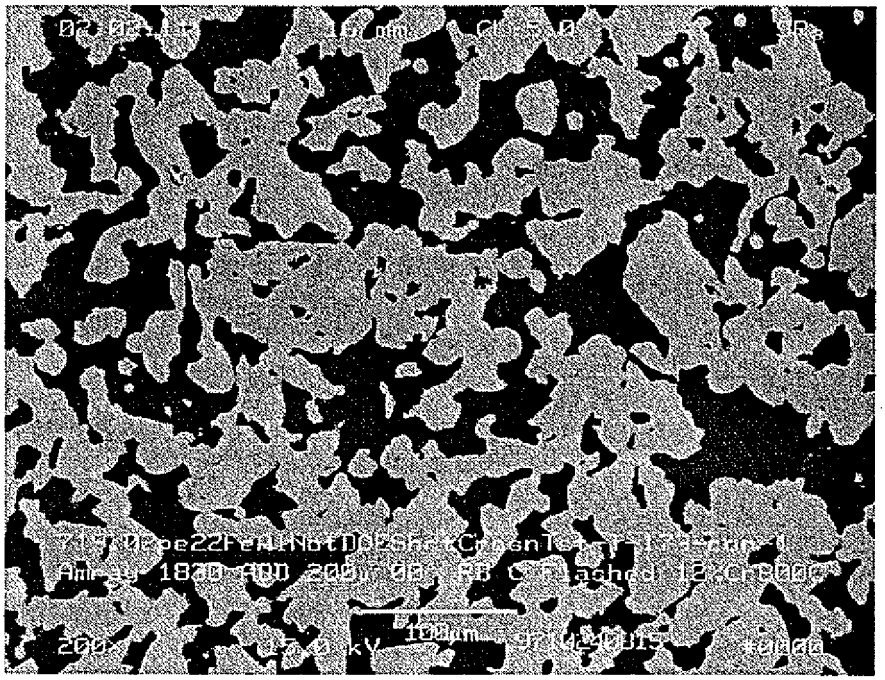

Figure 72: FAS control, 800°C preoxidation, cross-section. 200X (T-173-C-con-2)

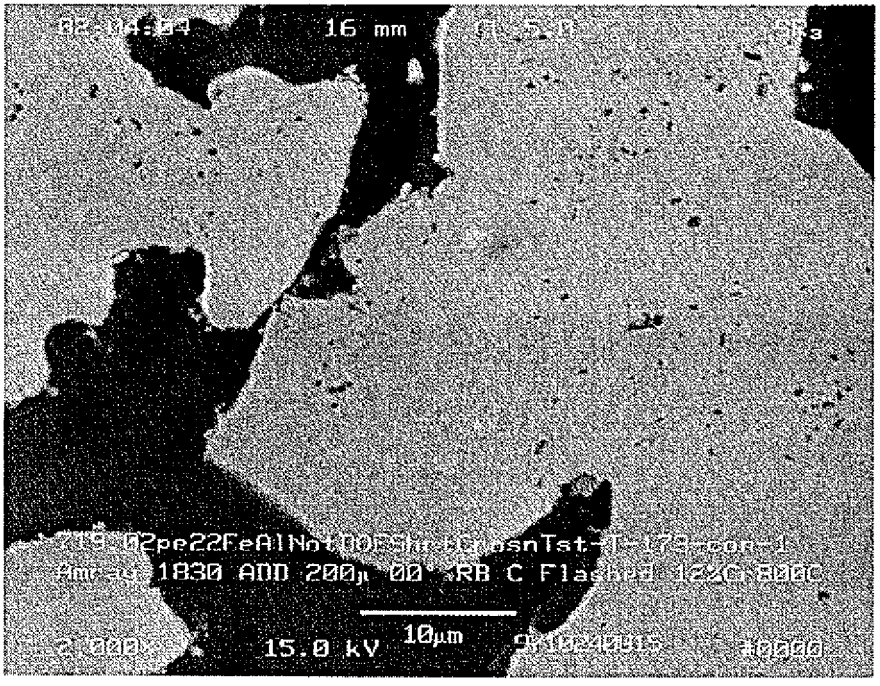

Figure 73: FAS control, 800°C preoxidation, cross-section. 2000X (T-173-C-con-2)

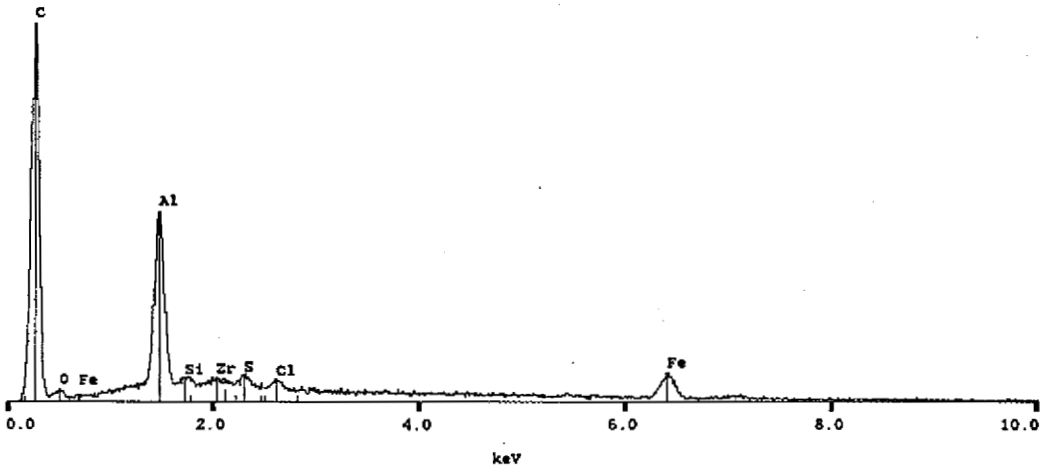

Figure 74: Full screen EDS spectrum of Figure 72. Carbon flashing has decreased the aluminum and iron peaks.

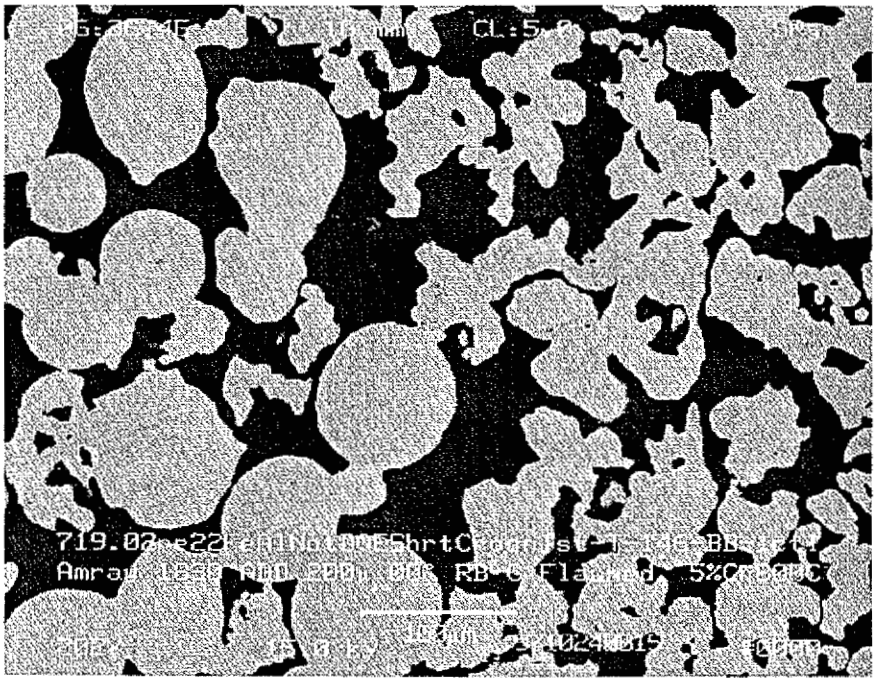

Figure 75: FAL control, 800°C preoxidation, cross-section. 200X (T-146-BB-con-2)

