

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

1/56

Figure 1-A

Composition analysis of cupric silicate (synthesized at acidic reaction conditions) using EDAX attached to SEM (Scanning Electron Microscope).

## Weight % Element

| Filename | o k   | NaK  | Sik  | ClK   | CuK   |
|----------|-------|------|------|-------|-------|
| II.spc   | 45.39 | 1.74 | 6.33 | 13.92 | 32.63 |
| .        |       |      |      |       |       |
| .        |       |      |      |       |       |
| .        |       |      |      |       |       |

## Atomic % Element

| Filename | o k   | NaK  | Sik  | ClK  | CuK   |
|----------|-------|------|------|------|-------|
| II.spc   | 70.15 | 1.87 | 5.57 | 9.71 | 12.70 |

17 MAY 2006

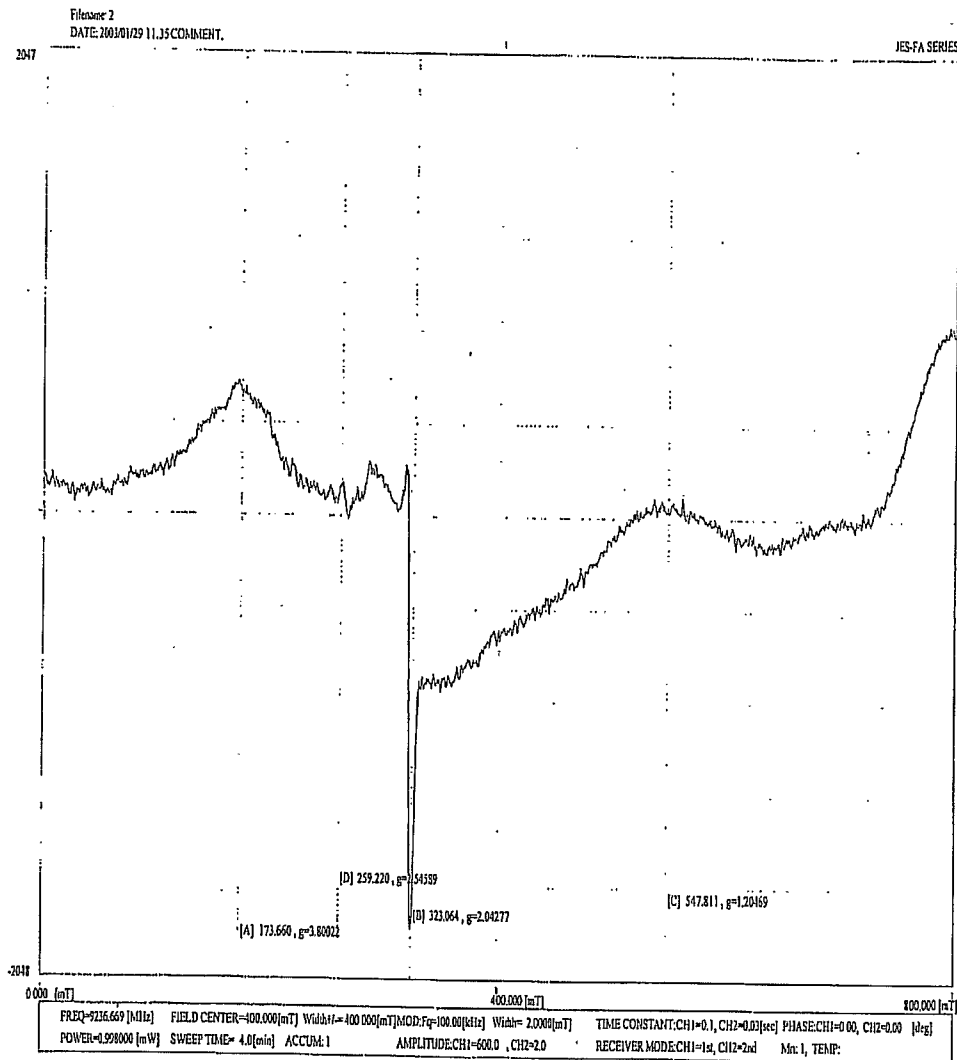
WO 2004/101435

PCT/IB2003/002011

2/56

Figure 1-B

ESR (Electron spin resonance) spectrometer analysis of cupric silicate (synthesized at acidic reaction conditions).



17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

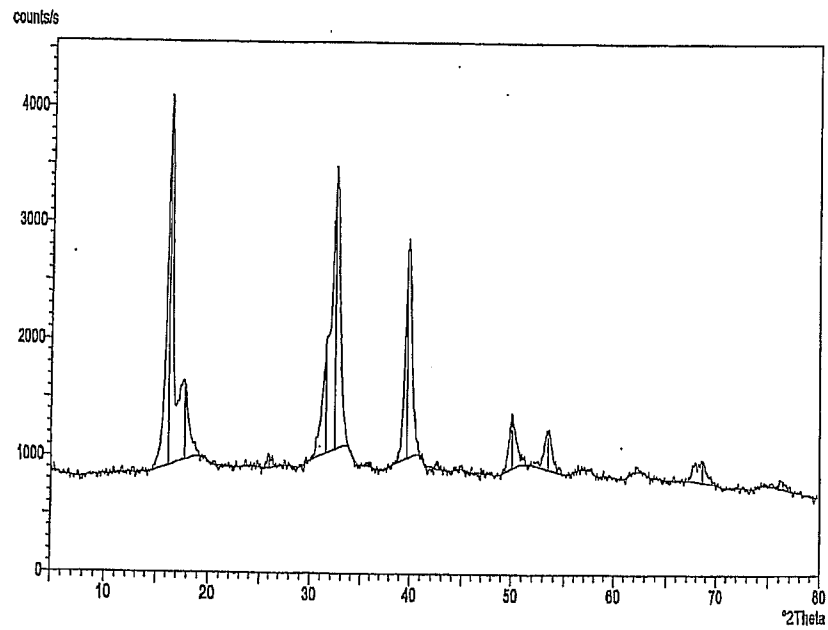
Figure 1-C

3/56

XRD (X-ray diffraction) pattern of cupric silicate (synthesized at acidic reaction conditions).

X'Pert Graphica & Identify  
Graph: 2-R

User-1  
1/25/03 14:37



Philips Analytical

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

Figure 1-C

4/56

XRD (X-ray diffraction) pattern of cupric silicate (synthesized at acidic reaction conditions).

X'Pert Graphics & Identify  
(searched) peak list: 2-R 2

User-1  
1/25/03 14:38

Original scan: 2-R  
Description of scan:

Date: 1/24/03 14:25

Used wavelength:

K-Alpha1

K-Alpha1 wavelength (Å):  
K-Alpha2 wavelength (Å):  
K-Alpha2/K-Alpha1 intensity ratio:  
K-Alpha wavelength (Å):  
K-Beta wavelength (Å):

1.54056  
1.54439  
0.50000  
1.54056  
1.39222

Peak search parameter set:

As Measured Intensities  
1/8/03 13:03  
Minimum of 2nd derivative  
0.00  
1.00  
2.00  
0.60

| d-spacing<br>(Å) | Relative<br>Intensity<br>(%) | Angle<br>(°2Theta) | Peak<br>Height<br>(counts/s) | Background<br>(counts/s) | Tip<br>Width<br>(°2Theta) | Significance |
|------------------|------------------------------|--------------------|------------------------------|--------------------------|---------------------------|--------------|
| 5.48673          | 100.00                       | 16.14080           | 3156.22                      | 923.90                   | 0.44000                   | 19.72        |
| 5.00327          | 20.71                        | 17.71241           | 653.63                       | 972.81                   | 0.64000                   | 4.14         |
| 3.43222          | 3.34                         | 25.93831           | 105.37                       | 906.45                   | 0.48000                   | 1.22         |
| 2.84108          | 30.80                        | 31.46211           | 972.17                       | 1038.45                  | 0.20000                   | 0.64         |
| 2.77130          | 75.78                        | 32.27568           | 2391.87                      | 1069.38                  | 0.28000                   | 2.91         |
| 2.27354          | 54.06                        | 39.60778           | 1706.22                      | 998.03                   | 0.40000                   | 7.76         |
| 1.82288          | 14.67                        | 49.99281           | 463.03                       | 916.51                   | 0.20000                   | 0.77         |
| 1.71366          | 10.53                        | 53.42238           | 332.20                       | 906.86                   | 0.48000                   | 1.89         |
| 1.36697          | 5.89                         | 68.59540           | 185.87                       | 802.15                   | 0.48000                   | 0.84         |
| 1.24612          | 1.96                         | 76.36139           | 61.84                        | 747.02                   | 0.96000                   | 0.83         |

17 MAY 200

WO 2004/101435

PCT/IB2003/002011

Figure 2-A

5/56

Composition analysis of cupric silicate (synthesized at acidic reaction conditions and at high temperature 70<sup>0</sup> C to 90<sup>0</sup> C) using EDAX attached to SEM (Scanning Electron Microscope).

Weight % by Element

| Filename  | o k   | NaK  | SiK   | ClK  | CuK   |
|-----------|-------|------|-------|------|-------|
| c-nat.spc | 45.84 | 0.89 | 27.31 | 4.63 | 21.33 |

Atomic % Element

| Filename  | o k   | NaK  | SiK   | ClK  | CuK  |
|-----------|-------|------|-------|------|------|
| c-nat.spc | 65.98 | 0.89 | 22.39 | 3.01 | 7.73 |

17 MAY 2006

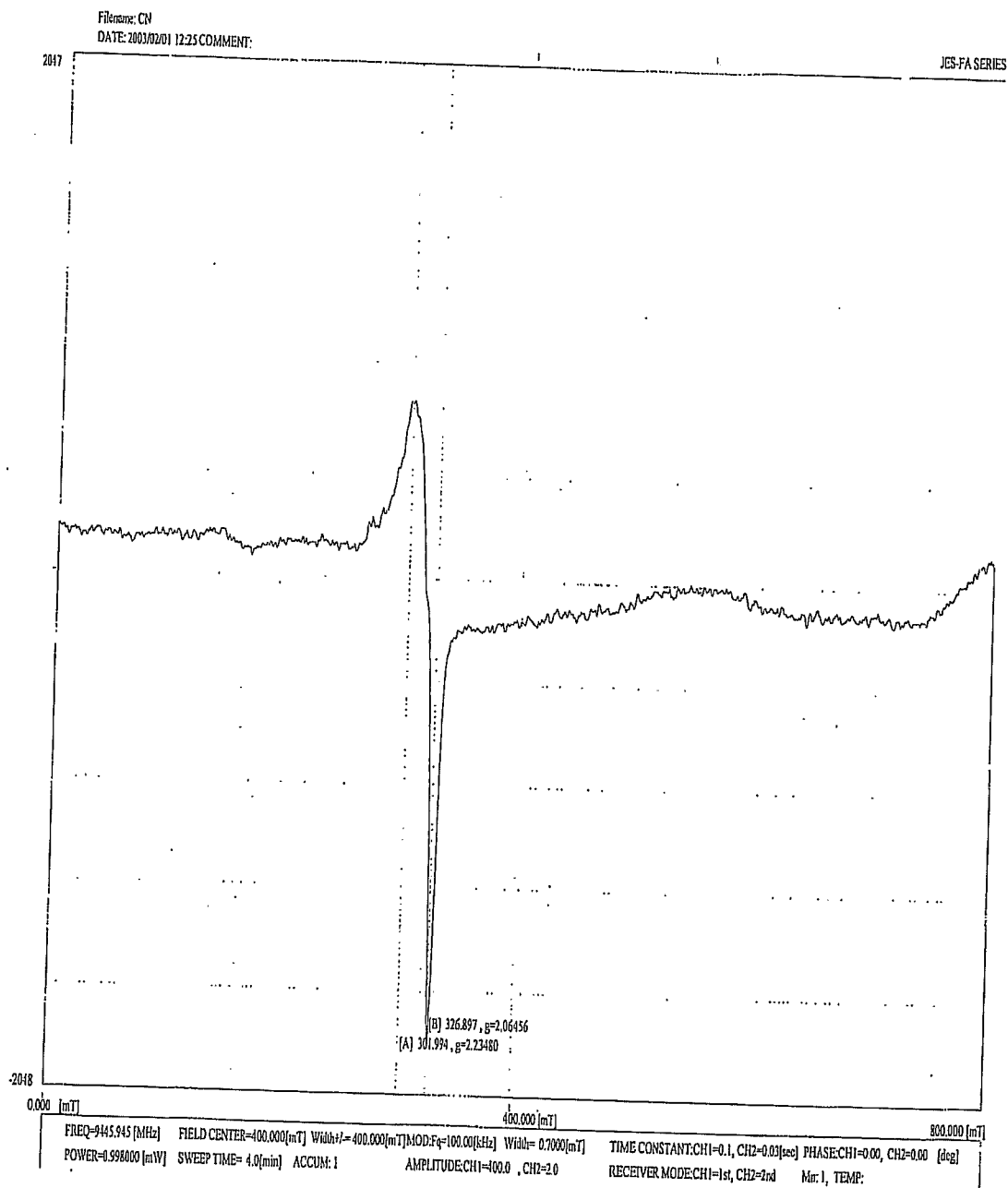
WO 2004/101435

PCT/IB2003/002011

Figure 2-B

6/56

ESR (Electron spin resonance) spectrometer analysis of cupric silicate (synthesized at acidic reaction conditions and at higher temperature 70<sup>0</sup> C to 90<sup>0</sup> C).



17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

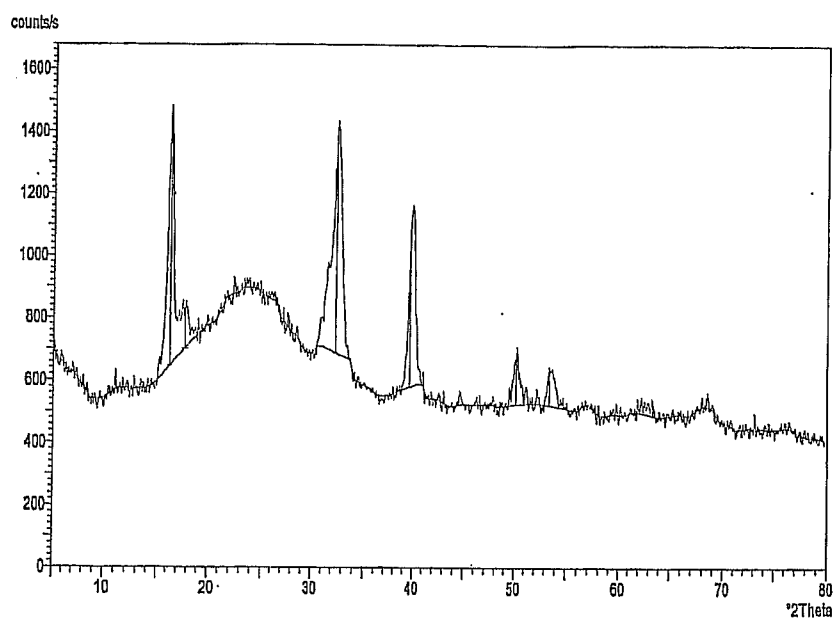
Figure 2-C

7/56

XRD (X-ray diffraction) pattern of cupric silicate (synthesized at acidic reaction conditions and at higher temperature 70<sup>0</sup> C to 90<sup>0</sup> C).

X'Pert Graphics & Identify  
Graph: CN-R

User-1  
2/3/03 11:54



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17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

Figure 2-C

8/56

XRD (X-ray diffraction) pattern of cupric silicate (synthesized at acidic reaction conditions and at higher temperature 70<sup>0</sup> C to 90<sup>0</sup> C).

X'Pert Graphics & Identify  
(searched) peak list: CN-R 2

User-1  
2/3/03 11:54

Original scan: CN-R  
Description of scan:

Date: 2/2/03 16:09

Used wavelength:

K-Alpha1

K-Alpha1 wavelength (Å): 1.54056  
K-Alpha2 wavelength (Å): 1.54439  
K-Alpha2/K-Alpha1 intensity ratio : 0.50000  
K-Alpha wavelength (Å): 1.54056  
K-Beta wavelength (Å): 1.39222

Peak search parameter set:

As Measured Intensities  
Set created: 1/8/03 13:03  
Peak positions defined by: Minimum of 2nd derivative  
Minimum peak tip width (°2Theta): 0.00  
Minimum peak tip width (°2Theta): 1.00  
Peak base width (°2Theta): 2.00  
Minimum significance: 0.60

| d-spacing<br>(Å) | Relative<br>Intensity<br>(%) | Angle<br>(°2Theta) | Peak<br>Height<br>(counts/s) | Background<br>(counts/s) | Tip<br>Width<br>(°2Theta) | Significance |
|------------------|------------------------------|--------------------|------------------------------|--------------------------|---------------------------|--------------|
| 5.46662          | 100.00                       | 16.20057           | 835.63                       | 647.06                   | 0.40000                   | 5.94         |
| 5.01048          | 15.55                        | 17.68674           | 129.92                       | 702.61                   | 0.64000                   | 0.71         |
| 2.77436          | 84.58                        | 32.23910           | 706.74                       | 690.34                   | 0.40000                   | 3.61         |
| 2.27554          | 60.14                        | 39.57159           | 502.52                       | 580.44                   | 0.56000                   | 8.46         |
| 1.82094          | 18.29                        | 50.04991           | 152.83                       | 524.53                   | 0.40000                   | 0.90         |
| 1.71674          | 13.71                        | 53.31888           | 114.53                       | 522.91                   | 0.40000                   | 0.62         |
| 1.46762          | 5.69                         | 63.31614           | 47.53                        | 489.95                   | 0.28000                   | 0.60         |

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

Figure 3-A:

9/56

Composition analysis of cupric silicate (synthesized at neutral (pH 6-7) reaction conditions) using EDAX attached to SEM (Scanning Electron Microscope).

