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MINERALOGY OF SOIL CORE SAMPLE, FEED MATERIALS PRODUCTION CENTER - (TECHNICAL REORT ISSUED BY MCCRONE ASSOCIATES, INC) - (USED AS A REFERENCE OU1 AND OU2 RI REPORTS)

08/07/92

MA-21576
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REPORT

Report to:

Mr. John D. Wood
Advanced Sciences, Inc.
Ross, Ohio 45061

MINERALOGY OF SOIL CORE SAMPLES
FERNALD, OHIO

DOE Contract No. DE-AC05-860R21659

Date: 7 August 1992

MA Number: MA-21576

Copy 3 of 3

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PROJECT FILE 08140

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CONSULTING: ULTRAMICROANALYSIS • MICROSCOPY • SMALL PARTICLE PROBLEMS • SOLID-STATE CHEMISTRY

6443

7 August 1992

Mr. John D. Wood
Advanced Sciences, Inc.
11003 Hamilton-Cleves Road
Ross, Ohio 45061

Dear Mr. Wood:

McCrone Associates has completed the polarized light microscopy and x-ray diffraction analysis of the 20 soil sample cores from Fernald, Ohio. The work was performed under DOE contract number DE-AC05-860R21659 and was authorized by your purchase order number 0045117.

The attached report summarizes the analytical methods used to determine the mineralogy of the soil samples and the results of our analysis. The thin sections and residual materials are being forwarded under separate cover.

Thank you for consulting McCrone Associates. If you have any questions, please do not hesitate to contact me.

Sincerely,

Jessica M. Elzea

Jessica M. Elzea, Ph.D.
Senior Research Scientist

JME:jc
Enclosure
Ref: MA21576; P.O. 0045117

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MINERALOGY OF SOIL CORE SAMPLES
FERNALD, OHIO

INTRODUCTION

Twenty soil core samples were examined by optical microscopy and x-ray diffraction to determine soil mineralogy. Mineralogy of the bulk soil and the silt and clay fractions was determined and/or quantified using either standard point counting techniques or x-ray diffraction techniques.

SAMPLE PREPARATION

Thin Sections

Thin sections, prepared by National Petrographic Services, Inc., were cut from the middle of and perpendicular to the long axis of the core. Prior to cutting, the core was impregnated with epoxy. The thin sections were stained for calcite and potassium feldspar minerals.

Preparation for X-Ray Diffraction

Splits of each core, taken near the center of the core, were disaggregated in water, ultrasonicated, and dispersed with hexametaphosphate. The dispersed sample was then passed through a 230 mesh sieve. A portion of the <230 mesh fraction was dried in a 110°C oven, powdered, and packed in shallow plastic holders for x-ray diffraction analysis. Another portion was allowed to settle and the <2 μm fraction was pipetted and dispersed onto a zero background holder to produce an oriented mount for x-ray diffraction. The

oriented mounts were air-dried prior to analysis. Selected samples were also ethylene glycol solvated and heated.

ANALYTICAL METHODS

Optical Microscopy

The mineralogy of each section was determined and quantified using standard petrographic techniques. Minerals were identified on the basis of their optical and physical properties. These properties include birefringence, reflectance, morphology, color in transmitted light, pleochroism, twinning, 2V, optic sign and color from staining. Malachite green stain was used as an aid for identification of clay minerals.

Quantification was performed with a polarizing light microscope at a magnification of 100X using a Chalkley ocular array. A minimum of 400 non-empty points were counted for each section. Two replicate analyses were performed. Sample 101403 was not point counted because the grain size was too small (<5 μm).

X-Ray Diffraction

Portions of the clay and silt fraction (<230 mesh) were analyzed by x-ray diffraction using a Siemens D5000 x-ray diffractometer equipped with a long fine focus copper source and a solid state Si(Li) Peltier cooled detector. Each of the oriented air-dried samples was scanned from 2 to 45° 2θ using a step size of 0.05° 2θ and a data collection time of 3 seconds per step. Five of the oriented samples were then

solvated with ethylene glycol in a desiccator for at least 48 hours and re-analyzed from 2 to 45° 2θ. This procedure was performed to determine whether or not montmorillonite might be present in the samples. The same five samples were then heated to 550°C for one hour. This test was performed to distinguish clay minerals that have essentially identical diffraction patterns prior to heating. For example, kaolin and chlorite have very similar x-ray diffraction patterns. Upon heating, however, the kaolin structure collapses and becomes amorphous to x-rays. Chlorite, on the other hand, is largely unaffected by heating, but may show minor shifting and changes in the intensity of some peaks. The test can also be used to aid in the identification of mixed layer minerals.