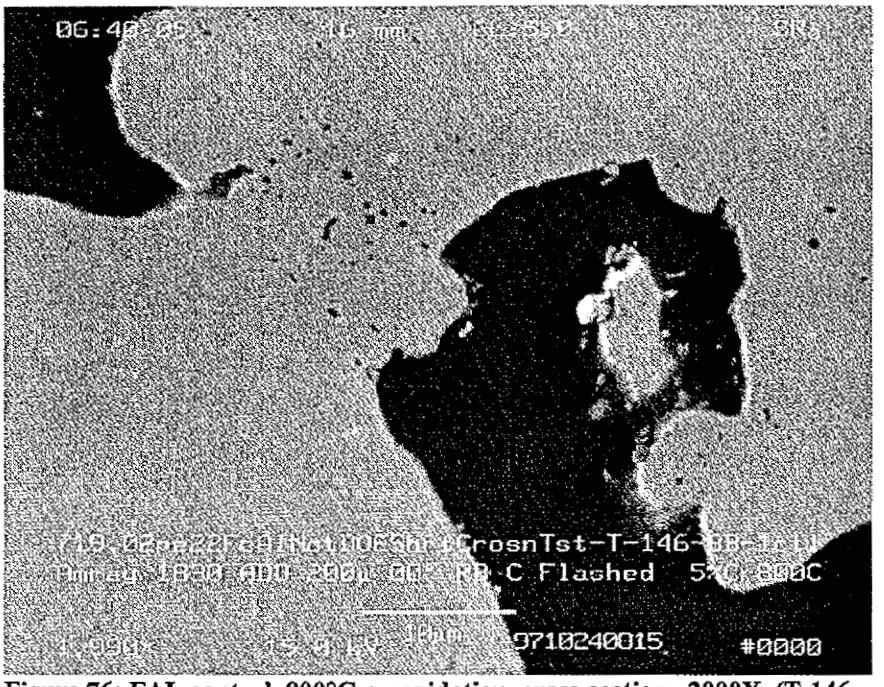

Figure 76: FAL control, 800°C preoxidation, cross-section. 2000X. (T-146-BB-con-2)

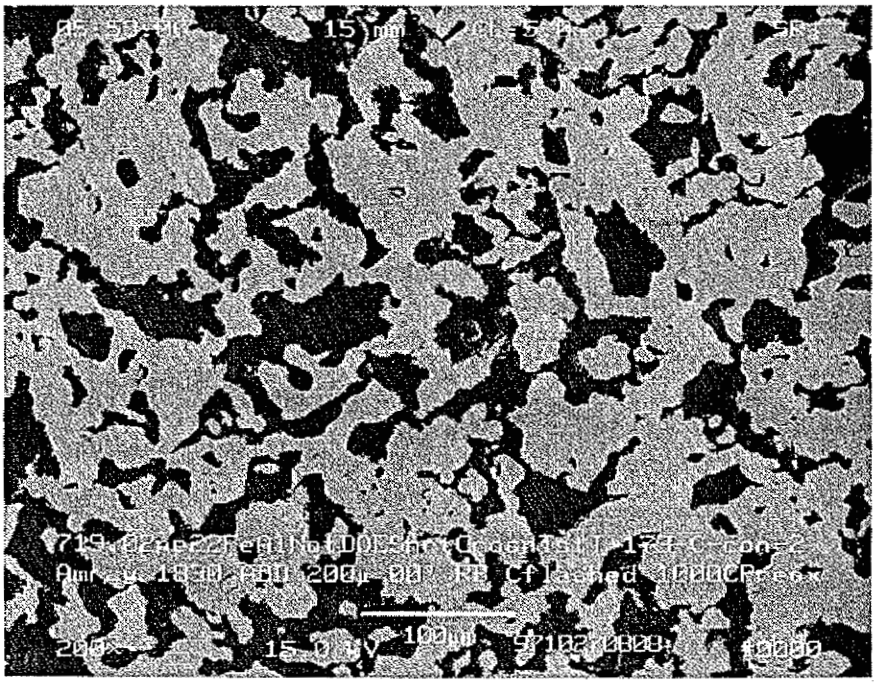

Figure 77: FAS control, 1000°C preoxidaton, cross-section. 200X (T-173-C-con-3)

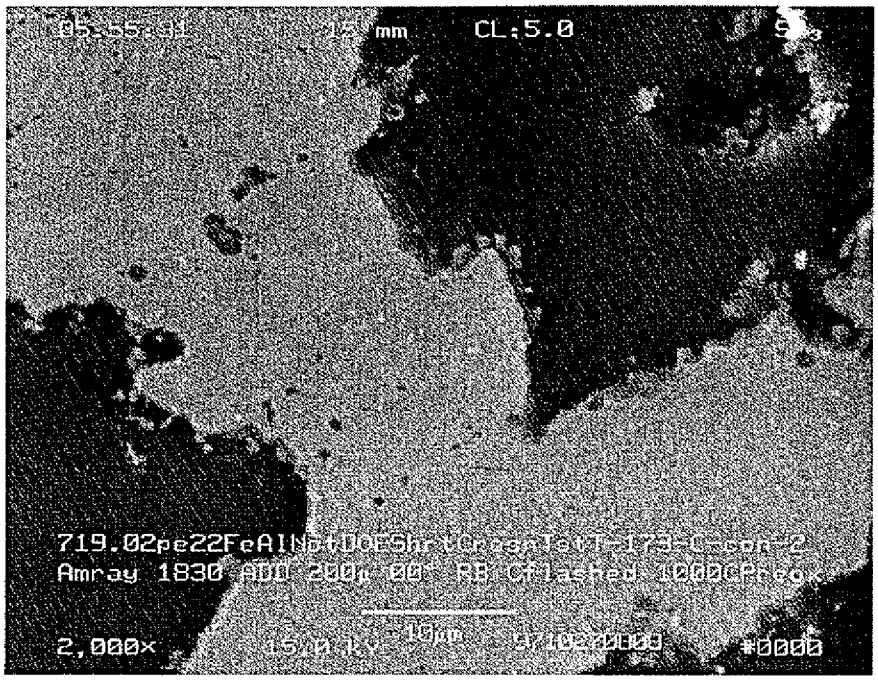

Figure 78: FAS control, 1000°C preoxidation, cross-section. Thick oxide layer. 200X (T-173-C-con-3)

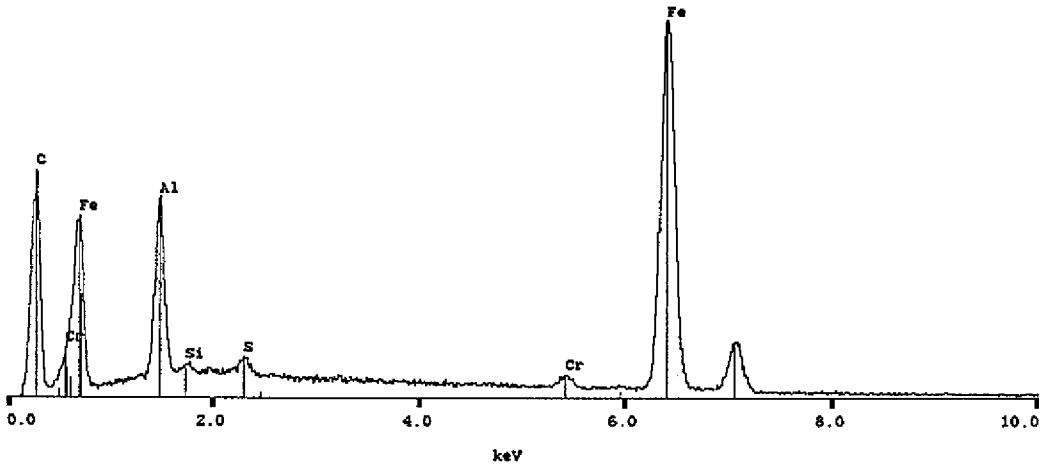

Figure 79. Full screen EDS spectrum of Figure 77.