Weight % by Element

| Filename | o k   | NaK  | SiK   | ClK  | CuK   |
|----------|-------|------|-------|------|-------|
| VI.spc   | 49.47 | 1.06 | 22.59 | 4.27 | 22.62 |

Atomic % by Element

| Filename | o k   | NaK  | SiK   | ClK  | CuK  |
|----------|-------|------|-------|------|------|
| VI.spc   | 69.98 | 1.04 | 18.20 | 2.73 | 8.06 |

17 MAY 2006

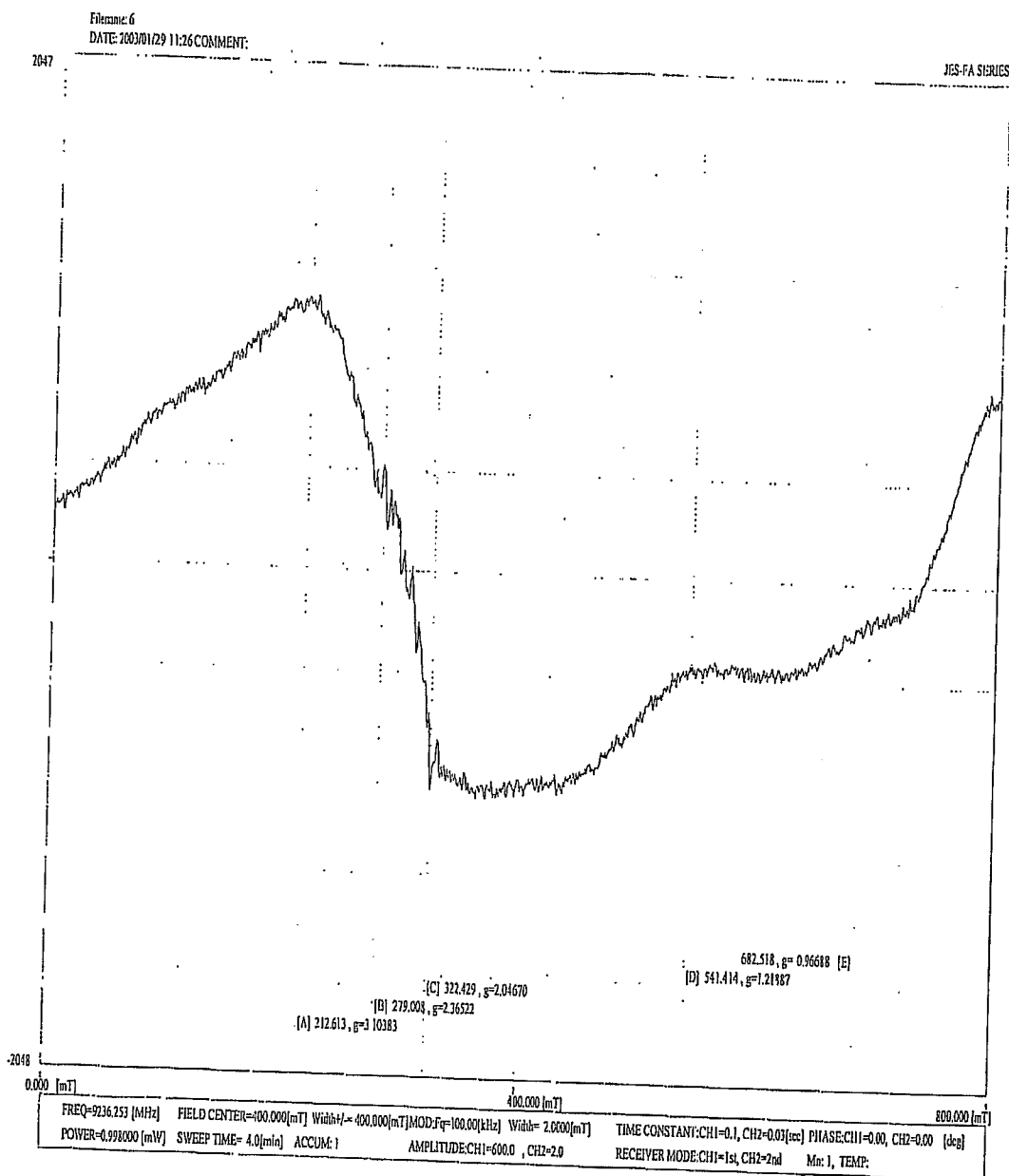
WO 2004/101435

PCT/IB2003/002011

Figure 3-B

10/56

ESR (Electron spin resonance) spectrometer analysis of cupric silicate (synthesized at neutral (pH 6-7) reaction conditions).



17 MAY 2006

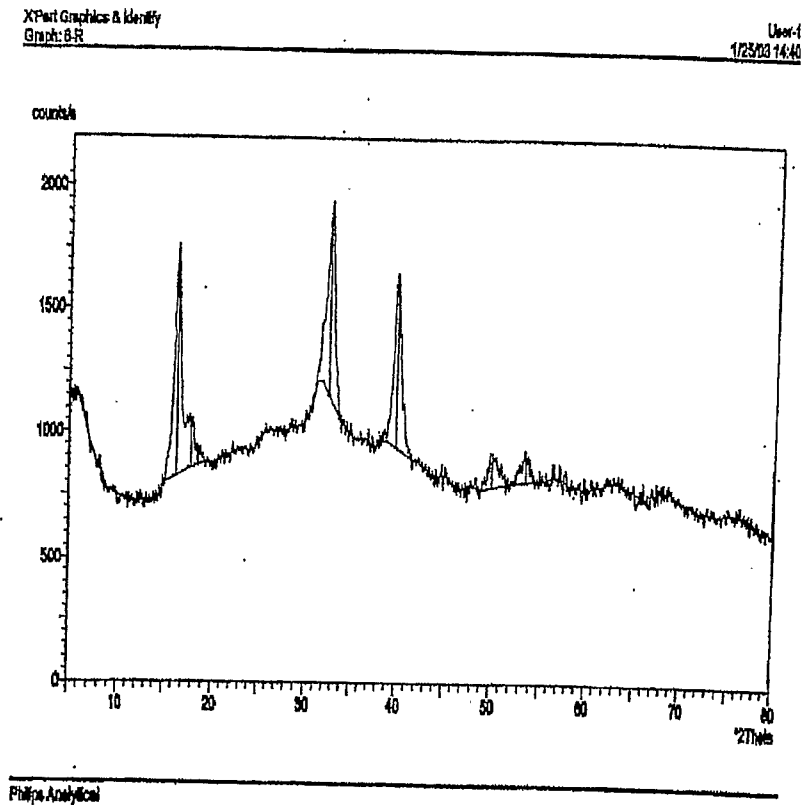
WO 2004/101435

PCT/IB2003/002011

Figure 3-C

11/56

XRD (X-ray diffraction) pattern of cupric silicate (synthesized at neutral (pH 6-7) reaction conditions).



17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

Figure 3-C

12/56

XRD (X-ray diffraction) pattern of cupric silicate (synthesized at neutral (pH 6-7) reaction conditions).

X'Pert Graphics & Identify  
(searched) peak list: 6-R 2

User-1  
1/25/03 14:41

Original scan: 6-R  
Description of scan:

Date: 1/25/03 11:54

Used wavelength:

K-Alpha1

K-Alpha1 wavelength (Å): 1.54056  
K-Alpha2 wavelength (Å): 1.54439  
K-Alpha2/K-Alpha1 intensity ratio: 0.50000  
K-Alpha wavelength (Å): 1.54056  
K-Beta wavelength (Å): 1.39222

Peak search parameter set:

As Measured Intensities

Set created:

1/8/03 13:03

Peak positions defined by:

Minimum of 2nd derivative

Minimum peak tip width (°2Theta):

0.00

Minimum peak tip width (°2Theta):

1.00

Peak base width (°2Theta):

2.00

Minimum significance:

0.60

| d-spacing<br>(Å) | Relative<br>Intensity<br>(%) | Angle<br>(°2Theta) | Peak<br>Height<br>(counts/s) | Background<br>(counts/s) | Tip<br>Width<br>(°2Theta) | Significance |
|------------------|------------------------------|--------------------|------------------------------|--------------------------|---------------------------|--------------|
| 5.46823          | 100.00                       | 16.19577           | 940.90                       | 822.33                   | 0.44000                   | 5.24         |
| 4.99966          | 19.39                        | 17.72532           | 182.41                       | 854.59                   | 0.64000                   | 0.74         |
| 2.76987          | 81.24                        | 32.29276           | 764.43                       | 1159.63                  | 0.36000                   | 2.79         |
| 2.26420          | 73.85                        | 39.77809           | 694.85                       | 945.62                   | 0.36000                   | 2.83         |
| 1.82157          | 14.47                        | 50.03142           | 136.11                       | 789.55                   | 0.48000                   | 0.76         |
| 1.71307          | 10.80                        | 53.44225           | 101.61                       | 812.60                   | 0.80000                   | 1.14         |

17 MAY 2006

Figure 4-A:

Composition analysis of cupric silicate (synthesized at basic (pH 10-11) reaction conditions) using EDAX attached to SEM (Scanning Electron Microscope).

## Weight % by Element

| FileNames | o k   | NaK  | Sik   | CuK   |
|-----------|-------|------|-------|-------|
| VII.spc   | 54.33 | 0.44 | 24.65 | 20.58 |

## Atomic % by Element

| FileNames | o k   | NaK  | Sik   | CuK  |
|-----------|-------|------|-------|------|
| VII.spc   | 73.56 | 0.41 | 19.01 | 7.02 |

17 May 2006

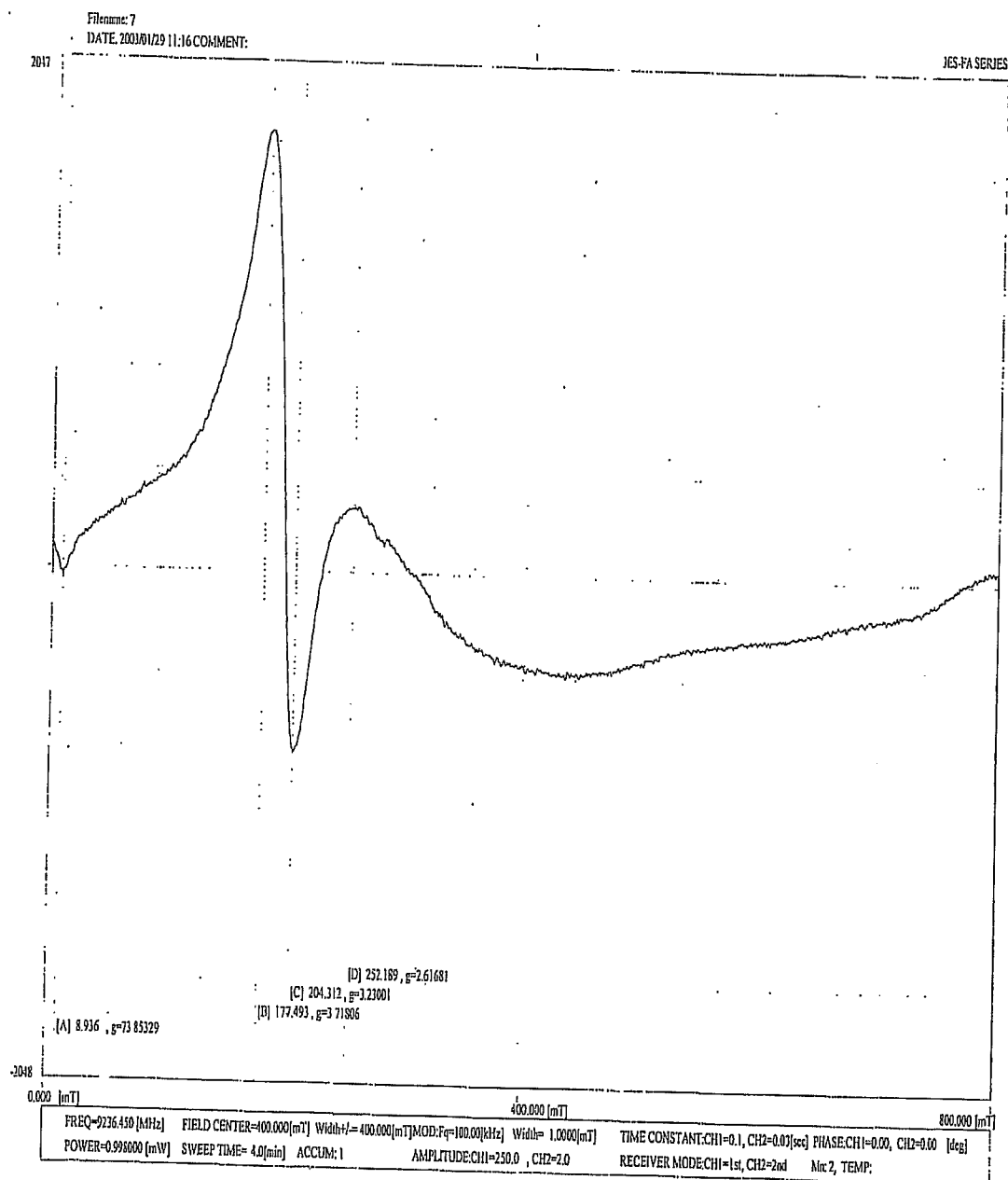
WO 2004/101435

PCT/IB2003/002011

Figure 4-B

14/56

ESR (Electron spin resonance) spectrometer analysis of cupric silicate (synthesized at basic (pH 10-11) reaction conditions).



17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

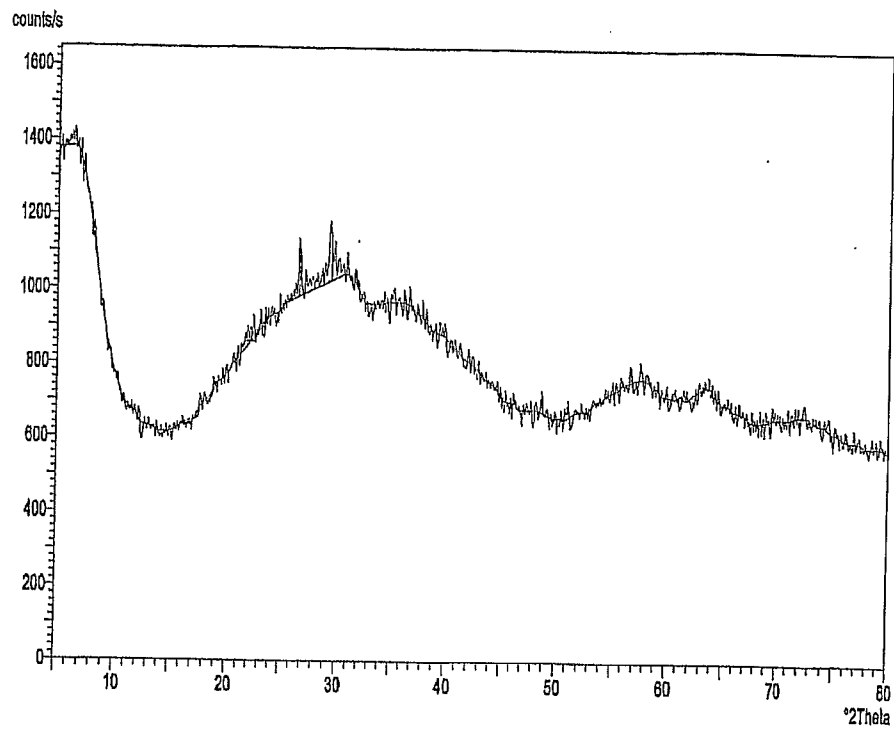
Figure 4-C

15/56

XRD (X-ray diffraction) pattern of cupric silicate (synthesized at basic (pH 10-11) reaction conditions).