RESULTS

Clay Mineral Identification

Clay minerals in the <2 μm fraction of the soils include illite and a mineral identified as mixed layer chlorite/smectite or vermiculite/smectite with a high percentage of non-swelling layers. Other mixed layer minerals, such as illite/smectite may be present in very small quantities but absence of superlattice peaks makes it very difficult to identify these minerals with confidence.

These identifications are based on diffraction patterns obtained from air-dried, ethylene glycol solvated, and heated mounts. Diffraction patterns of heated mounts are shown in

Figures 1 through 20. Results of glycolation and heating are shown in Figures 21 through 25 and Table I.

Illite was identified on the basis of three major reflections at approximately 10 Å, 5 Å and 3.3 Å and a series of minor reflections. The major reflections correspond to hkl's of (001), (002) and (003) and closely match JCPDS-ICDD (Joint Committee on Powder Diffraction Standards - International Centre for Diffraction Data) card #26-0911. The heated and glycolated patterns confirm this identification.

The mixed layer clay mineral was identified based on peak position, peak breadth, and changes in the diffraction pattern as a result of glycolation and heating. For example, the 14 Å peak near 6.2° 2θ sharpened and shifted a small amount as a result of glycolation. The amount of shift is too small for montmorillonite or some other smectite group mineral which typically show a shift to 17 Å after solvation with ethylene glycol. Some of the major smectite reflections are also missing. This slight shift as a result of glycolation and the position of peaks with non-integral spacings suggest a mixed layer chlorite/smectite. However, this mineral collapses to 10 Å after heating, as shown in Figures 21 through 25. It, therefore, may be concluded that this mineral is mixed layer vermiculite/smectite because vermiculite collapses as a result of heating and chlorite does not. However, the overall diffraction pattern is consistent with chlorite/smectite and not vermiculite/

TABLES

smectite. Because the identification of this mineral is somewhat ambiguous, it will be referred to as corrensite. Trace amounts of calcite, dolomite and quartz were also observed in the <2 μm fraction. These minerals were not quantified.

Modal Mineralogy

Results obtained from the optical examination of the thin sections and quantification are summarized in Table II. The major mineral phases present in most of the cores are calcite, dolomite, quartz and potassium feldspars (microcline and anorthoclase). Minor mineral components in the soil cores include chlorite, biotite, hornblende and iron oxides. Magnetite and hematite are the iron oxide minerals present. Humic material (decayed organic matter) is also present in each of the soil cores.

Figure 26 is a carbonate-clay-quartz and feldspar ternary diagram prepared from the data in Table II. The diagram shows that the majority of the cores are composed of carbonates, quartz and potassium feldspars in proportions ranging from predominantly carbonates to predominantly quartz and feldspars. Cores 100567 and 100552 are composed primarily of clays, quartz and potassium feldspars.

All 20 soil samples are comprised of the same minerals but in varying proportions. The amount of each clay was estimated using peak areas. The 001 illite peak at approximately 8° 2θ and the corrensite peak at approximately 6.2° 2θ were selected for quantitative analysis. Each peak

was fit with a Gaussian function and peak areas were calculated. Ratios of these peak areas were then used to estimate percentages. Results are summarized in Table III. Two percentages are reported in this table. One is the percentage of the clay fraction that each mineral constitutes. The other is the percentage reported on a whole rock basis. Illite is the most abundant clay mineral ranging from 55 to 80% of the clay fraction and 1.29 to 65% of the bulk soil. Corrensite abundance ranges from 15 to 50% of the clay fraction and 0.84 to 35% of the bulk soil.

QUALITY ASSURANCE AND QUALITY CONTROL

To assess the reproducibility of the point count data, replicate thin sections were made and point counts performed on one of the samples. Results, shown in Table IV, indicate good reproducibility for some phases and not others. This variation is probably due to sample inhomogeneity.

To assure the quality of the x-ray diffraction data, a quartz standard was analyzed prior to actual sample analysis. This scan was performed to check instrument calibration by examining peak position and intensity. An example of a quartz standard diffraction pattern is shown in Figure 27. The quartz standard runs indicated that the instrument was in alignment and required no adjustments.

SUMMARY

Twenty soil samples were examined by optical microscopy

and x-ray diffraction to determine soil mineralogy. The soils contain quartz, calcite, dolomite, K-spar, organics, iron oxides, chlorite, biotite, hornblende, illite and mixed layer chlorite (vermiculite?)/smectite. These minerals occur in varying proportions.