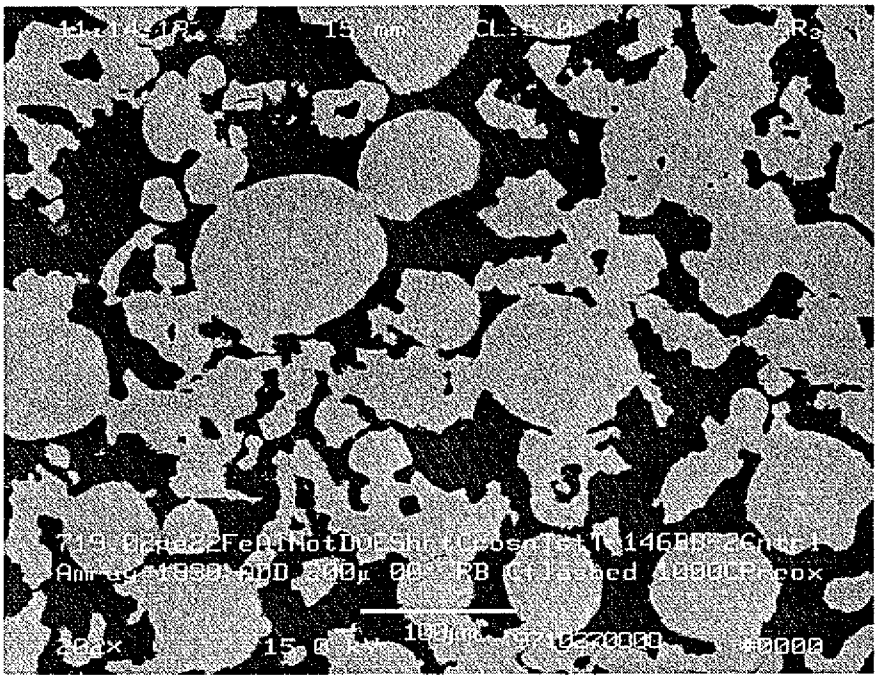

Figure 80: FAL control, 1000°C preoxidation, cross-section. 200X (T-146-BB-con-3)

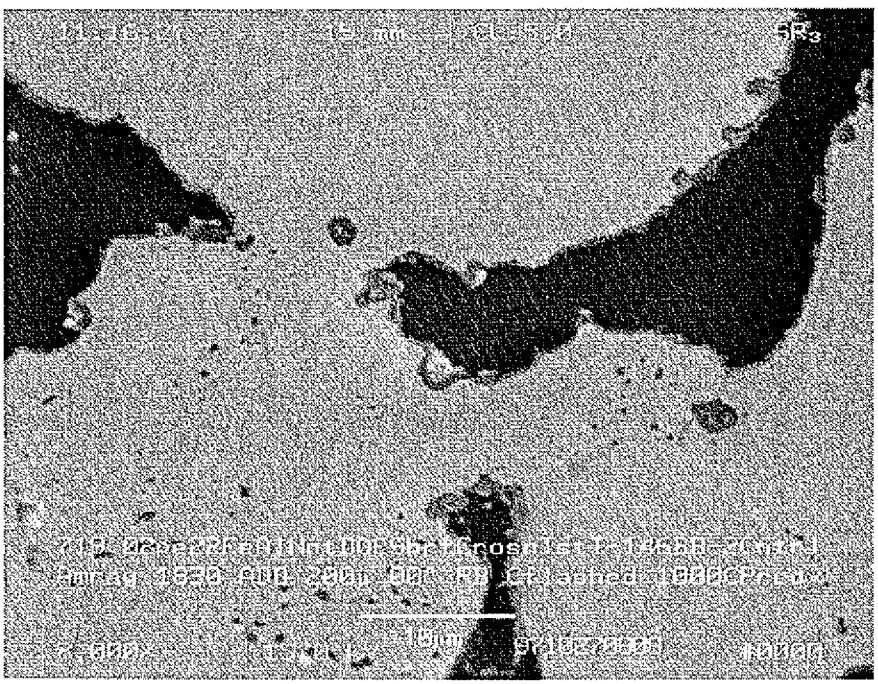

Figure 81: FAL control, 1000°C preoxidation, cross-section. 2000X. (T-146-BB-con-3)

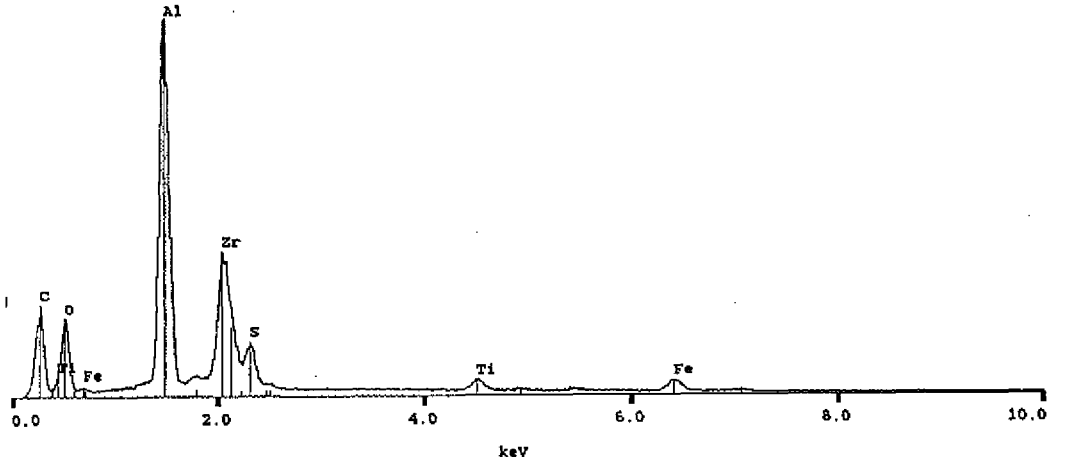

Figure 82. Spot EDS spectrum of "gray pools" on the edge of the particles of Figure 81.

Upstream Surfaces

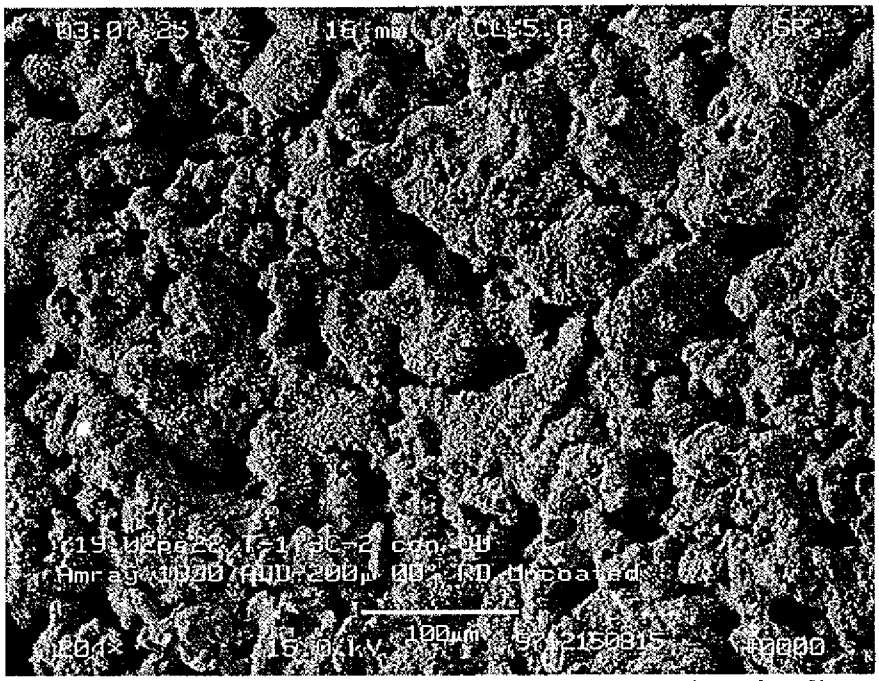

Figure 87: FAS control, 1000°C preoxidation, upstream surface of medium. 200X (T-173-C-con-3)