XPert Graphics & Identify  
Graph: 7-R

User-1  
1/25/03 14:42



Philips Analytical

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

Figure 4-C

16/56

XRD (X-ray diffraction) pattern of cupric silicate (synthesized at basic (pH 10-11) reaction conditions).

X'Pert Graphics & Identify  
(searched) peak list: 7-R 2

User-1  
1/25/03 14:42

Original scan: 7-R  
Description of scan:

Date: 1/25/03 12:44

Used wavelength:

K-Alpha1

K-Alpha1 wavelength (Å):  
K-Alpha2 wavelength (Å):  
K-Alpha2/K-Alpha1 intensity ratio ;  
K-Alpha wavelength (Å):  
K-Beta wavelength (Å):

1.54056  
1.54439  
0.50000  
1.54056  
1.39222

Peak search parameter set:

As Measured Intensities

Set created:  
Peak positions defined by:  
Minimum peak tip width (°2Theta):  
Minimum peak tip width (°2Theta):  
Peak base width (°2Theta):  
Minimum significance:

1/8/03 13:03  
Minimum of 2nd derivative  
0.00  
1.00  
2.00  
0.60

| d-spacing<br>(Å) | Relative<br>Intensity<br>(%) | Angle<br>(°2Theta) | Peak<br>Height<br>(counts/s) | Background<br>(counts/s) | Tip<br>Width<br>(°2Theta) | Significance |
|------------------|------------------------------|--------------------|------------------------------|--------------------------|---------------------------|--------------|
| 4.01966          | 16.81                        | 22.09561           | 25.68                        | 860.24                   | 0.96000                   | 0.66         |
| 3.34217          | 100.00                       | 26.64983           | 152.74                       | 982.28                   | 0.20000                   | 0.78         |
| 3.03278          | 66.38                        | 29.42686           | 101.40                       | 1024.95                  | 0.48000                   | 0.63         |

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

17/56

Figure 5-A:

Composition analysis of cupric silicate (synthesized at extreme acidic reaction conditions (below pH 2) by addition of 10 ml HCl ) using EDAX attached to SEM (Scanning Electron Microscope).

## Weight % by Element

| FileNames | o k   | NaK  | SiK   | ClK  | CuK   |
|-----------|-------|------|-------|------|-------|
| c10.spc   | 45.69 | 1.06 | 32.63 | 3.30 | 17.33 |

## Atomic % by Element

| FileNames | o k   | NaK  | SiK   | ClK  | CuK  |
|-----------|-------|------|-------|------|------|
| c10.spc   | 64.47 | 1.04 | 26.23 | 2.10 | 6.16 |

17 MAY 2006

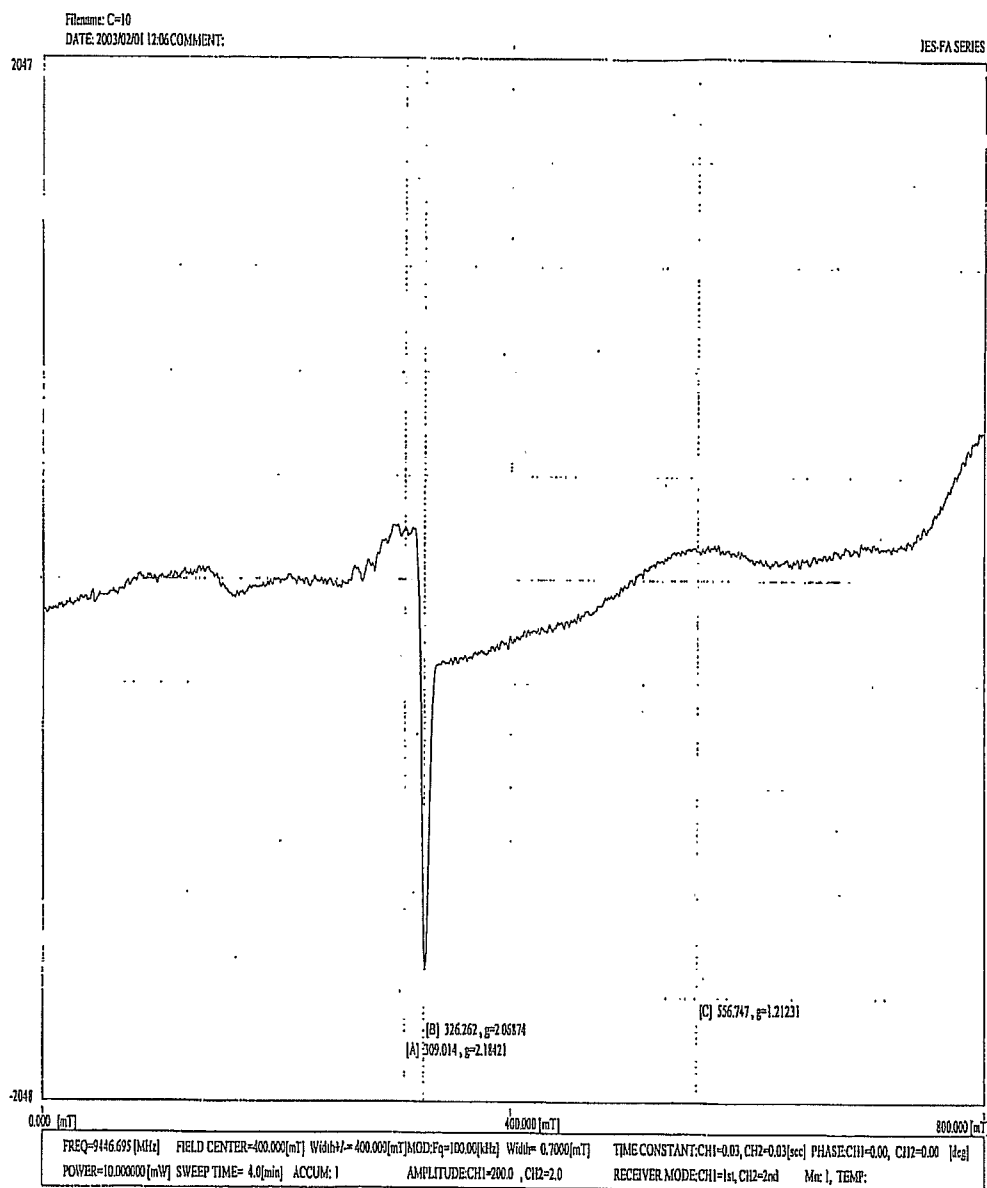
WO 2004/101435

PCT/IB2003/002011

Figure 5-B

18/56

ESR (Electron spin resonance) spectrometer analysis of cupric silicate (synthesized at extreme acidic reaction conditions (below pH 2) by addition of 10 ml HCl ).



17 MAY 2006

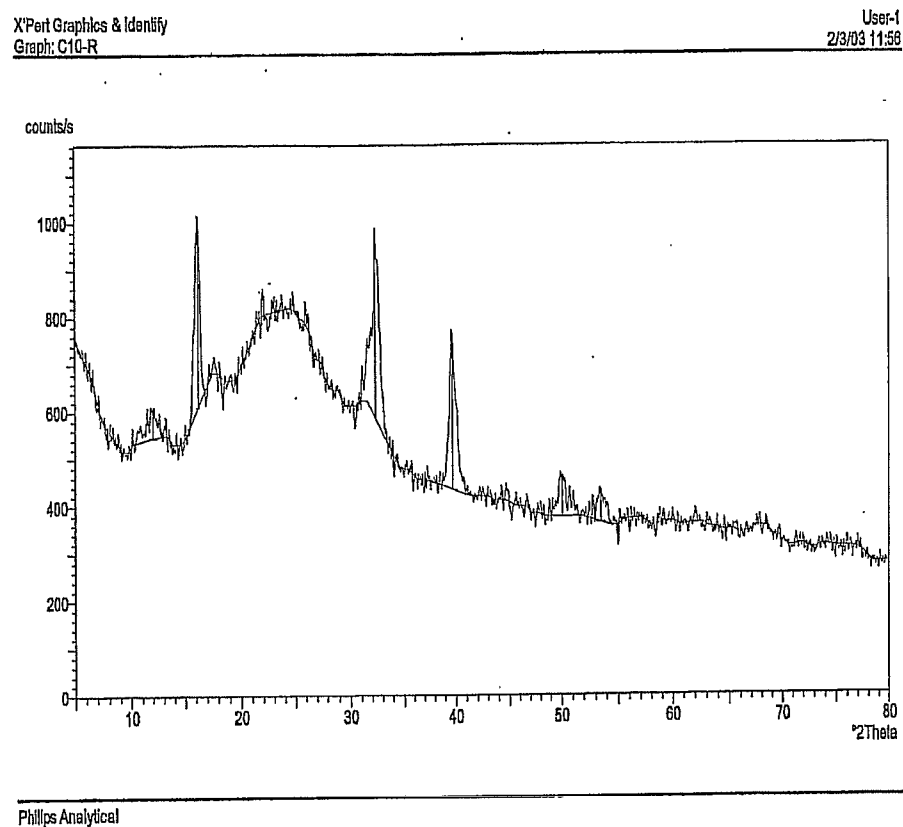
WO 2004/101435

PCT/IB2003/002011

19/56

Figure 5-C

XRD (X-ray diffraction) pattern of cupric silicate ( synthesized at extreme acidic reaction conditions (below pH 2) by addition of 10 ml HCl ).



17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

20/56

Figure 5-C

XRD (X-ray diffraction) pattern of cupric silicate (synthesized at extreme acidic reaction conditions (below pH 2) by addition of 10 ml HCl).

X'Pert Graphics & Identify  
(searched) peak list: C10-R 2

User-1  
2/3/03 11:56

Original scan: C10-R  
Description of scan:

Date: 2/2/03 15:13

Used wavelength:

K-Alpha1

K-Alpha1 wavelength (Å): 1.54056  
K-Alpha2 wavelength (Å): 1.54439  
K-Alpha2/K-Alpha1 intensity ratio : 0.50000  
K-Alpha wavelength (Å): 1.54056  
K-Beta wavelength (Å): 1.39222

Peak search parameter set:

As Measured Intensities

Set created: 1/8/03 13:03  
Peak positions defined by: Minimum of 2nd derivative  
Minimum peak tip width (°2Theta): 0.00  
Minimum peak tip width (°2Theta): 1.00  
Peak base width (°2Theta): 2.00  
Minimum significance: 0.60

| d-spacing<br>(Å) | Relative<br>Intensity<br>(%) | Angle<br>(°2Theta) | Peak<br>Height<br>(counts/s) | Background<br>(counts/s) | Tip<br>Width<br>(°2Theta) | Significance |
|------------------|------------------------------|--------------------|------------------------------|--------------------------|---------------------------|--------------|
| 7.39149          | 15.98                        | 11.96350           | 64.02                        | 545.13                   | 0.80000                   | 0.73         |
| 5.46724          | 100.00                       | 16.19872           | 400.70                       | 610.14                   | 0.32000                   | 2.15         |
| 2.77097          | 98.52                        | 32.27956           | 394.77                       | 587.64                   | 0.20000                   | 0.79         |
| 2.26751          | 82.36                        | 39.71761           | 330.02                       | 436.05                   | 0.28000                   | 1.67         |
| 1.82010          | 20.70                        | 50.07447           | 82.93                        | 377.75                   | 0.48000                   | 0.98         |
| 1.71117          | 15.69                        | 53.50644           | 62.86                        | 365.08                   | 0.80000                   | 0.92         |

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

21/56

Figure 6-A:

Composition analysis of cupric silicate (synthesized at extreme acidic reaction conditions (below pH 2) by addition of 20 ml HCl ) using EDAX attached to SEM (Scanning Electron Microscope).

Weight % by Element

| FileNames | o k   | NaK  | Sik   | ClK  | CuK   |
|-----------|-------|------|-------|------|-------|
| c20.spc   | 52.91 | 0.60 | 33.23 | 1.92 | 11.34 |

Atomic % by Element

| FileNames | o k   | NaK  | Sik   | ClK  | CuK  |
|-----------|-------|------|-------|------|------|
| c20.spc   | 69.64 | 0.55 | 24.91 | 1.14 | 3.76 |

17 MAY 2006

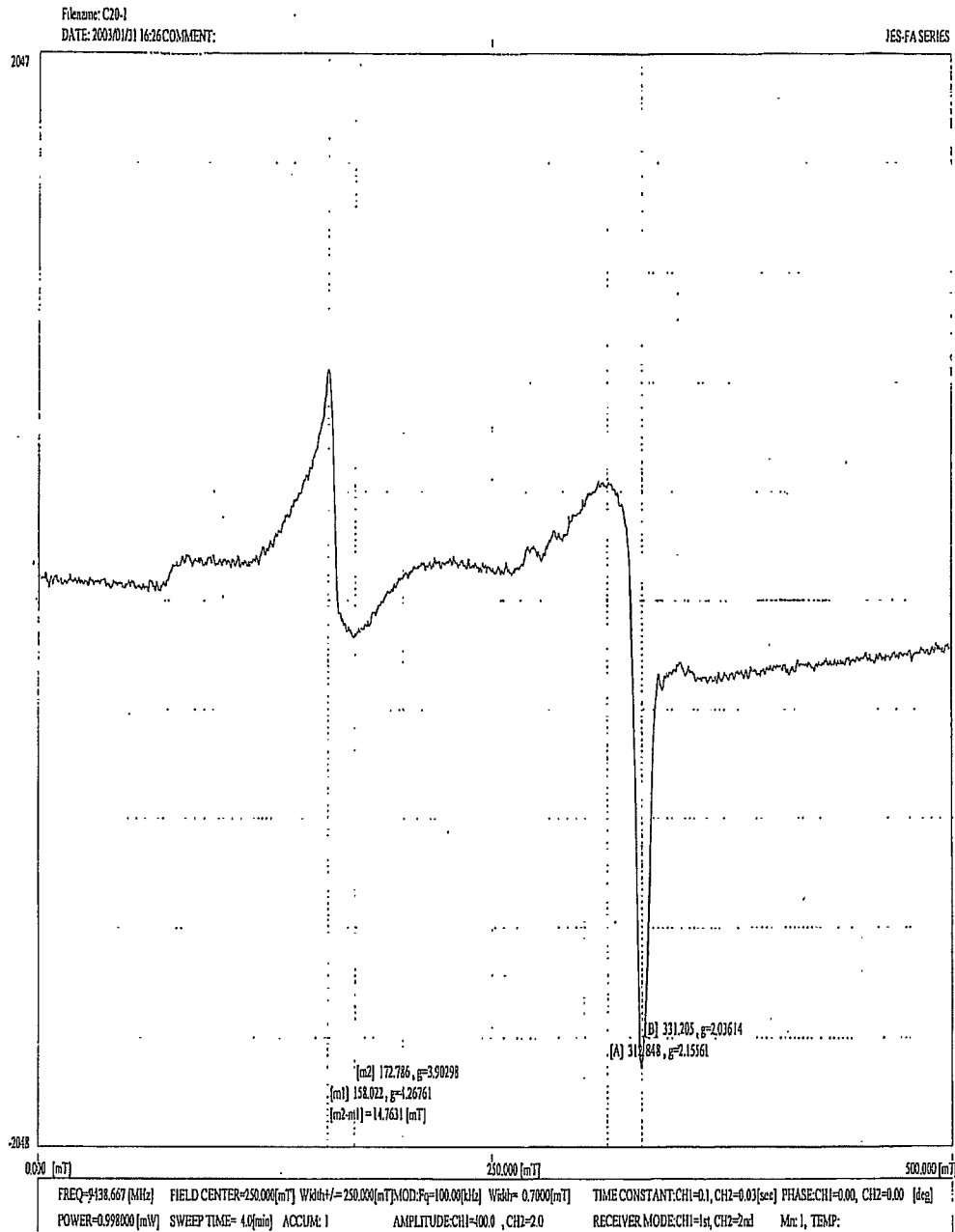
WO 2004/101435

22/56

PCT/IB2003/002011

Figure 6-B

ESR (Electron spin resonance) spectrometer analysis of cupric silicate (synthesized at extreme acidic reaction conditions (below pH 2) by addition of 20 ml HCl ).



17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

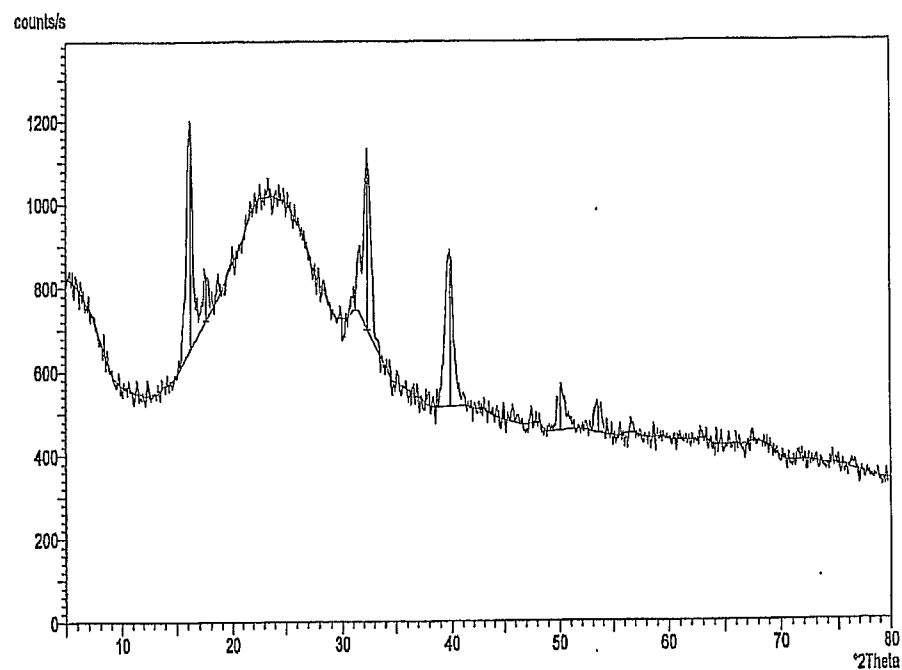
23/56

Figure 6-C

XRD (X-ray diffraction) pattern of cupric silicate (synthesized at extreme acidic reaction conditions (below pH 2) by addition of 20 ml HCl).

X'Pert Graphics & Identify  
Graph: C20-R

User-1  
2/3/03 11:57



Philips Analytical

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

24/56

Figure 6-C

XRD (X-ray diffraction) pattern of cupric silicate (synthesized at extreme acidic reaction conditions (below pH 2) by addition of 20 ml HCl ).

X'Pert Graphics & Identify  
(searched) peak list: C20-R 2

User-1  
2/3/03 11:57

Original scan: C20-R  
Description of scan:

Date: 2/2/03 14:43

Used wavelength: K-Alpha1

K-Alpha1 wavelength (Å): 1.54056  
K-Alpha2 wavelength (Å): 1.54439  
K-Alpha2/K-Alpha1 intensity ratio: 0.50000  
K-Alpha wavelength (Å): 1.54056  
K-Beta wavelength (Å): 1.39222

Peak search parameter set: As Measured Intensities  
Set created: 1/8/03 13:03  
Peak positions defined by: Minimum of 2nd derivative  
Minimum peak tip width (°2Theta): 0.00  
Minimum peak tip width (°2Theta): 1.00  
Peak base width (°2Theta): 2.00  
Minimum significance: 0.60

| d-spacing<br>(Å) | Relative<br>Intensity<br>(%) | Angle<br>(°2Theta) | Peak<br>Height<br>(counts/s) | Background<br>(counts/s) | Tip<br>Width<br>(°2Theta) | Significance |
|------------------|------------------------------|--------------------|------------------------------|--------------------------|---------------------------|--------------|
| 5.44576          | 100.00                       | 16.26305           | 541.23                       | 653.67                   | 0.20000                   | 0.71         |
| 5.03216          | 19.73                        | 17.60991           | 106.76                       | 721.64                   | 0.48000                   | 0.77         |
| 2.76378          | 76.53                        | 32.36589           | 414.21                       | 698.97                   | 0.56000                   | 3.99         |
| 2.26021          | 67.52                        | 39.85131           | 365.45                       | 515.17                   | 0.56000                   | 4.06         |
| 2.01957          | 7.07                         | 44.84173           | 38.28                        | 483.78                   | 0.24000                   | 0.70         |
| 1.82106          | 15.18                        | 50.04628           | 82.15                        | 457.19                   | 0.64000                   | 0.84         |
| 1.71148          | 11.43                        | 53.49579           | 61.84                        | 451.40                   | 0.80000                   | 1.24         |

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

25/56

Figure 7-A:

Composition analysis of zinc silicate (synthesized at neutral (pH 6-7) reaction conditions) using EDAX attached to SEM (Scanning Electron Microscope).

Weight % by Element

| FileNames | o k   | SiK  | ClK  | ZnK   |
|-----------|-------|------|------|-------|
| nine.spc  | 35.71 | 4.89 | 0.08 | 59.32 |

Atomic % by Element

| FileNames | o k   | SiK  | ClK  | ZnK   |
|-----------|-------|------|------|-------|
| nine.spc  | 67.32 | 5.25 | 0.06 | 27.37 |

17 MAY 2006

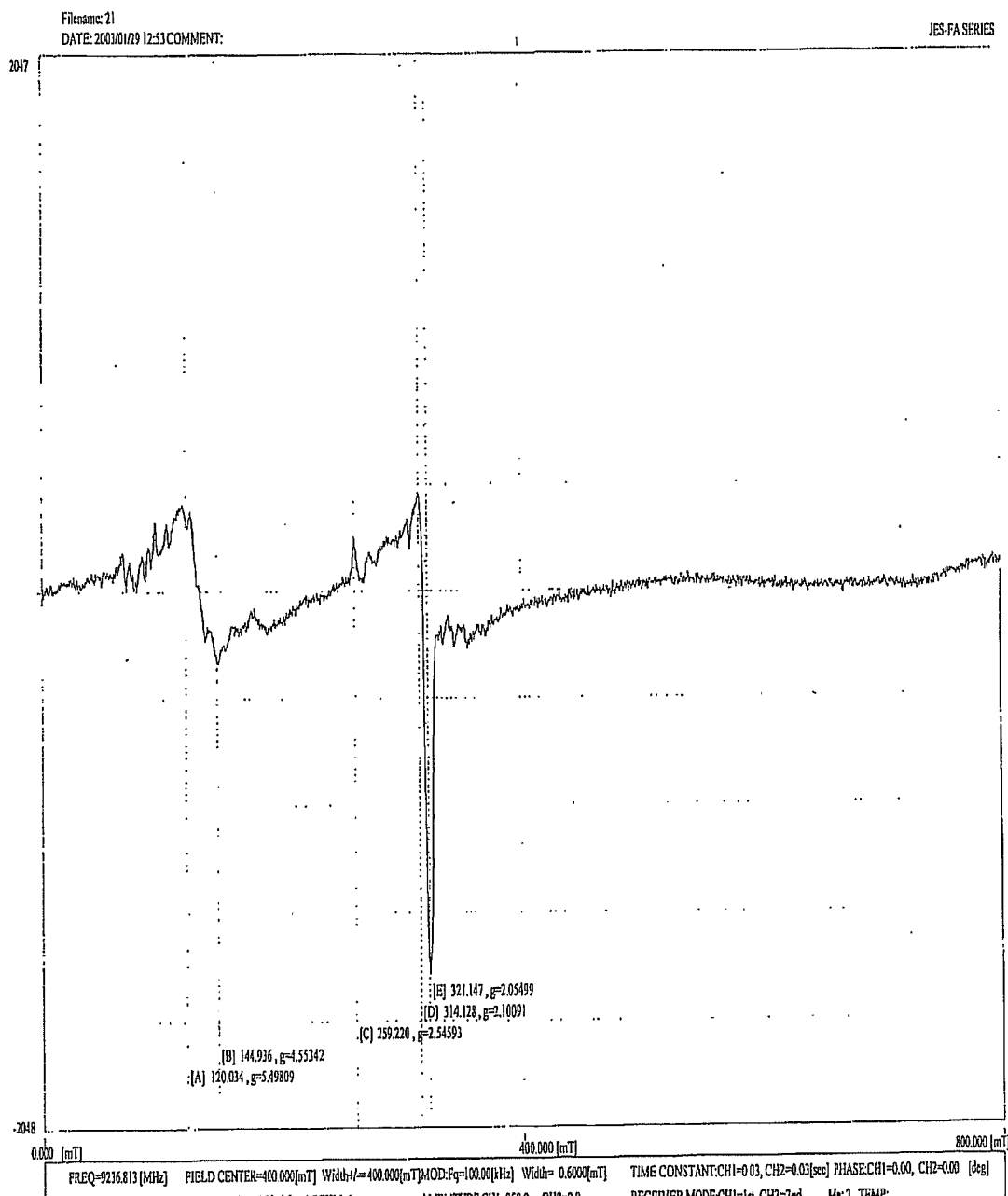
WO 2004/101435

PCT/IB2003/002011

26/56

Figure 7-B

ESR (Electron spin resonance) spectrometer analysis of zinc silicate (synthesized at neutral (pH 6-7) reaction conditions).



17 MAY 2006

WO 2004/101435

27/56

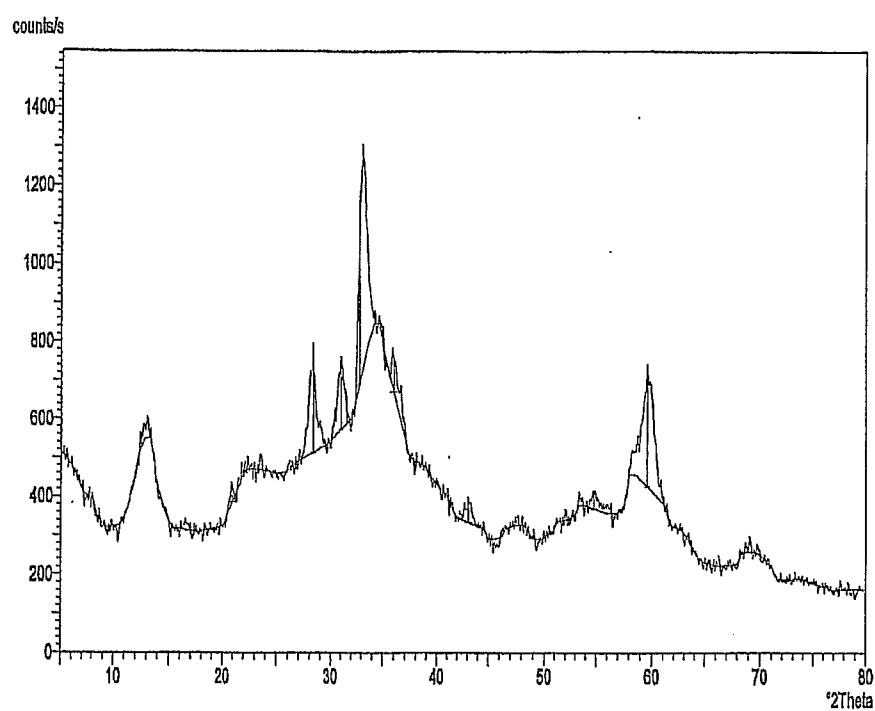
PCT/IB2003/002011

Figure 7-C

XRD (X-ray diffraction) pattern of zinc silicate (synthesized at neutral (pH 6-7) reaction conditions).

X'Pert Graphics & Identify  
Graph: 21-R

User-1  
1/25/03 14:38



Philips Analytical

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

28/56

Figure 7-C

XRD (X-ray diffraction) pattern of zinc silicate (synthesized at neutral (pH 6-7) reaction conditions).

X'Pert Graphics & Identify  
(searched) peak list: 21-R 2

User-1  
1/25/03 14:39

Original scan: 21-R  
Description of scan:

Date: 1/25/03 13:25

Used wavelength: K-Alpha1

K-Alpha1 wavelength (Å):  
K-Alpha2 wavelength (Å):  
K-Alpha2/K-Alpha1 intensity ratio:  
K-Alpha wavelength (Å):  
K-Beta wavelength (Å):

1.54056  
1.54439  
0.50000  
1.54056  
1.39222

Peak search parameter set:

As Measured Intensities  
Set created: 1/8/03 13:03  
Peak positions defined by: Minimum of 2nd derivative  
Minimum peak tip width (°2Theta): 0.00  
Minimum peak tip width (°2Theta): 1.00  
Peak base width (°2Theta): 2.00  
Minimum significance: 0.60

| d-spacing<br>(Å) | Relative<br>Intensity<br>(%) | Angle<br>(°2Theta) | Peak<br>Height<br>(counts/s) | Background<br>(counts/s) | Tip<br>Width<br>(°2Theta) | Significance |
|------------------|------------------------------|--------------------|------------------------------|--------------------------|---------------------------|--------------|
| 4.24766          | 9.82                         | 20.89591           | 43.60                        | 386.64                   | 0.48000                   | 0.85         |
| 3.15351          | 59.30                        | 28.27636           | 263.36                       | 514.45                   | 0.48000                   | 1.66         |
| 2.88286          | 40.51                        | 30.99464           | 179.93                       | 574.24                   | 0.40000                   | 0.76         |
| 2.73150          | 100.00                       | 32.75904           | 444.15                       | 691.51                   | 0.28000                   | 0.83         |
| 2.49483          | 21.20                        | 35.96794           | 94.17                        | 671.04                   | 0.64000                   | 0.70         |
| 2.09711          | 13.25                        | 43.09916           | 58.83                        | 334.47                   | 0.64000                   | 0.73         |
| 1.67436          | 9.61                         | 54.77999           | 42.67                        | 370.46                   | 0.64000                   | 0.92         |
| 1.55031          | 69.13                        | 59.58455           | 307.02                       | 427.76                   | 0.40000                   | 0.84         |

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

29/56

Figure 8-A:

Composition analysis of zinc silicate (synthesized at extreme acidic (below pH2) reaction conditions) using EDAX attached to SEM (Scanning Electron Microscope).

## Weight % by Element

| FileNames   | o k   | ZnL   | NaK  | SiK   | ClK  |
|-------------|-------|-------|------|-------|------|
| zinc-10.spc | 35.59 | 41.94 | 0.00 | 17.04 | 5.43 |

## Atomic % by Element

| FileNames   | o k   | ZnL   | NaK  | SiK   | ClK  |
|-------------|-------|-------|------|-------|------|
| zinc-10.spc | 61.35 | 17.69 | 0.00 | 16.73 | 4.22 |

17 MAY 2006

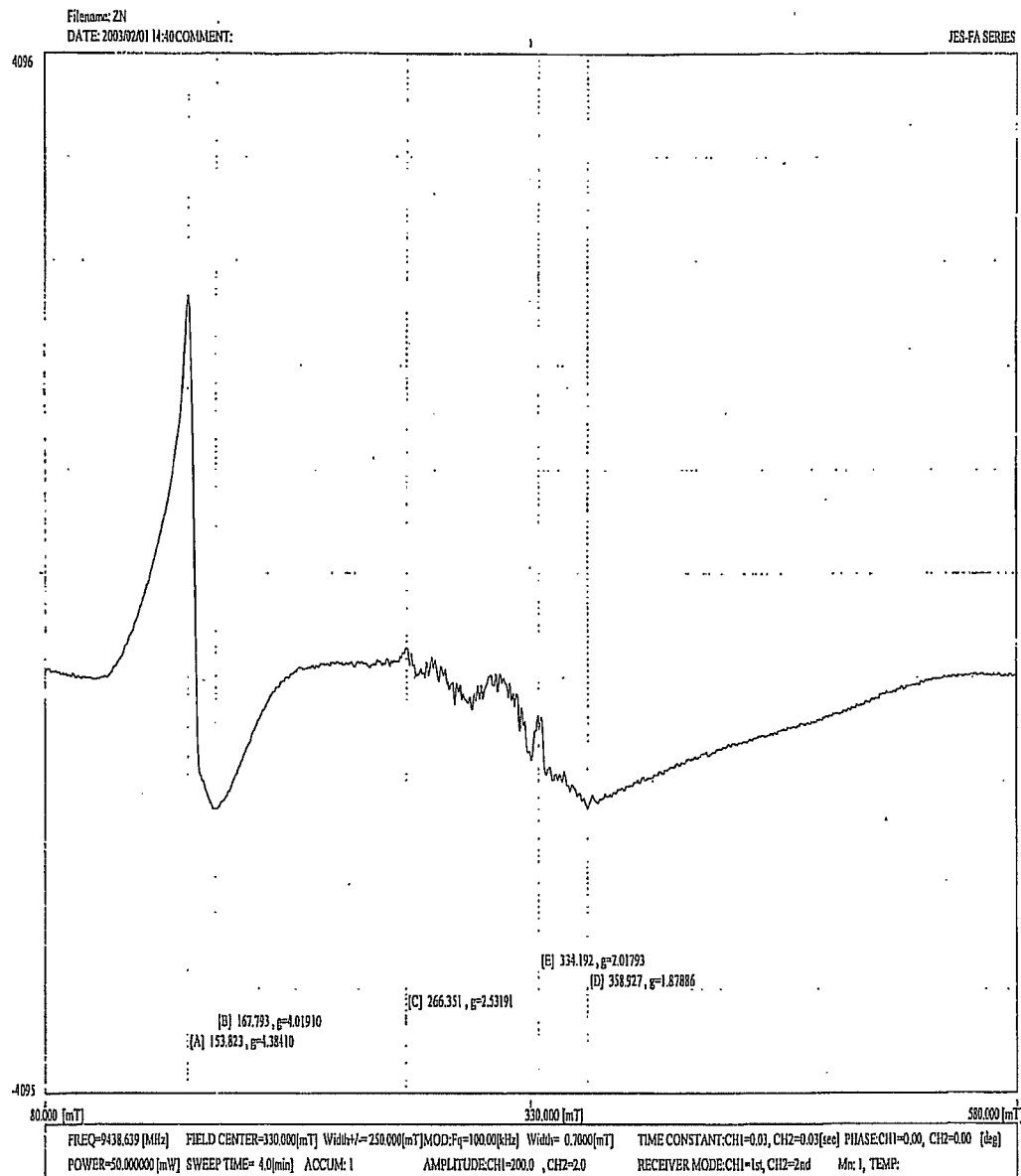
WO 2004/101435

PCT/IB2003/002011

30/56

Figure 8-B

ESR (Electron spin resonance) spectrometer analysis of zinc silicate (synthesized at extreme acidic (below pH2) reaction conditions).