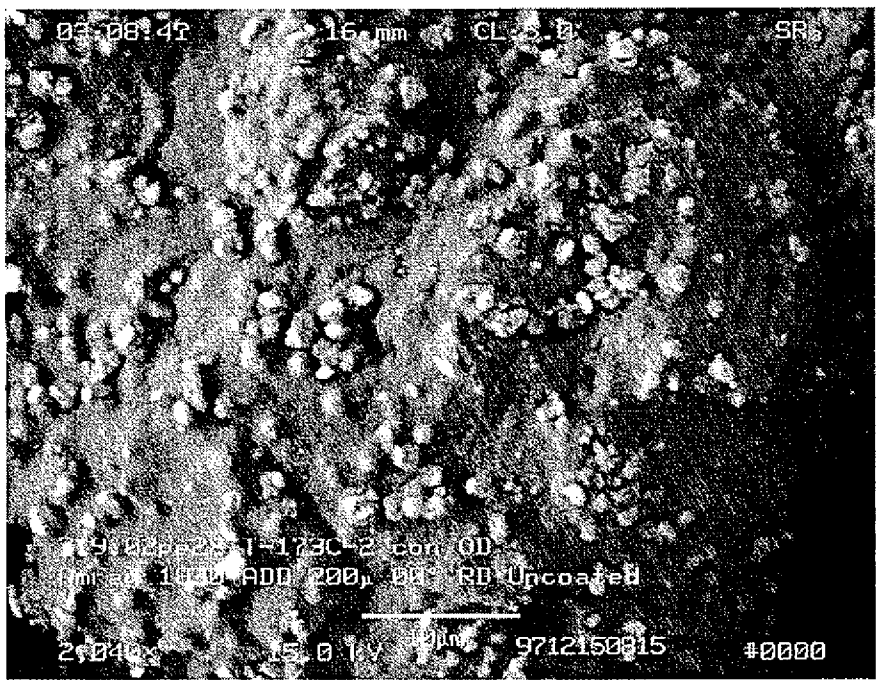

Figure 88: FAS control, 1000°C preoxidation, upstream surface of medium. 2000X (T-173-C-con-3)

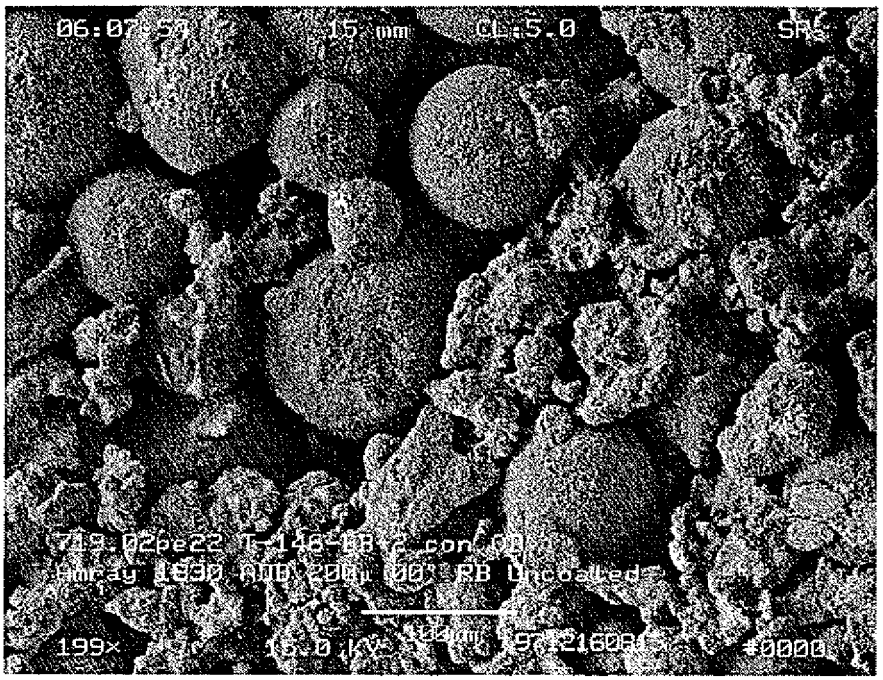

Figure 89: FAL control, 1000°C preoxidation, upstream surface of medium. 200X (T-146-BB-con-3)

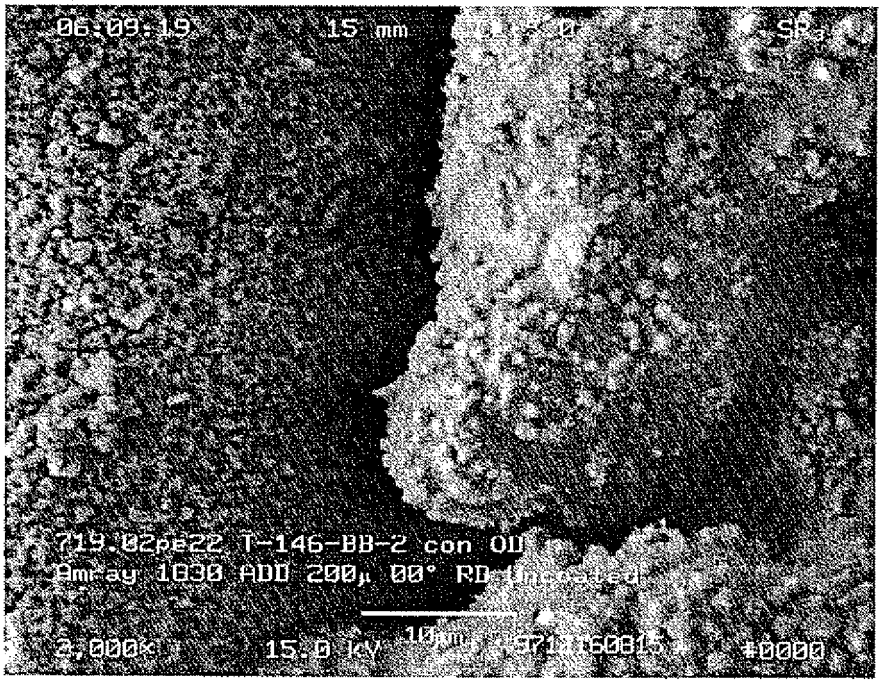

Figure 90: FAL control, 1000°C preoxidation, upstream surface of medium. Rough surface. 2000X (T-146-BB-con-3)

Run #1: 925°F with 0.0783 vol% H_2S

Run #2: 1200°F with 0.783 vol% H_2S

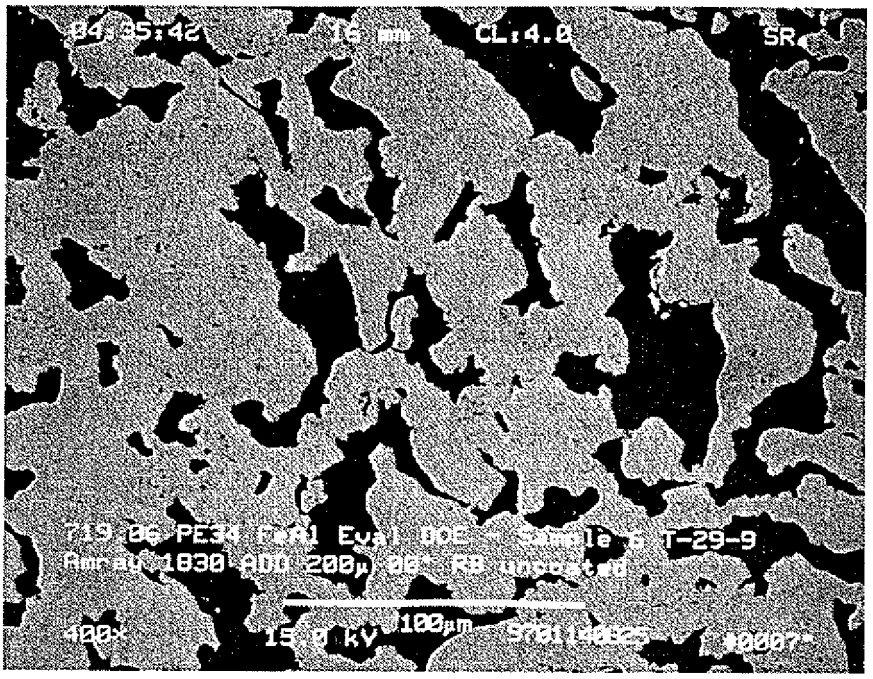

Figure 109: FAS media exposed for 14 days at 1200°F wit 0.783 vol% H_2S. This sample was not preoxidized prior to exposure. (T-29-9) (400X)

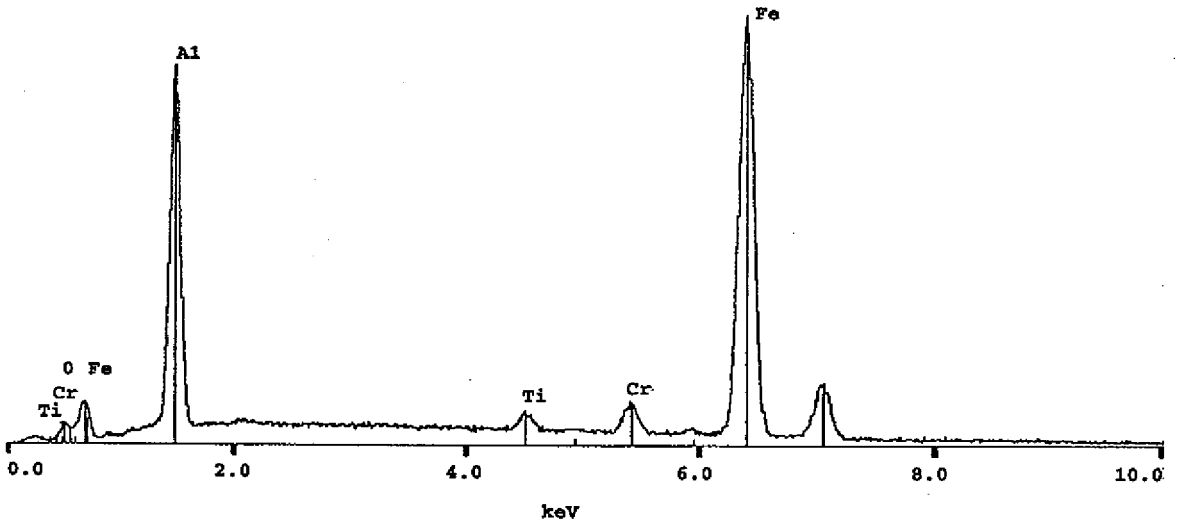

Figure 110: Spot spectrum of the particle surface through the epoxy of Figure 109. No indication of sulfidation.

Run #3: 925°F with 7.83 vol% H_2S

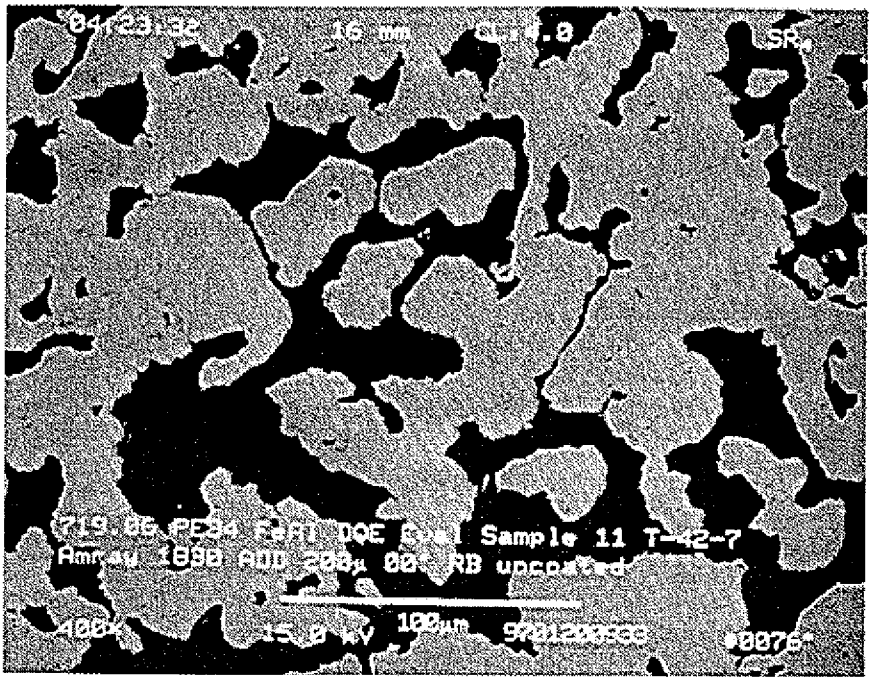

Figure 115: FAS media exposed for 14 days at 925°F with 7.83 vol% H_2S. This sample was preoxidized prior to exposure. (T-42-7) (400X)

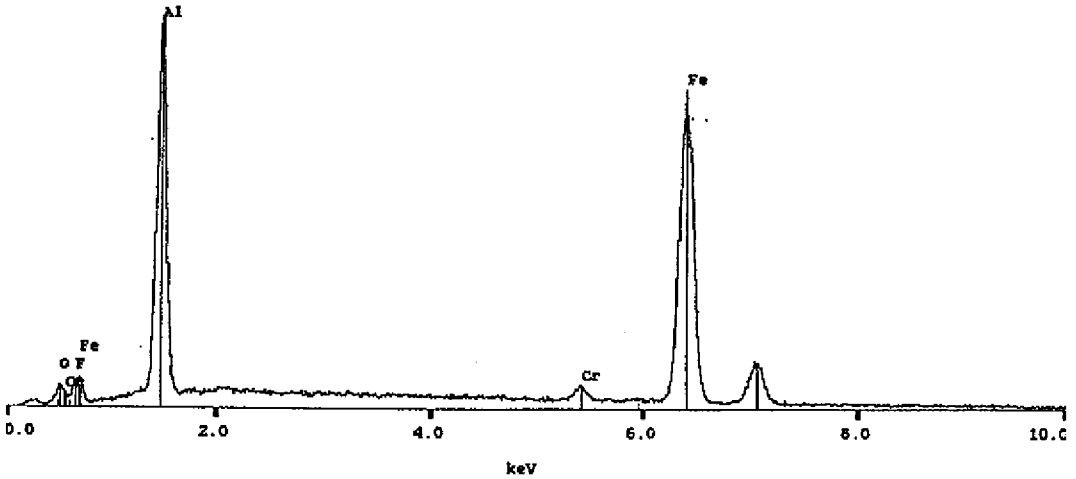

Figure 116: Spot spectrum of the particle surface through the epoxy of Figure 115. No indication of sulfidation.