17 May 2006

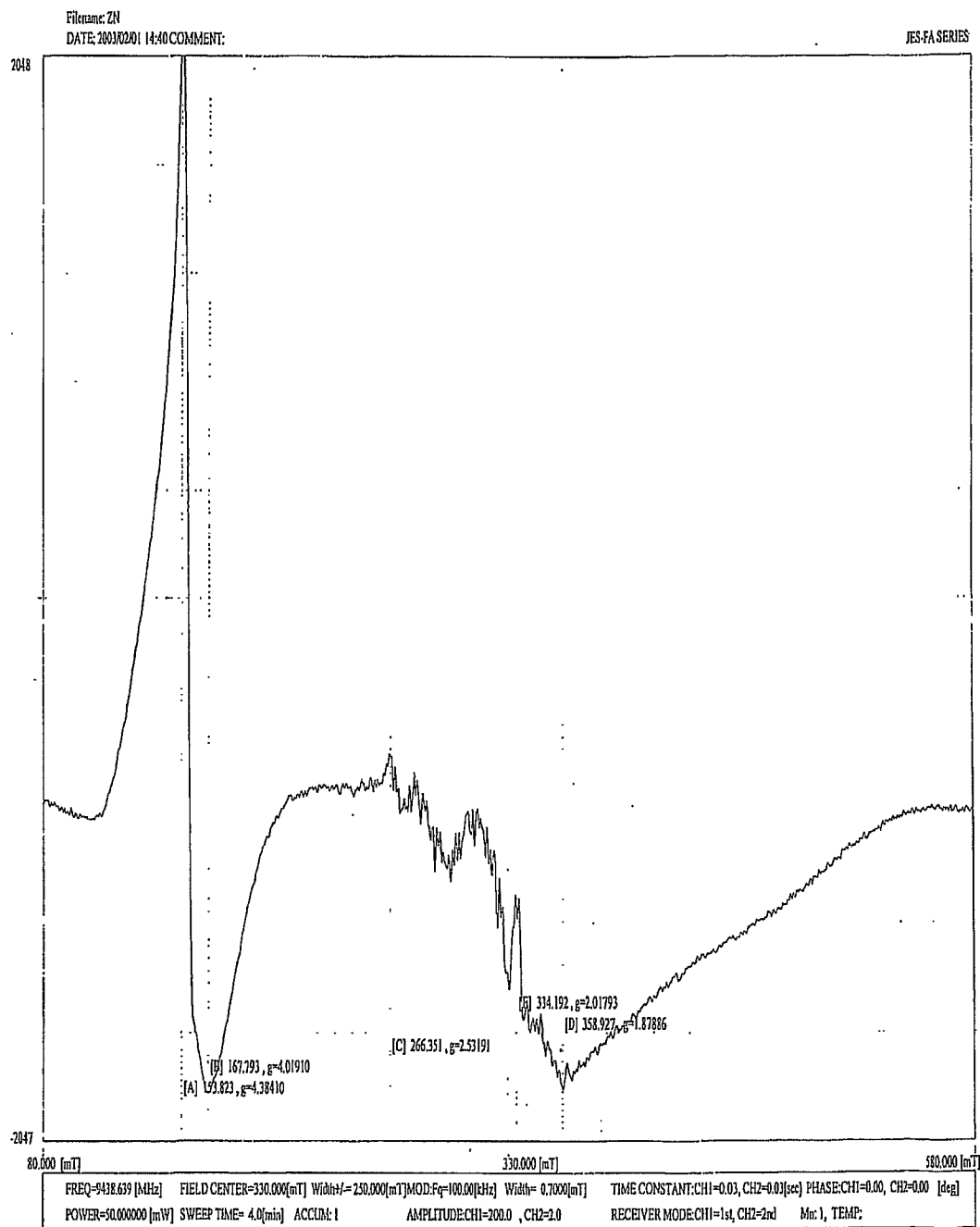
WO 2004/101435

31/56

PCT/IB2003/002011

Figure 8-B

ESR (Electron spin resonance) spectrometer analysis of zinc silicate (synthesized at extreme acidic (below pH2) reaction conditions).



17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

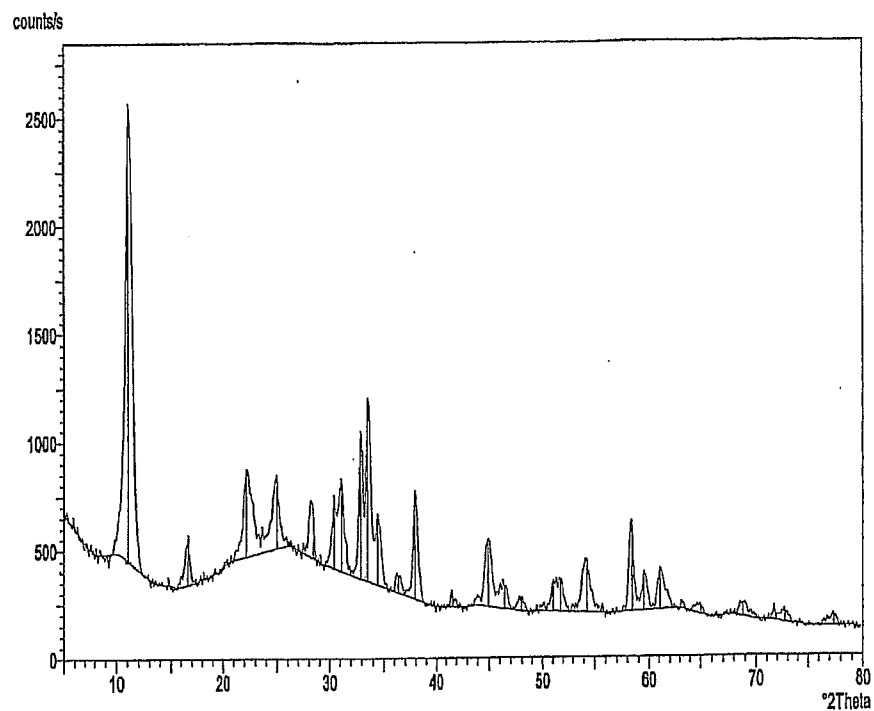
32/56

Figure 8-C

XRD (X-ray diffraction) pattern of zinc silicate (synthesized at extreme acidic (below pH2) reaction conditions).

X'Pert Graphics & Identify  
Graph: XZ-R

User-1  
2/3/03 11:58



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17 MAY 2006

WO 2004/101435

33/56

PCT/IB2003/002011

Figure 8-C

XRD (X-ray diffraction) pattern of zinc silicate (synthesized at extreme acidic (below pH2) reaction conditions).

| X'Pert Graphics & Identify<br>(searched) peak list: XZ-R 2 |                              |                           |                              | User-1<br>2/3/03 11:58   |                           |              |
|------------------------------------------------------------|------------------------------|---------------------------|------------------------------|--------------------------|---------------------------|--------------|
| Original scan: XZ-R                                        |                              | Date: 2/1/03 18:50        |                              |                          |                           |              |
| Description of scan:                                       |                              |                           |                              |                          |                           |              |
| Used wavelength:                                           |                              | K-Alpha1                  |                              |                          |                           |              |
| K-Alpha1 wavelength (Å):                                   |                              | 1.54056                   |                              |                          |                           |              |
| K-Alpha2 wavelength (Å):                                   |                              | 1.54439                   |                              |                          |                           |              |
| K-Alpha2/K-Alpha1 intensity ratio :                        |                              | 0.50000                   |                              |                          |                           |              |
| K-Alpha wavelength (Å):                                    |                              | 1.54056                   |                              |                          |                           |              |
| K-Beta wavelength (Å):                                     |                              | 1.39222                   |                              |                          |                           |              |
| Peak search parameter set:                                 |                              | As Measured Intensities   |                              |                          |                           |              |
| Set created:                                               |                              | 1/8/03 13:03              |                              |                          |                           |              |
| Peak positions defined by:                                 |                              | Minimum of 2nd derivative |                              |                          |                           |              |
| Minimum peak tip width (°2Theta):                          |                              | 0.00                      |                              |                          |                           |              |
| Minimum peak tip width (°2Theta):                          |                              | 1.00                      |                              |                          |                           |              |
| Peak base width (°2Theta):                                 |                              | 2.00                      |                              |                          |                           |              |
| Minimum significance:                                      |                              | 0.60                      |                              |                          |                           |              |
| d-spacing<br>(Å)                                           | Relative<br>Intensity<br>(%) | Angle<br>(°2Theta)        | Peak<br>Height<br>(counts/s) | Background<br>(counts/s) | Tip<br>Width<br>(°2Theta) | Significance |
| 7.98264                                                    | 100.00                       | 11.07467                  | 2079.88                      | 453.30                   | 0.48000                   | 16.11        |
| 5.33677                                                    | 10.63                        | 16.59748                  | 221.17                       | 343.67                   | 0.32000                   | 1.31         |
| 4.00484                                                    | 19.52                        | 22.17845                  | 406.04                       | 474.57                   | 0.28000                   | 0.97         |
| 3.56647                                                    | 16.16                        | 24.94587                  | 336.14                       | 510.88                   | 0.24000                   | 1.03         |
| 3.14366                                                    | 10.46                        | 28.36683                  | 217.55                       | 465.82                   | 0.48000                   | 4.95         |
| 2.93766                                                    | 15.03                        | 30.40232                  | 312.67                       | 418.68                   | 0.24000                   | 1.39         |
| 2.86706                                                    | 20.14                        | 31.16978                  | 418.81                       | 403.81                   | 0.32000                   | 2.08         |
| 2.72163                                                    | 31.97                        | 32.88120                  | 664.98                       | 370.63                   | 0.32000                   | 4.93         |
| 2.67080                                                    | 40.17                        | 33.52527                  | 835.44                       | 358.14                   | 0.36000                   | 7.23         |
| 2.60200                                                    | 15.53                        | 34.43904                  | 322.95                       | 340.43                   | 0.24000                   | 0.93         |
| 2.46786                                                    | 3.83                         | 36.37469                  | 79.68                        | 303.54                   | 0.32000                   | 1.82         |
| 2.37176                                                    | 23.66                        | 37.90343                  | 492.02                       | 275.31                   | 0.36000                   | 4.69         |
| 2.16675                                                    | 2.30                         | 41.64812                  | 47.90                        | 237.27                   | 0.48000                   | 0.80         |
| 2.01636                                                    | 14.86                        | 44.91711                  | 308.99                       | 237.75                   | 0.64000                   | 5.99         |
| 1.95400                                                    | 4.79                         | 46.43299                  | 99.53                        | 226.89                   | 0.72000                   | 2.14         |
| 1.89620                                                    | 2.90                         | 47.93553                  | 60.26                        | 216.13                   | 0.64000                   | 1.07         |
| 1.78961                                                    | 6.59                         | 50.98829                  | 136.97                       | 214.24                   | 0.40000                   | 0.92         |
| 1.76470                                                    | 6.90                         | 51.76088                  | 143.48                       | 213.02                   | 0.32000                   | 0.65         |
| 1.68726                                                    | 11.52                        | 54.32631                  | 239.59                       | 208.98                   | 0.32000                   | 1.25         |
| 1.57830                                                    | 19.87                        | 58.42442                  | 413.19                       | 213.32                   | 0.40000                   | 6.07         |
| 1.55167                                                    | 7.86                         | 59.52677                  | 163.47                       | 215.82                   | 0.24000                   | 0.83         |
| 1.51555                                                    | 8.99                         | 61.09471                  | 186.93                       | 219.37                   | 0.32000                   | 1.26         |
| 1.43353                                                    | 1.90                         | 65.00406                  | 39.44                        | 195.08                   | 0.56000                   | 0.61         |
| 1.36374                                                    | 2.96                         | 68.78101                  | 61.53                        | 182.93                   | 0.64000                   | 0.99         |
| 1.29976                                                    | 2.39                         | 72.68780                  | 49.61                        | 155.06                   | 0.64000                   | 0.68         |
| 1.23245                                                    | 2.46                         | 77.36409                  | 51.16                        | 137.24                   | 0.48000                   | 0.76         |

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

34/56

Figure 9-A:

Composition analysis of silver silicate (synthesized at neutral (pH 6-7) reaction conditions) using EDAX attached to SEM (Scanning Electron Microscope).

## Weight % by Element

| FileNames   | o k   | NaK  | SiK  | ClK   | AgL   |
|-------------|-------|------|------|-------|-------|
| Silver5.spc | 29.55 | 0.56 | 2.63 | 15.79 | 51.47 |

## Atomic % by Element

| FileNames   | o k   | NaK  | SiK  | ClK   | AgL   |
|-------------|-------|------|------|-------|-------|
| Silver5.spc | 63.96 | 0.85 | 3.25 | 15.42 | 16.52 |

17 MAY 2006

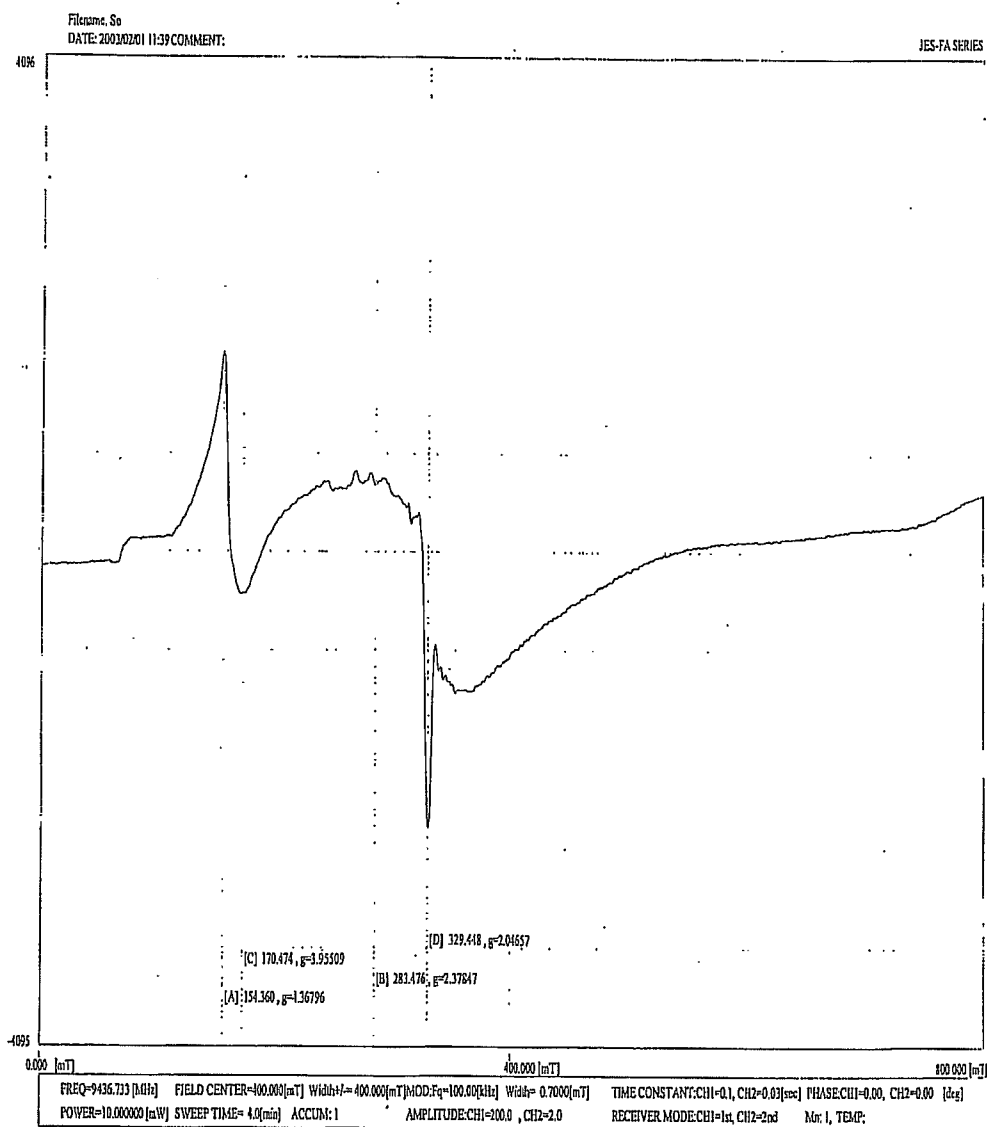
WO 2004/101435

35/56

PCT/IB2003/002011

Figure 9-B

ESR (Electron spin resonance) spectrometer analysis of silver silicate (synthesized at neutral (pH 6-7) reaction conditions).