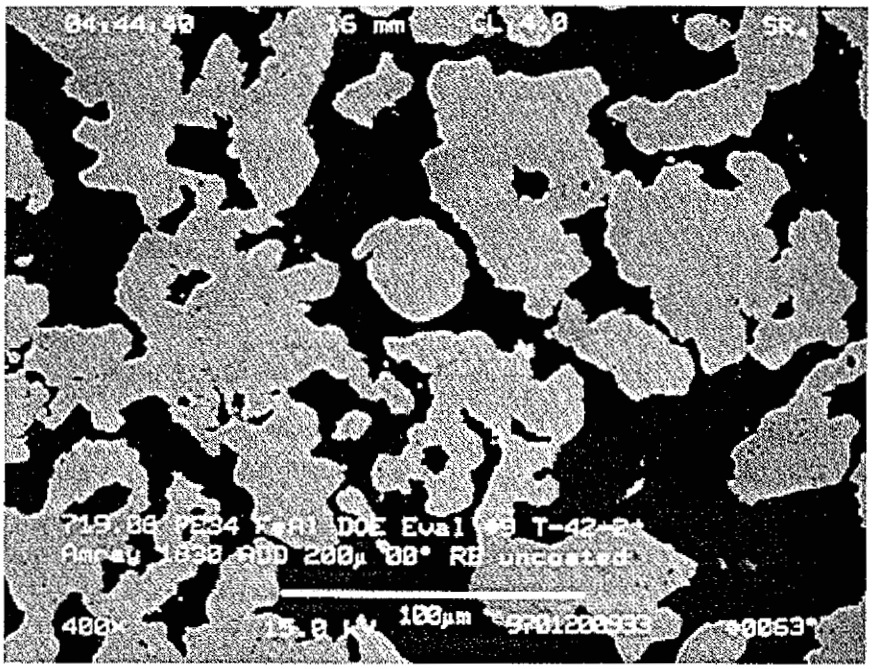

Figure 117: FAS media exposed for 14 days at 925°F with 7.83 vol% H_2S. This sample was not preoxidized prior to exposure. (T-42-2) (400X)

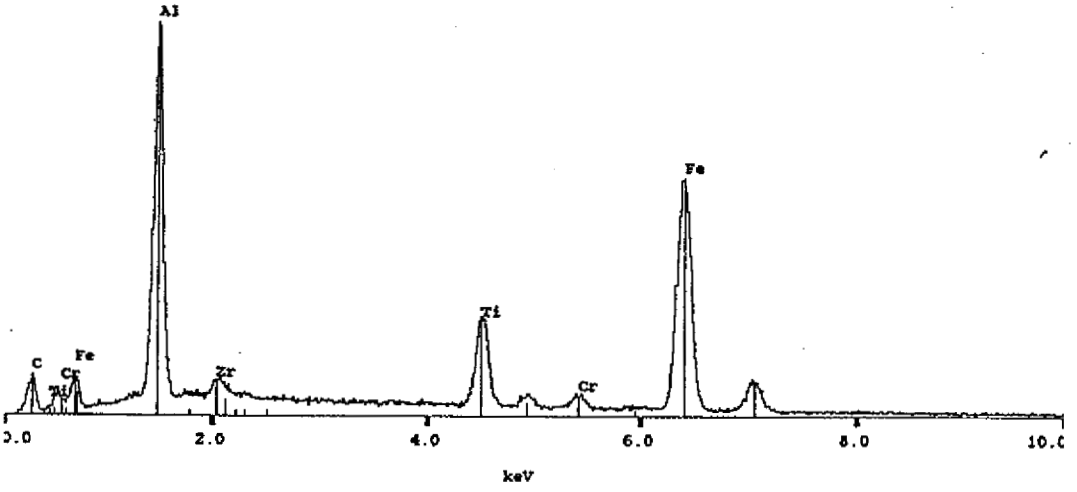

Figure 118: Spot spectrum of the particle surface through the epoxy of Figure 117. No indication of sulfidation.

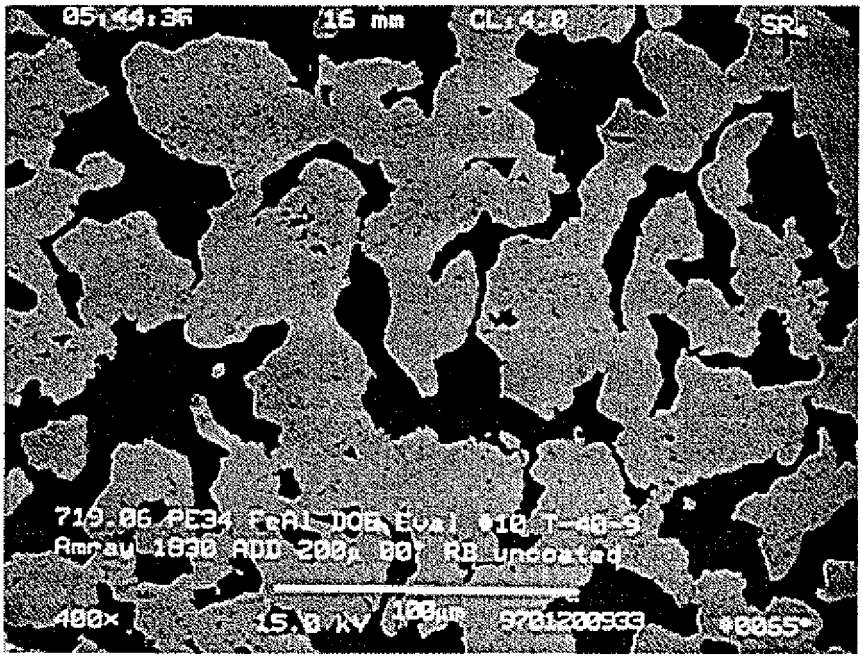

Figure 119: FAL media exposed for 14 days at 925°F with 7.83 vol% H_2S. This sample was preoxidized prior to exposure. (T-40-9) (400X)

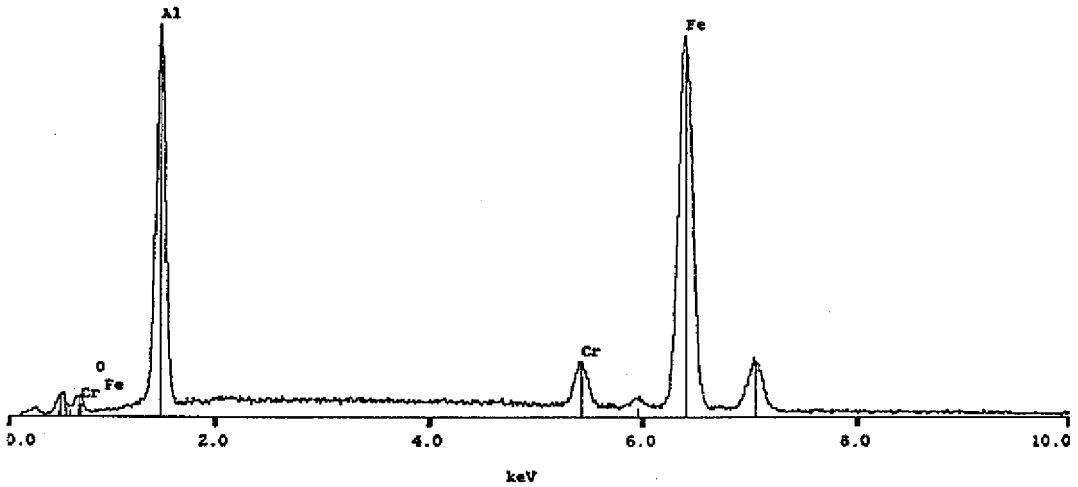

Figure 120: Spot spectrum of the particle surface through the epoxy of Figure 119. No indication of sulfidation.

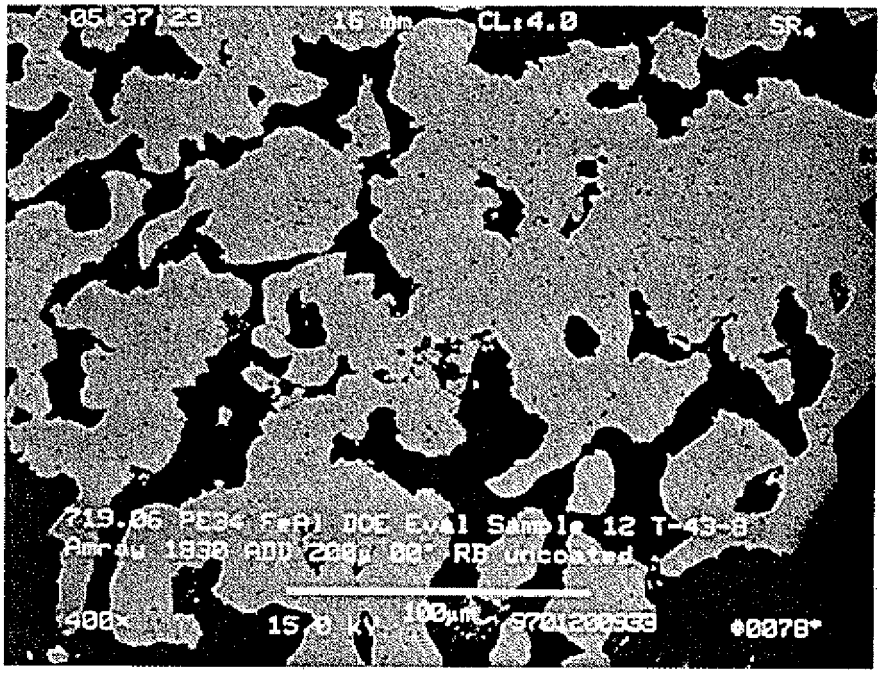

Figure 121: FAS-0%Cr media exposed for 14 days at 925°F with 7.83 vol% H_2S. This sample was preoxidized prior to exposure. (T-43-8) (400X)

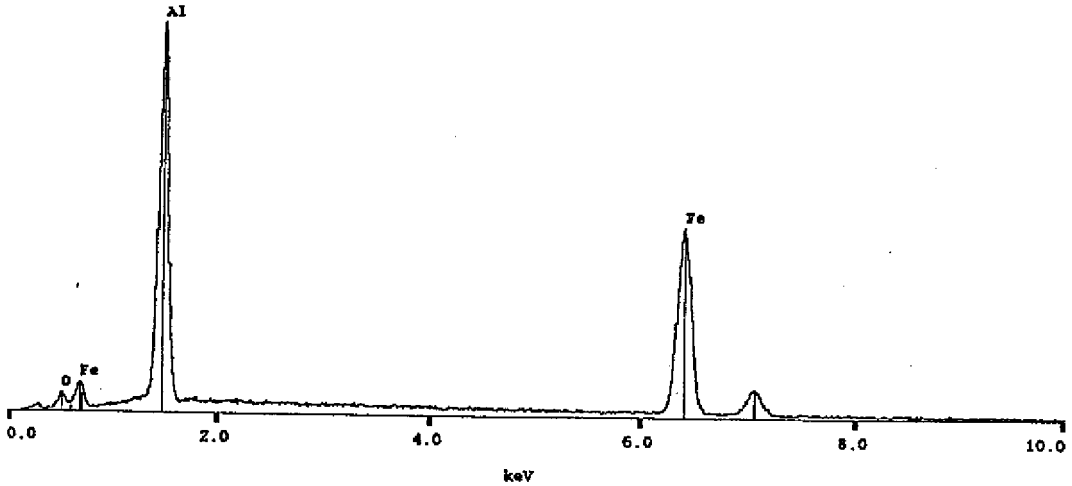

Figure 122: Spot spectrum of the particle surface through the epoxy of Figure 121. No indication of sulfidation.

Run #4: 925°F with 0.783 vol% H_2S

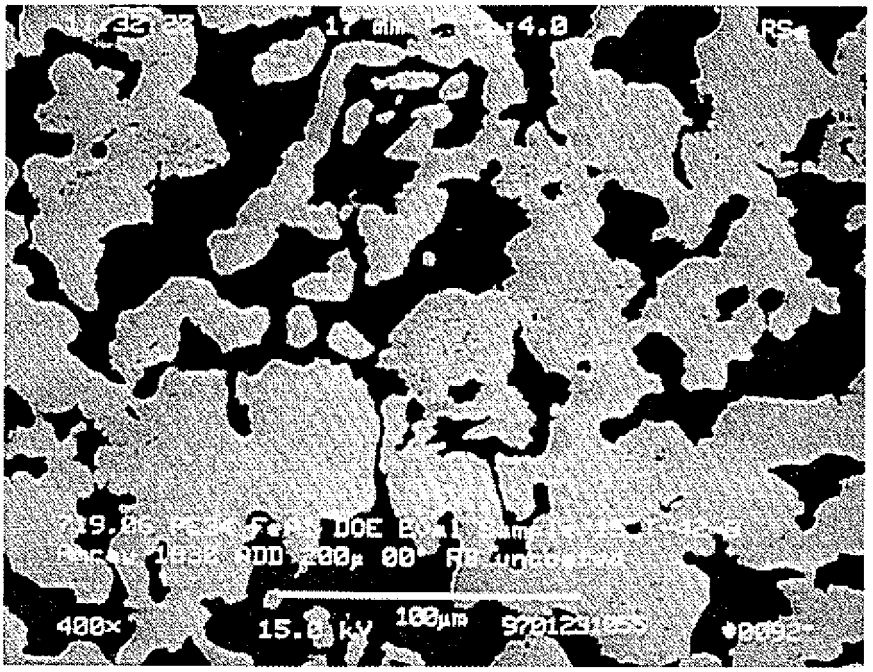

Figure 123: FAS media exposed for 14 days at 925°F with 0.783 vol% H_2S. This sample was preoxidized prior to exposure. (T-42-8) (400X)

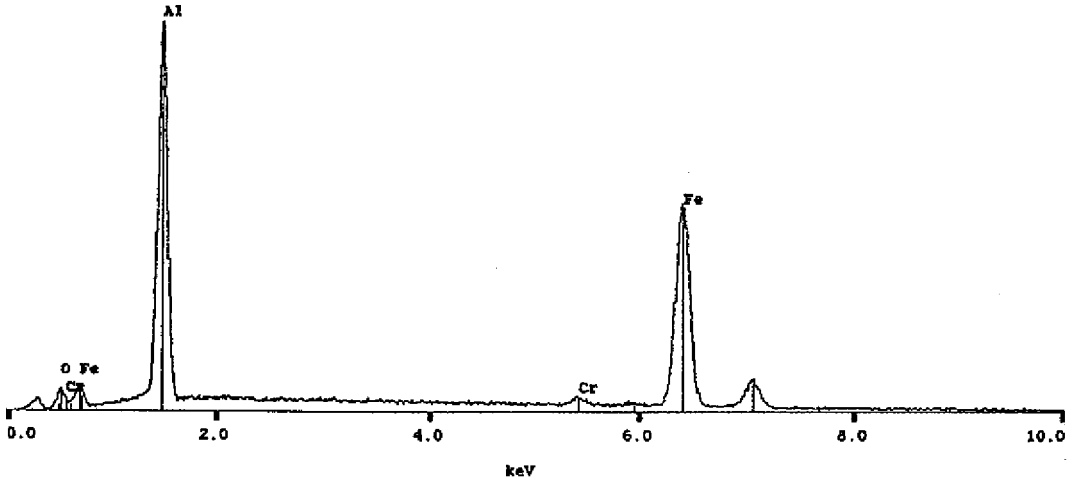

Figure 124: Spot spectrum of the particle surface through the epoxy of Figure 123. No indication of sulfidation.