17 MAY 2006

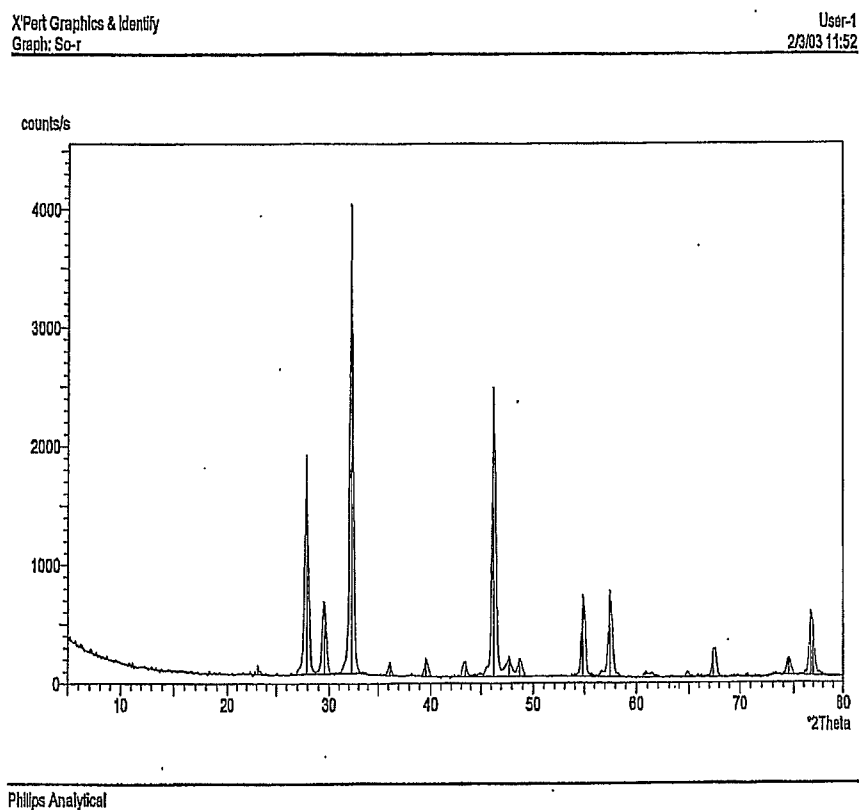
WO 2004/101435

PCT/IB2003/002011

36/56

Figure 9-C

XRD (X-ray diffraction) pattern of silver silicate (synthesized at neutral (pH 6-7) reaction conditions).



17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

Figure 9-C

37/56

XRD (X-ray diffraction) pattern of silver silicate (synthesized at neutral (pH 6-7) reaction conditions).

X'Pert Graphics & Identify  
(searched) peak list: So-r 2

User-1  
2/3/03 11:52

Original scan: So-r  
Description of scan:

Date: 2/3/03 11:12

Used wavelength:

K-Alpha1

K-Alpha1 wavelength (Å): 1.54056  
K-Alpha2 wavelength (Å): 1.54439  
K-Alpha2/K-Alpha1 intensity ratio : 0.50000  
K-Alpha wavelength (Å): 1.54056  
K-Beta wavelength (Å): 1.39222

Peak search parameter set:

As Measured Intensities  
Set created: 1/8/03 13:03  
Peak positions defined by: Minimum of 2nd derivative  
Minimum peak tip width (°2Theta): 0.00  
Minimum peak tip width (°2Theta): 1.00  
Peak base width (°2Theta): 2.00  
Minimum significance: 0.60

| d-spacing<br>(Å) | Relative<br>Intensity<br>(%) | Angle<br>(°2Theta) | Peak<br>Height<br>(counts/s) | Background<br>(counts/s) | Tip<br>Width<br>(°2Theta) | Significance |
|------------------|------------------------------|--------------------|------------------------------|--------------------------|---------------------------|--------------|
| 12.51901         | 0.61                         | 7.05514            | 24.25                        | 269.08                   | 0.32000                   | 0.75         |
| 3.84145          | 1.61                         | 23.13452           | 63.48                        | 84.62                    | 0.24000                   | 0.85         |
| 3.19616          | 46.53                        | 27.89129           | 1835.66                      | 84.32                    | 0.32000                   | 11.62        |
| 3.02038          | 15.33                        | 29.55040           | 604.98                       | 86.85                    | 0.40000                   | 10.85        |
| 2.76936          | 100.00                       | 32.29885           | 3945.11                      | 91.02                    | 0.36000                   | 24.39        |
| 2.48336          | 2.75                         | 36.13978           | 108.38                       | 69.78                    | 0.20000                   | 1.06         |
| 2.27608          | 3.61                         | 39.56180           | 142.47                       | 63.39                    | 0.24000                   | 1.46         |
| 2.08218          | 3.16                         | 43.42372           | 124.78                       | 58.90                    | 0.44000                   | 4.34         |
| 1.96033          | 61.37                        | 46.27446           | 2421.27                      | 59.81                    | 0.44000                   | 31.71        |
| 1.90300          | 4.13                         | 47.75348           | 162.86                       | 60.29                    | 0.20000                   | 0.87         |
| 1.86696          | 3.87                         | 48.73456           | 152.60                       | 60.60                    | 0.28000                   | 2.05         |
| 1.67244          | 17.12                        | 54.84804           | 675.21                       | 58.99                    | 0.40000                   | 11.19        |
| 1.60159          | 18.06                        | 57.49439           | 712.55                       | 55.15                    | 0.20000                   | 2.33         |
| 1.52203          | 0.97                         | 60.80730           | 38.34                        | 49.06                    | 0.32000                   | 0.61         |
| 1.43528          | 1.08                         | 64.91550           | 42.68                        | 50.99                    | 0.28000                   | 1.03         |
| 1.38831          | 5.42                         | 67.39817           | 213.70                       | 52.15                    | 0.24000                   | 1.32         |
| 1.27274          | 3.54                         | 74.48880           | 139.61                       | 66.51                    | 0.48000                   | 3.96         |
| 1.24157          | 13.09                        | 76.69181           | 516.25                       | 62.23                    | 0.24000                   | 2.43         |
| 1.23836          | 11.31                        | 76.92707           | 446.10                       | 61.78                    | 0.16000                   | 0.61         |

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

38/56

Figure 10-A:

Composition analysis of silver silicate (synthesized at acidic (pH 2) reaction conditions) using EDAX attached to SEM (Scanning Electron Microscope).

## Weight % by Element

| FileNames    | o k   | NaK  | Sik   | ClK  | AgL   |
|--------------|-------|------|-------|------|-------|
| Silver-4.spc | 52.01 | 4.83 | 20.85 | 0.46 | 21.86 |

## Atomic % by Element

| FileNames    | o k   | NaK  | Sik   | ClK  | AgL  |
|--------------|-------|------|-------|------|------|
| Silver-4.spc | 73.57 | 4.75 | 16.80 | 0.29 | 4.59 |

17 MAY 2006

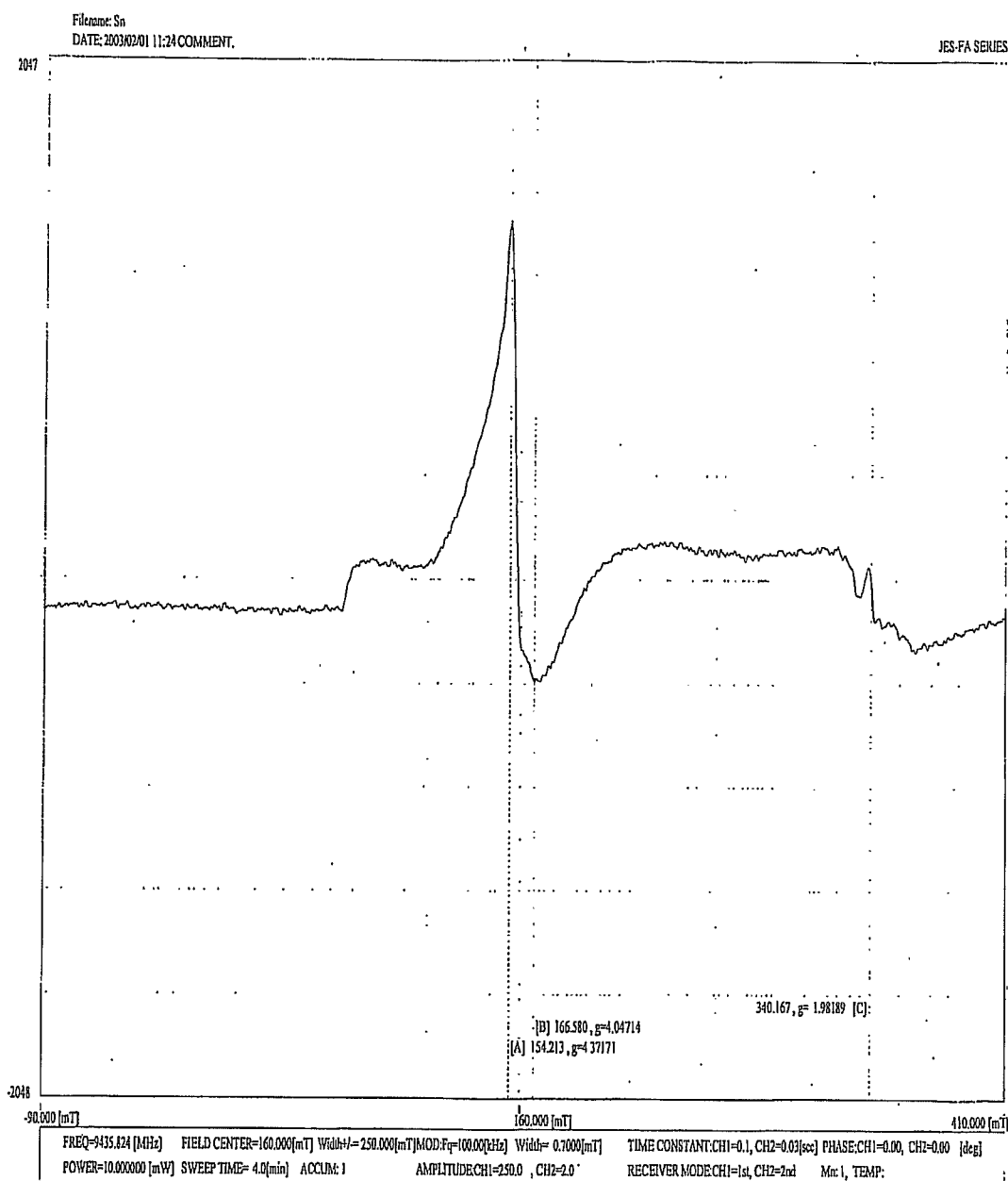
WO 2004/101435

PCT/IB2003/002011

Figure 10-B

39/56

ESR (Electron spin resonance) spectrometer analysis of silver silicate (synthesized at acidic (pH 2) reaction conditions).



17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

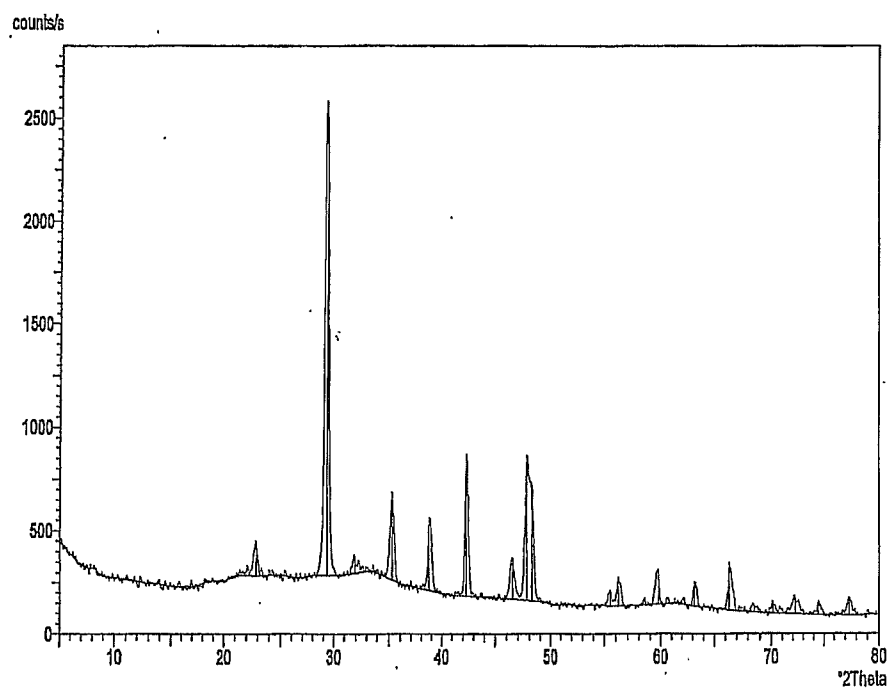
Figure 10-C

40/56

XRD (X-ray diffraction) pattern of silver silicate (synthesized at acidic (pH 2) reaction conditions).

X'Pert Graphics & Identify  
Graph: Sn-r

User-1  
2/3/03 12:41



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17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

41/56

Figure 10-C

XRD (X-ray diffraction) pattern of silver silicate (synthesized at acidic (pH 2) reaction conditions).

X'Pert Graphics & Identify  
(searched) peak list: Sn-r 2

User-1  
2/3/03 12:41

Original scan: Sn-r  
Description of scan:

Date: 2/3/03 12:12

Used wavelength:

K-Alpha1

K-Alpha1 wavelength (Å): 1.54056  
K-Alpha2 wavelength (Å): 1.54439  
K-Alpha2/K-Alpha1 intensity ratio: 0.50000  
K-Alpha wavelength (Å): 1.54056  
K-Beta wavelength (Å): 1.39222

Peak search parameter set:

As Measured Intensities

Set created: 1/8/03 13:03  
Peak positions defined by: Minimum of 2nd derivative  
Minimum peak tip width (°2Theta): 0.00  
Minimum peak tip width (°2Theta): 1.00  
Peak base width (°2Theta): 2.00  
Minimum significance: 0.60

| d-spacing<br>(Å) | Relative<br>Intensity<br>(%) | Angle<br>(°2Theta) | Peak<br>Height<br>(counts/s) | Background<br>(counts/s) | Tip<br>Width<br>(°2Theta) | Significance |
|------------------|------------------------------|--------------------|------------------------------|--------------------------|---------------------------|--------------|
| 3.89288          | 7.31                         | 22.82476           | 162.05                       | 285.57                   | 0.20000                   | 0.84         |
| 3.04209          | 100.00                       | 29.33483           | 2217.87                      | 286.93                   | 0.44000                   | 27.45        |
| 2.80105          | 2.99                         | 31.92363           | 66.30                        | 297.07                   | 0.64000                   | 0.85         |
| 2.54412          | 18.81                        | 35.24794           | 417.13                       | 264.05                   | 0.24000                   | 2.56         |
| 2.32266          | 15.21                        | 38.73633           | 337.42                       | 211.76                   | 0.32000                   | 3.87         |
| 2.13433          | 30.40                        | 42.31091           | 674.27                       | 184.90                   | 0.24000                   | 5.12         |
| 1.95266          | 8.89                         | 46.46684           | 197.27                       | 168.22                   | 0.36000                   | 3.23         |
| 1.90573          | 30.86                        | 47.68093           | 684.55                       | 162.50                   | 0.24000                   | 2.62         |
| 1.88838          | 24.63                        | 48.14670           | 546.21                       | 160.31                   | 0.32000                   | 2.62         |
| 1.65610          | 3.33                         | 55.43541           | 73.96                        | 136.14                   | 0.24000                   | 0.81         |
| 1.63624          | 6.25                         | 56.16747           | 138.52                       | 134.86                   | 0.20000                   | 0.81         |
| 1.54698          | 7.23                         | 59.72562           | 160.38                       | 146.27                   | 0.28000                   | 2.15         |
| 1.47111          | 4.99                         | 63.14884           | 110.71                       | 134.86                   | 0.32000                   | 2.37         |
| 1.40804          | 10.18                        | 66.33090           | 225.85                       | 116.60                   | 0.32000                   | 3.21         |
| 1.36874          | 1.37                         | 68.49464           | 30.40                        | 107.27                   | 0.48000                   | 0.82         |
| 1.34028          | 2.30                         | 70.15949           | 50.94                        | 101.71                   | 0.40000                   | 1.02         |
| 1.30705          | 3.20                         | 72.21879           | 71.02                        | 97.84                    | 0.64000                   | 1.37         |
| 1.27367          | 2.54                         | 74.42506           | 56.25                        | 93.68                    | 0.24000                   | 0.67         |
| 1.23314          | 3.73                         | 77.31282           | 82.74                        | 91.67                    | 0.40000                   | 2.27         |

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

42/56

Figure 11-A:

Composition analysis of manganese silicate (synthesized at neutral (pH 6-7) reaction conditions) using EDAX attached to SEM (Scanning Electron Microscope).