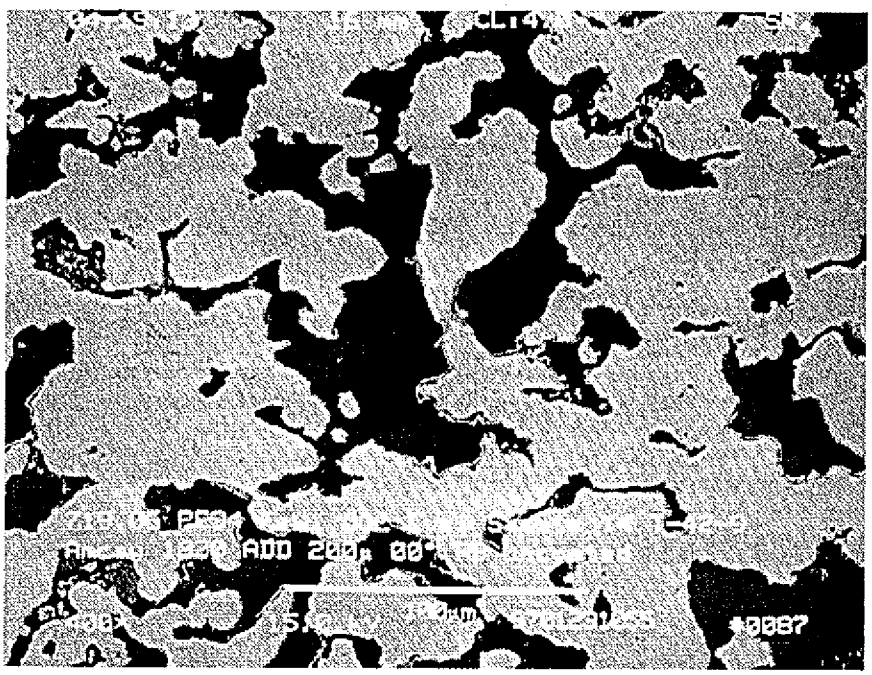

Figure 125: FAS media exposed for 14 days at 925°F with 0.783 vol% H_2S. This sample was not preoxidized prior to exposure. (T-42-9) (400X)

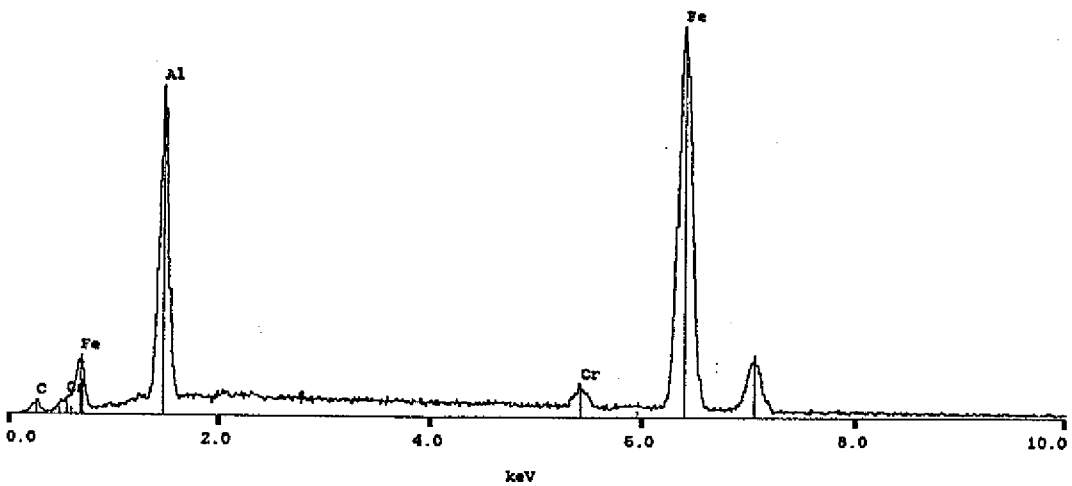

Figure 126: Spot spectrum of the particle surface through the epoxy of Figure 125.

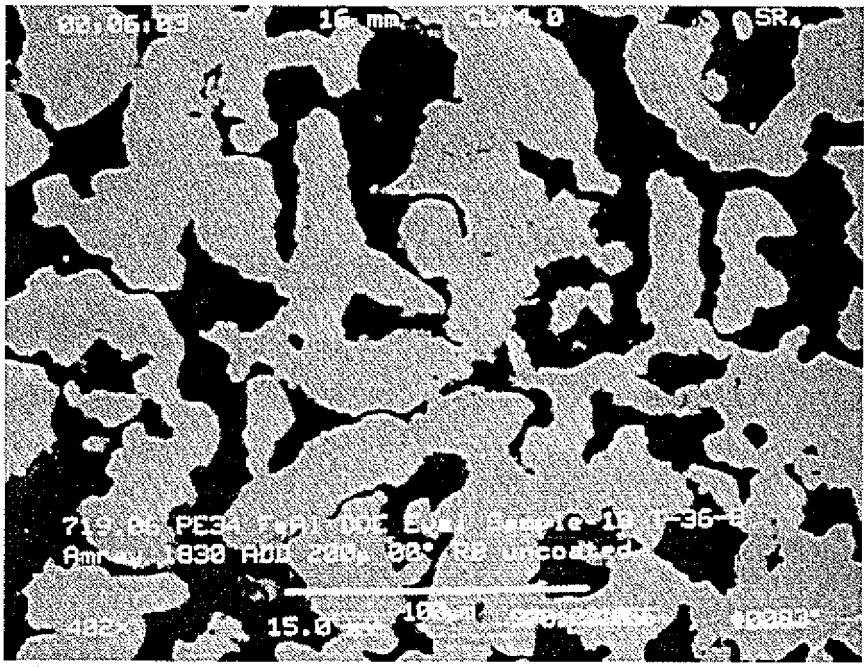

Figure 127: FAL media exposed for 14 days at 925°F with 0.783 vol% H_2S. This sample was preoxidized prior to exposure. (T-36-8) (400X)

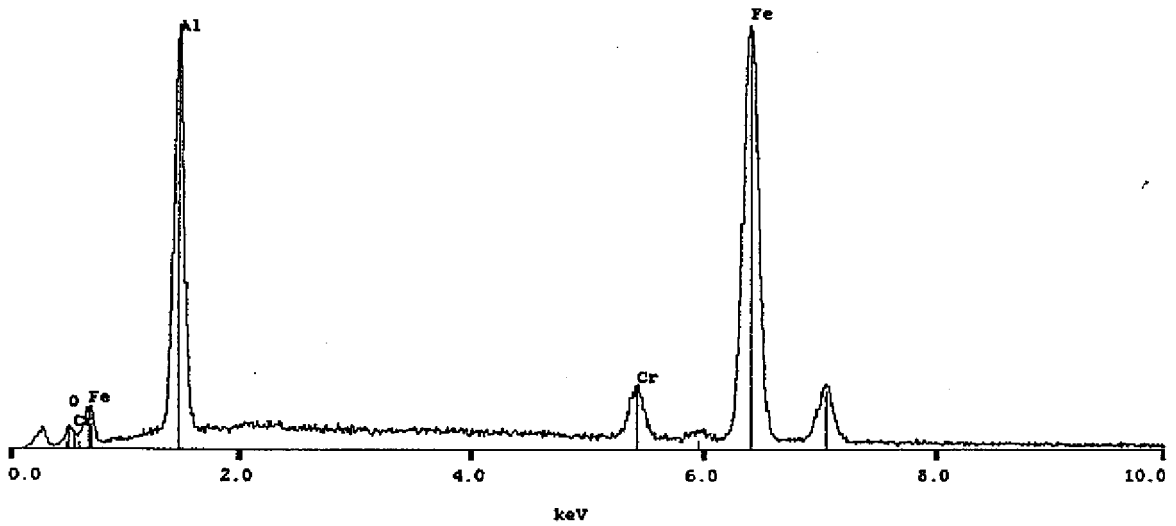

Figure 128: Spot spectrum of the particle surface through the epoxy of Figure 127. No indication of sulfidation.