Weight % by Element

| FileNames   | o k    | NaK  | SiK   | ClK  | MnK   |
|-------------|--------|------|-------|------|-------|
| Manganese-o | 142.30 | 1.03 | 19.11 | 0.43 | 37.14 |

Atomic % by Element

| FileNames   | o k    | NaK  | SiK   | ClK  | MnK   |
|-------------|--------|------|-------|------|-------|
| Manganese-o | 165.17 | 1.10 | 16.77 | 0.30 | 16.66 |

17 MAY 2006

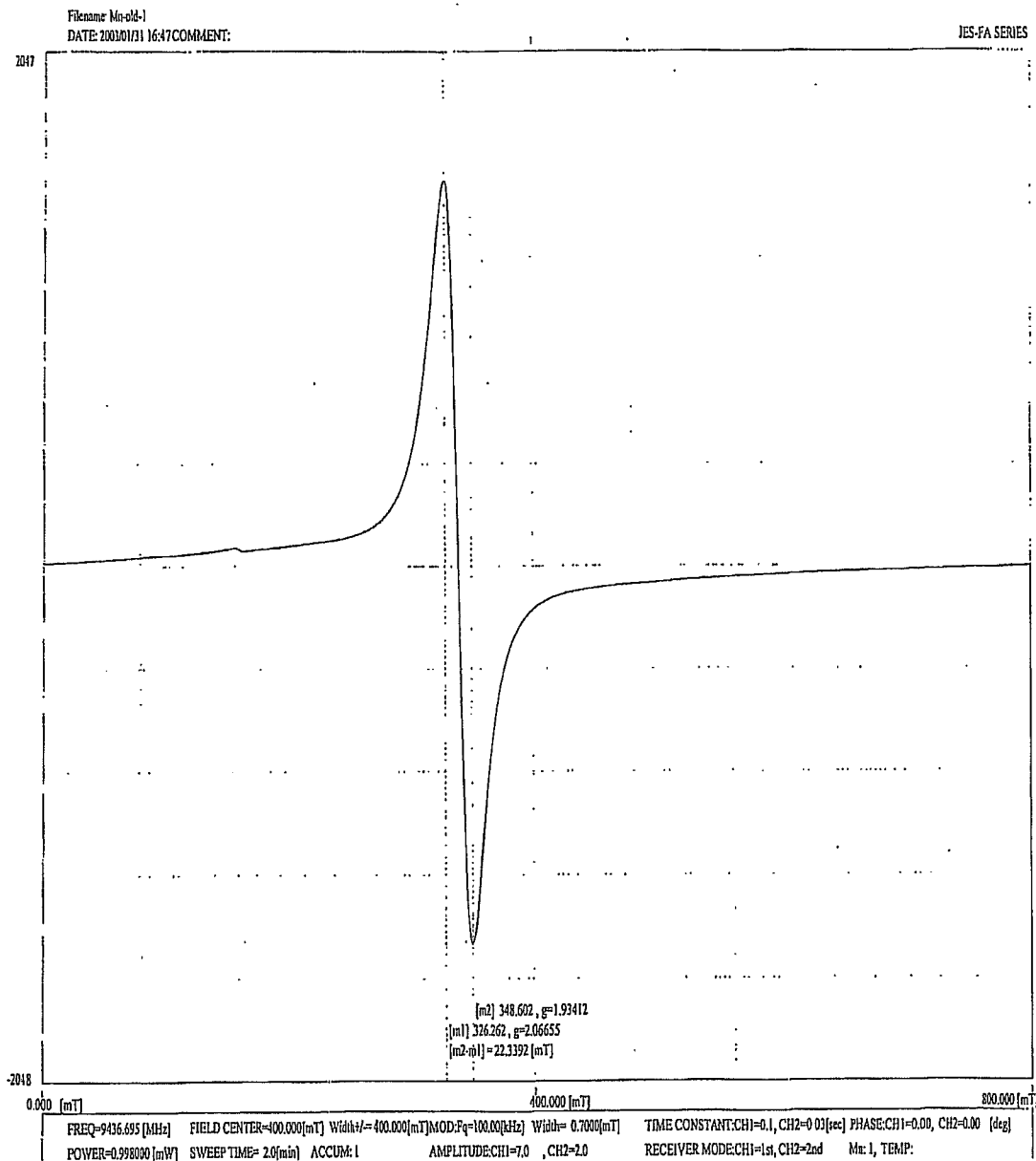
WO 2004/101435

PCT/IB2003/002011

Figure 11-B

43/56

ESR (Electron spin resonance) spectrometer analysis of manganese silicate (synthesized at neutral (pH 6-7) reaction conditions).



17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

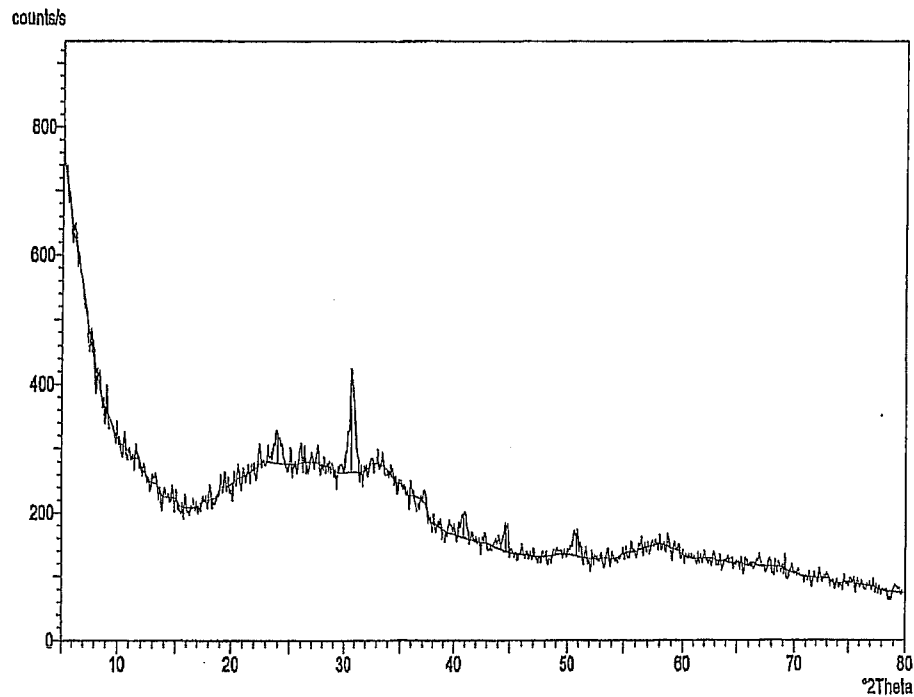
Figure 11-C

44/56

XRD (X-ray diffraction) pattern of manganese silicate (synthesized at neutral (pH 6-7) reaction conditions).

X'Pert Graphics & Identify  
Graph: MO-R

User-1  
2/3/03 11:49



Philips Analytical

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

Figure 11-C

45/56

XRD (X-ray diffraction) pattern of manganese silicate (synthesized at neutral (pH 6-7) reaction conditions).

X'Pert Graphics & Identify  
(searched) peak list: MO-R 2

User-1  
2/3/03 11:50

Original scan: MO-R  
Description of scan:

Date: 2/2/03 16:35

Used wavelength: K-Alpha1

K-Alpha1 wavelength (Å): 1.54056  
K-Alpha2 wavelength (Å): 1.54439  
K-Alpha2/K-Alpha1 intensity ratio: 0.50000  
K-Alpha wavelength (Å): 1.54056  
K-Beta wavelength (Å): 1.39222

Peak search parameter set: As Measured Intensities  
Set created: 1/8/03 13:03  
Peak positions defined by: Minimum of 2nd derivative  
Minimum peak tip width (°2Theta): 0.00  
Minimum peak tip width (°2Theta): 1.00  
Peak base width (°2Theta): 2.00  
Minimum significance: 0.60

| d-spacing<br>(Å) | Relative<br>Intensity<br>(%) | Angle<br>(°2Theta) | Peak<br>Height<br>(counts/s) | Background<br>(counts/s) | Tip<br>Width<br>(°2Theta) | Significance |
|------------------|------------------------------|--------------------|------------------------------|--------------------------|---------------------------|--------------|
| 3.70419          | 29.83                        | 24.00430           | 44.16                        | 278.06                   | 0.64000                   | 0.71         |
| 2.91440          | 100.00                       | 30.65087           | 148.04                       | 264.37                   | 0.20000                   | 0.63         |
| 2.20663          | 25.19                        | 40.86153           | 37.29                        | 162.18                   | 0.48000                   | 0.69         |
| 2.02880          | 29.18                        | 44.62686           | 43.19                        | 140.28                   | 0.48000                   | 0.68         |
| 1.79758          | 23.71                        | 50.74610           | 35.10                        | 133.23                   | 0.48000                   | 0.61         |

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

46/56

Figure 12-A:

Composition analysis of manganese silicate (synthesized at extreme acidic (below pH 2) reaction conditions) using EDAX attached to SEM (Scanning Electron Microscope).

Weight % by Element

| FileNames    | o k   | NaK  | SiK   | ClK  | MnK   |
|--------------|-------|------|-------|------|-------|
| manganese-ne | 34.04 | 0.82 | 30.75 | 0.75 | 33.64 |

Atomic % by Element

| FileNames    | o k   | NaK  | SiK   | ClK  | MnK   |
|--------------|-------|------|-------|------|-------|
| manganese-ne | 54.67 | 0.92 | 28.13 | 0.54 | 15.73 |

17 MAY 2006

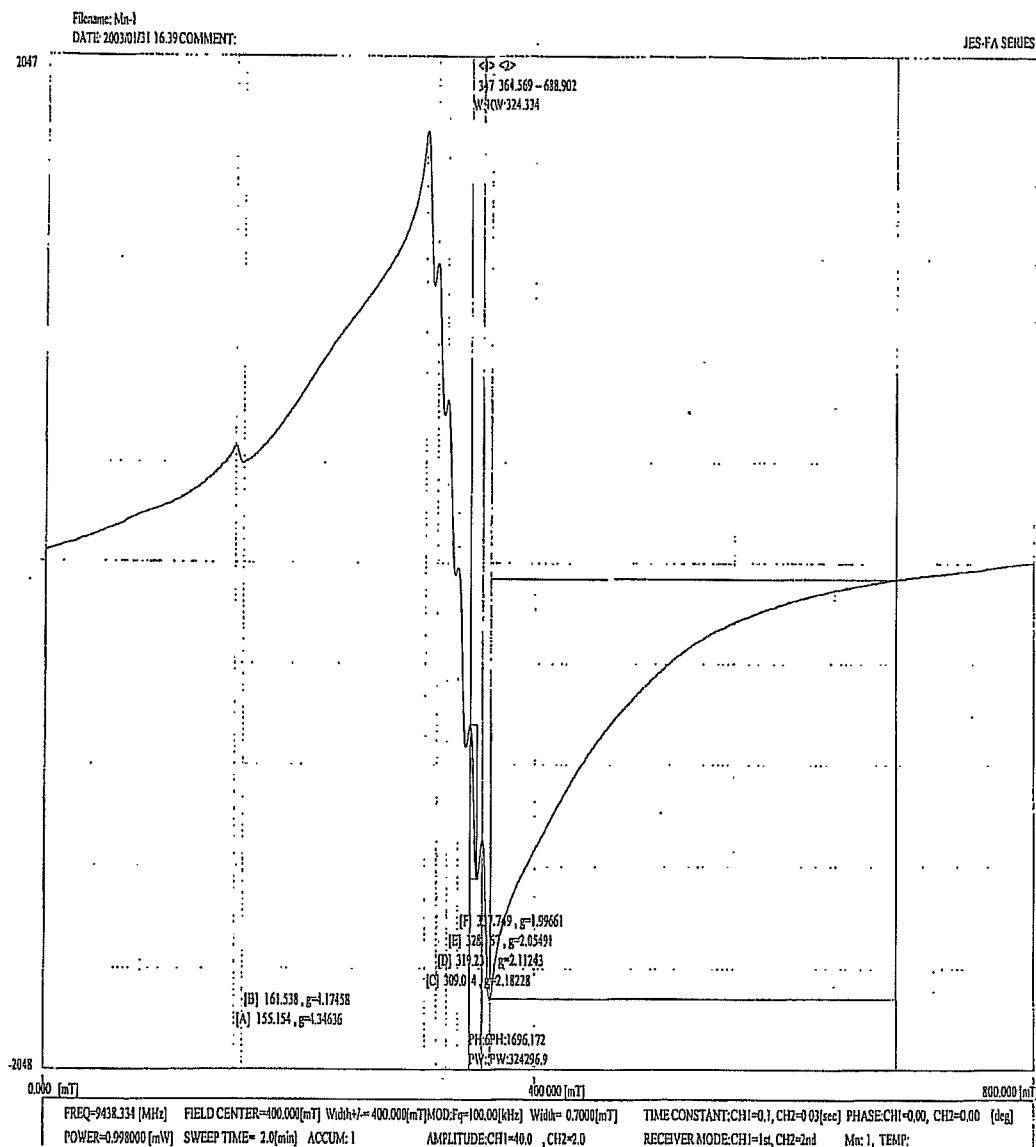
WO 2004/101435

PCT/IB2003/002011

Figure 12-B

47/56

ESR (Electron spin resonance) spectrometer analysis of manganese silicate (synthesized at extreme acidic (below pH 2) reaction conditions).



17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

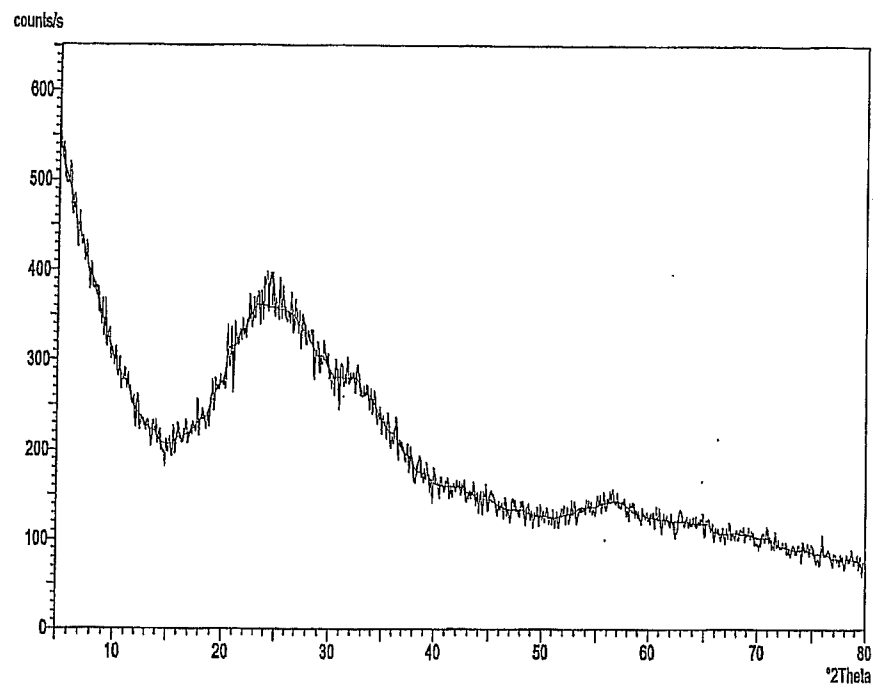
Figure 12-C

48/56

XRD (X-ray diffraction) pattern of manganese silicate (synthesized at extreme acidic (below pH 2) reaction conditions).

X'Pert Graphics & Identify  
Graph: MN-R

User-1  
2/3/03 11:50



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17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

Figure 12-C

49/56

XRD (X-ray diffraction) pattern of manganese silicate (synthesized at extreme acidic (below pH 2) reaction conditions).

X'Pert Graphics & Identify  
(searched) peak list: MN-R 2

User-1  
2/3/03 11:51

Original scan: MN-R  
Description of scan:

Date: 2/2/03 17:01

Used wavelength:

K-Alpha1

K-Alpha1 wavelength (Å):  
K-Alpha2 wavelength (Å):  
K-Alpha2/K-Alpha1 intensity ratio :  
K-Alpha wavelength (Å):  
K-Beta wavelength (Å):

1.54056  
1.54439  
0.50000  
1.54056  
1.39222

Peak search parameter set:

Set created:  
Peak positions defined by:  
Minimum peak tip width (°2Theta):  
Minimum peak tip width (°2Theta):  
Peak base width (°2Theta):  
Minimum significance:

As Measured Intensities  
1/8/03 13:03  
Minimum of 2nd derivative  
0.00  
1.00  
2.00  
0.60

| d-spacing<br>(Å) | Relative<br>Intensity<br>(%) | Angle<br>(°2Theta) | Peak<br>Height<br>(counts/s) | Background<br>(counts/s) | Tip<br>Width<br>(°2Theta) | Significance |
|------------------|------------------------------|--------------------|------------------------------|--------------------------|---------------------------|--------------|
| 3.60774          | 100.00                       | 24.65599           | 32.88                        | 359.03                   | 0.96000                   | 0.77         |

17 MAY 2006

Figure 13-A:

Composition analysis of zirconium silicate (synthesized at neutral (pH 6-7) reaction conditions) using EDAX attached to SEM (Scanning Electron Microscope).

## Weight % by Element

| FileNames    | o k   | Sik   | ZrL   |
|--------------|-------|-------|-------|
| Zircon99.spc | 39.00 | 14.78 | 46.22 |

## Atomic % by Element

| FileNames    | o k   | Sik   | ZrL   |
|--------------|-------|-------|-------|
| Zircon99.spc | 70.23 | 15.17 | 14.60 |

17 MAY 2006

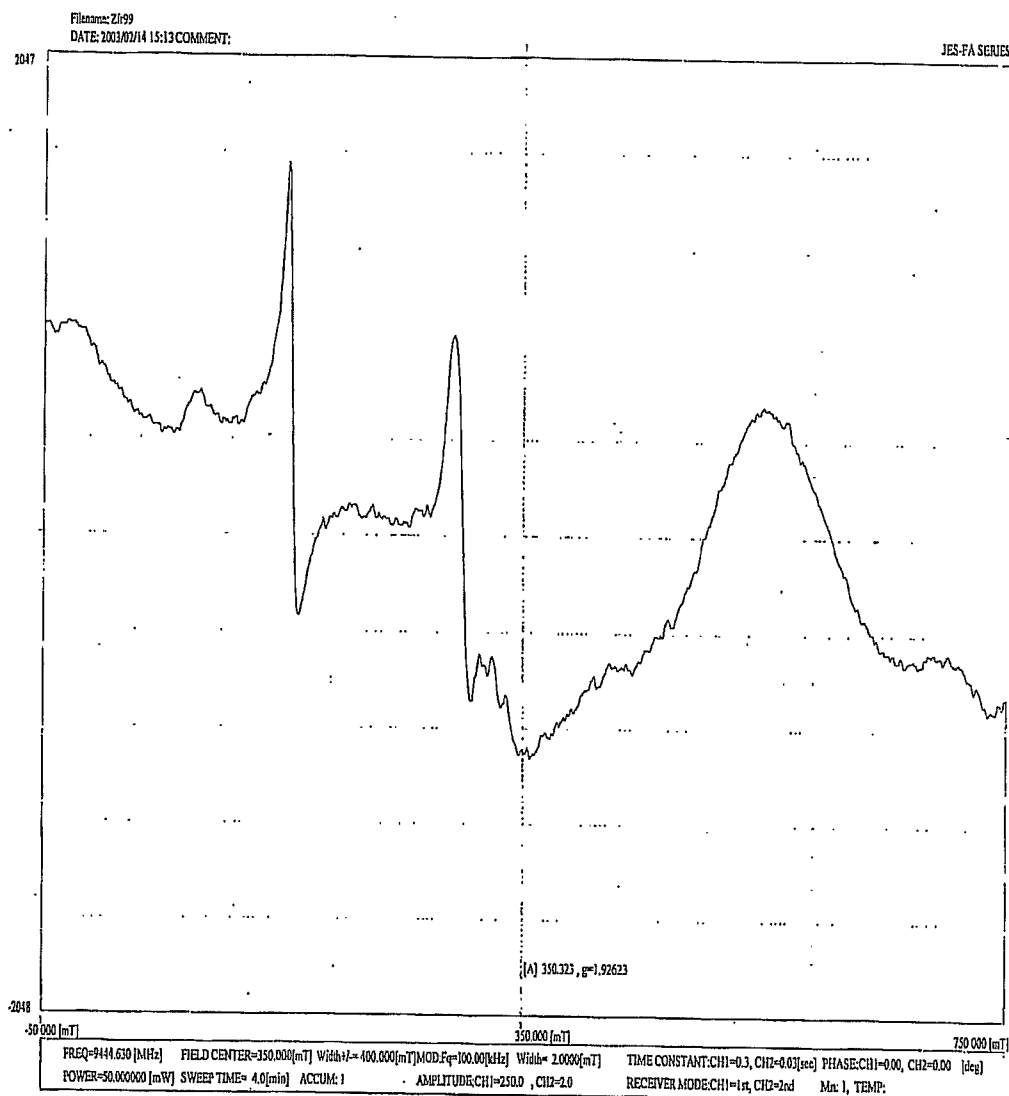
WO 2004/101435

PCT/IB2003/002011

Figure 13-B

51/56

ESR (Electron spin resonance) spectrometer analysis of zirconium silicate (synthesized at neutral (pH 6-7) reaction conditions).



17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

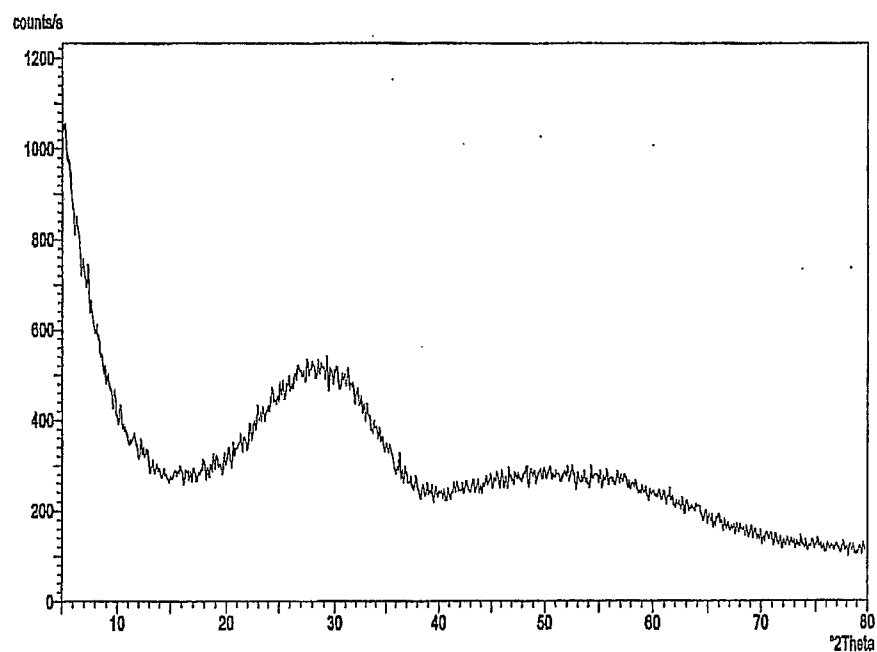
Figure 13-C

52/56

XRD (X-ray diffraction) pattern of zirconium silicate (synthesized at neutral (pH 6-7) reaction conditions).

X'Pert Graphics & Identify  
Graph: 89

User-1  
2/22/03 13:13



Philips Analytical

17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

53/56

Figure 14-A:

Composition analysis of zirconium silicate (synthesized at extreme acidic (below pH 2) reaction conditions using EDAX attached to SEM (Scanning Electron Microscope)).

Weight % by Element

| FileNames    | o k   | NaK  | SiK   | ZrL   | ClK  |
|--------------|-------|------|-------|-------|------|
| zircon55.spc | 51.43 | 0.95 | 26.86 | 20.76 | 0.00 |

Atomic % by Element

| FileNames    | o k   | NaK  | SiK   | ZrL  | ClK  |
|--------------|-------|------|-------|------|------|
| zircon55.spc | 72.40 | 0.93 | 21.54 | 5.13 | 0.00 |

17 MAY 2006

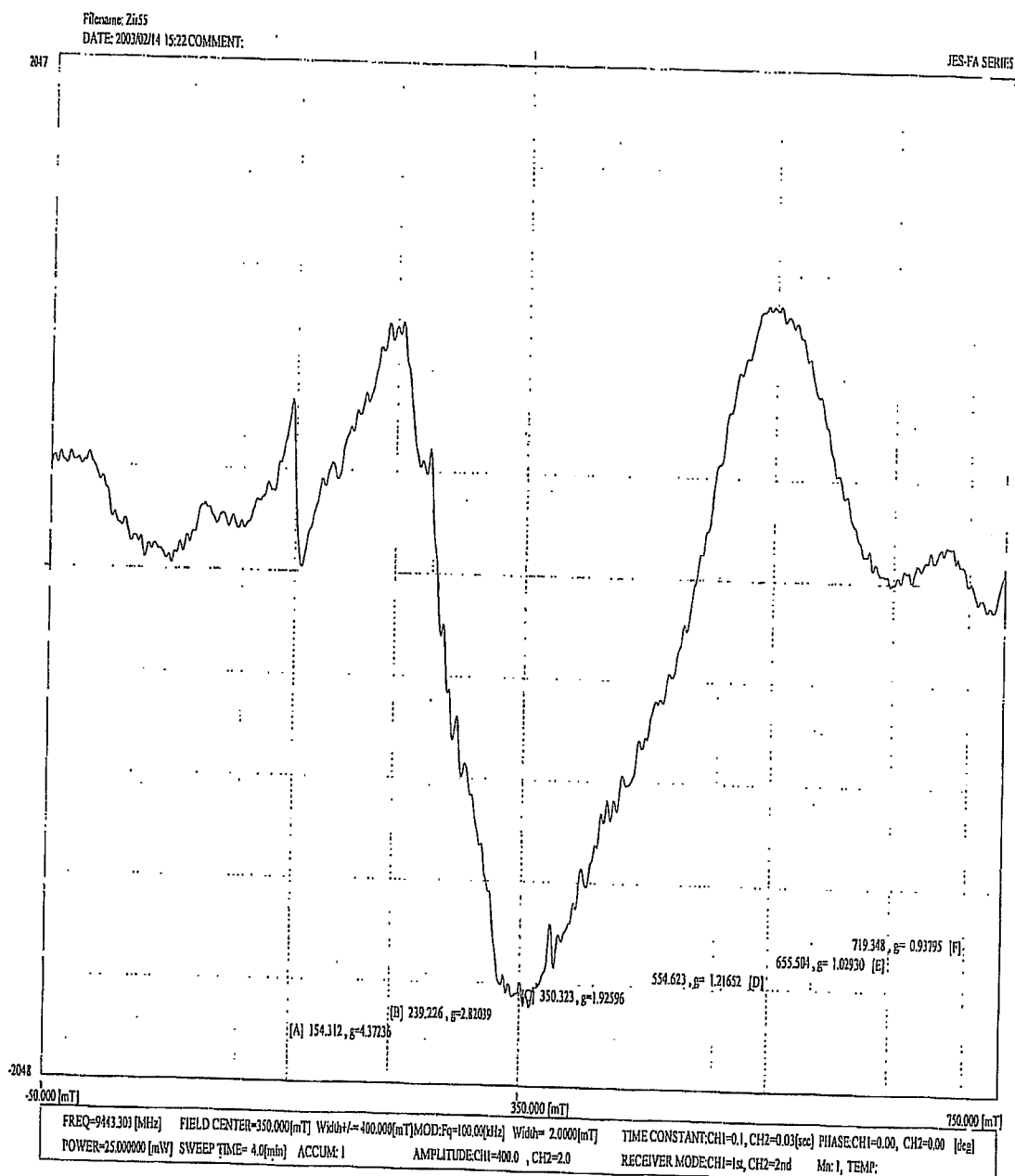
WO 2004/101435

PCT/IB2003/002011

Figure 14-B

54/56

ESR (Electron spin resonance) spectrometer analysis of zirconium silicate (synthesized at extreme acidic (below pH 2) reaction conditions).



17 MAY 2006

WO 2004/101435

PCT/IB2003/002011

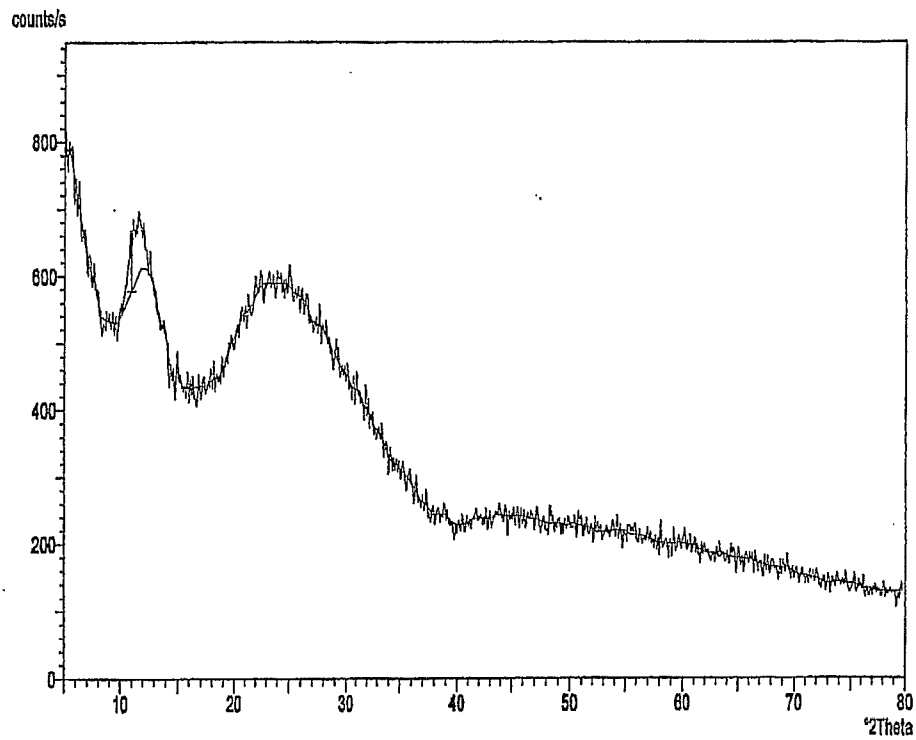
55/56

Figure 14-C

XRD (X-ray diffraction) pattern of zirconium silicate (synthesized at extreme acidic (below pH 2) reaction conditions).

XPert Graphics & Identify  
Graph: 55

User-1  
2/22/03 13:12



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17 MAY 2006

Figure 14-C

XRD (X-ray diffraction) pattern of zirconium silicate (synthesized at extreme acidic (below pH 2) reaction conditions).

X'Pert Graphics & Identify  
(searched) peak list: 55 2

User-1  
2/22/03 13:12

Original scan: 55  
Description of scan:

Date: 2/22/03 11:31

Used wavelength:

K-Alpha1

K-Alpha1 wavelength (Å):  
K-Alpha2 wavelength (Å):  
K-Alpha2/K-Alpha1 intensity ratio :  
K-Alpha wavelength (Å):  
K-Beta wavelength (Å):

1.54056  
1.54439  
0.50000  
1.54056  
1.39222

Peak search parameter set:

As Measured Intensities

Set created:

1/8/03 13:03

Peak positions defined by:

Minimum of 2nd derivative

Minimum peak tip width (°2Theta):

0.00

Minimum peak tip width (°2Theta):

1.00

Peak base width (°2Theta):

2.00

Minimum significance:

0.60

| d-spacing<br>(Å) | Relative<br>Intensity<br>(%) | Angle<br>(°2Theta) | Peak<br>Height<br>(counts/s) | Background<br>(counts/s) | Tip<br>Width<br>(°2Theta) | Significance |
|------------------|------------------------------|--------------------|------------------------------|--------------------------|---------------------------|--------------|
| 8.11438          | 100.00                       | 10.89433           | 84.80                        | 578.00                   | 0.80000                   | 0.69         |