Respectfully submitted,

Jessica M. Elzea

Jessica M. Elzea, Ph.D.
Senior Research Scientist

TABLE I

SAMPLE	d-SPACING (Å) (001) PEAK				APPROXIMATE % CHLORITE LAYERS
	AIR-DRIED	GLYCOLATED	HEATED	Δd*	
100882	14.4689	14.4689	10	0	100
100704	13.2859	14.0257	10	0.73	90
101285	13.7882	14.2330	10	0.44	90
101403	14.0992	15.4341	10	1.33	80
100719	13.2523	14.0202	10	0.78	90

* Δd = change in d-spacing (Å) as a result of glycolation.

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TABLE II

Summary of Point Count Data

SAMPLE	PHASES AND POINT COUNTED PERCENTAGES									
	CALCITE	DOLOMITE	QUARTZ	K-SPAR	ORGANICS (HUMIC)	CLAY	IRON OXIDES	CHLORITE	BIOTITE	HORN-BLENDE
101285	32.26	23.73	15.67	18.20	4.15	2.53	0.46	2.07	0.23	0.70
100771	39.77	31.26	12.64	11.26	1.84	1.61	0.46	0.47	0	0.69
101234	33.49	26.28	18.45	14.35	0.28	2.51	1.91	2.28	0	0.45
100704	33.80	25.41	18.18	11.89	3.96	4.43	0.70	0.47	0	1.16
100787	28.69	27.64	20.47	14.34	2.33	3.16	0.63	0.84	0	1.90
100758	34.33	24.42	20.97	12.21	2.07	3.23	0.46	0.46	0.24	1.61
101277	32.64	36.81	13.34	11.81	1.01	2.55	0.92	0	0.23	0.69
101329	39.96	25.24	10.34	13.93	0.19	4.57	0.60	4.37	0	0.80
100732	19.04	27.52	18.58	22.25	2.06	5.73	0.23	4.36	0	0.23
100813	23.34	35.19	11.65	18.20	3.88	3.16	0.49	3.40	0	0.49
100844	17.72	5.92	42.65	11.14	5.45	1.6	0	1.66	0	0.47
101366	24.66	19.73	20.85	26.90	2.02	2.92	0.63	0	0	2.24
100677	37.30	23.20	12.70	18.28	0.57	5.56	1.79	0	0	0.60
100690	21.31	14.14	27.69	24.30	5.78	4.38	1.59	0	0	0.81
100719	22.20	19.03	20.93	18.60	5.92	8.67	2.54	0	0	2.11
101366	26.03	17.57	22.34	21.48	3.25	2.82	1.95	2.17	0	2.39
101403	Not suitable for point counting - grain size too small - mostly clay									
100552	2.16	0	27.11	7.93	16.92	45.38	0.25	0	0	0.25
100882	39.41	25.06	14.81	12.98	2.95	3.42	0.23	0	0	1.14
100567	9.79	7.33	11.25	5.14	5.13	60.39	0.73	0	0	0.25
100567*	9.02	8.11	11.75	6.26	5.01	63.69	0.81	0.03	0	0.33
100704*	35.87	22.74	19.11	12.31	3.47	3.84	0.70	0.47	0	1.49

* Replicate

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TABLE III

SAMPLE	CLAY FRACTION		WHOLE ROCK	
	% ILLITE	% CORRENSITE	% ILLITE	% CORRENSITE
101295	80	20	2.73	0.68
100690	50	50	2.19	2.19
101366	55	45	1.55	1.27
100719	60	40	5.20	3.47
100677	85	15	4.72	0.84
100844	76	24	1.22	0.38
100732	75	35	4.29	1.44
100813	70	30	2.21	0.95
101329	65	35	2.97	1.60
101277	65	35	1.66	0.89
100787	55	45	1.73	1.43
100758	55	45	1.78	1.45
100704	65	35	2.50	1.34
101234	65	35	1.63	0.88
100771	80	20	1.29	0.32
101285	55	45	1.89	1.14
100567	75	35	45.29	15.1
100882	75	35	2.56	0.86
100552	70	30	31.76	13.62
101403	65	35	65	35

Ref: MA21576

TABLE IV

Results of Replicate Point Count of Sample 101285

SAMPLE	PHASES AND POINT COUNTED PERCENTAGES									
	CALCITE	DOLOMITE	QUARTZ	K-SPAR	ORGANICS (HUMIC)	CLAY	IRON OXIDES	CHLORITE	BIOTITE	HORN-BLENDE
Rep.* A	32.26	23.73	15.67	18.20	4.15	2.53	0.46	2.07	0.23	0.70
Rep.* B	38.64	27.45	12.69	7.77	4.36	3.41	3.97	0	0	1.33

* Replicate

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FIGURES

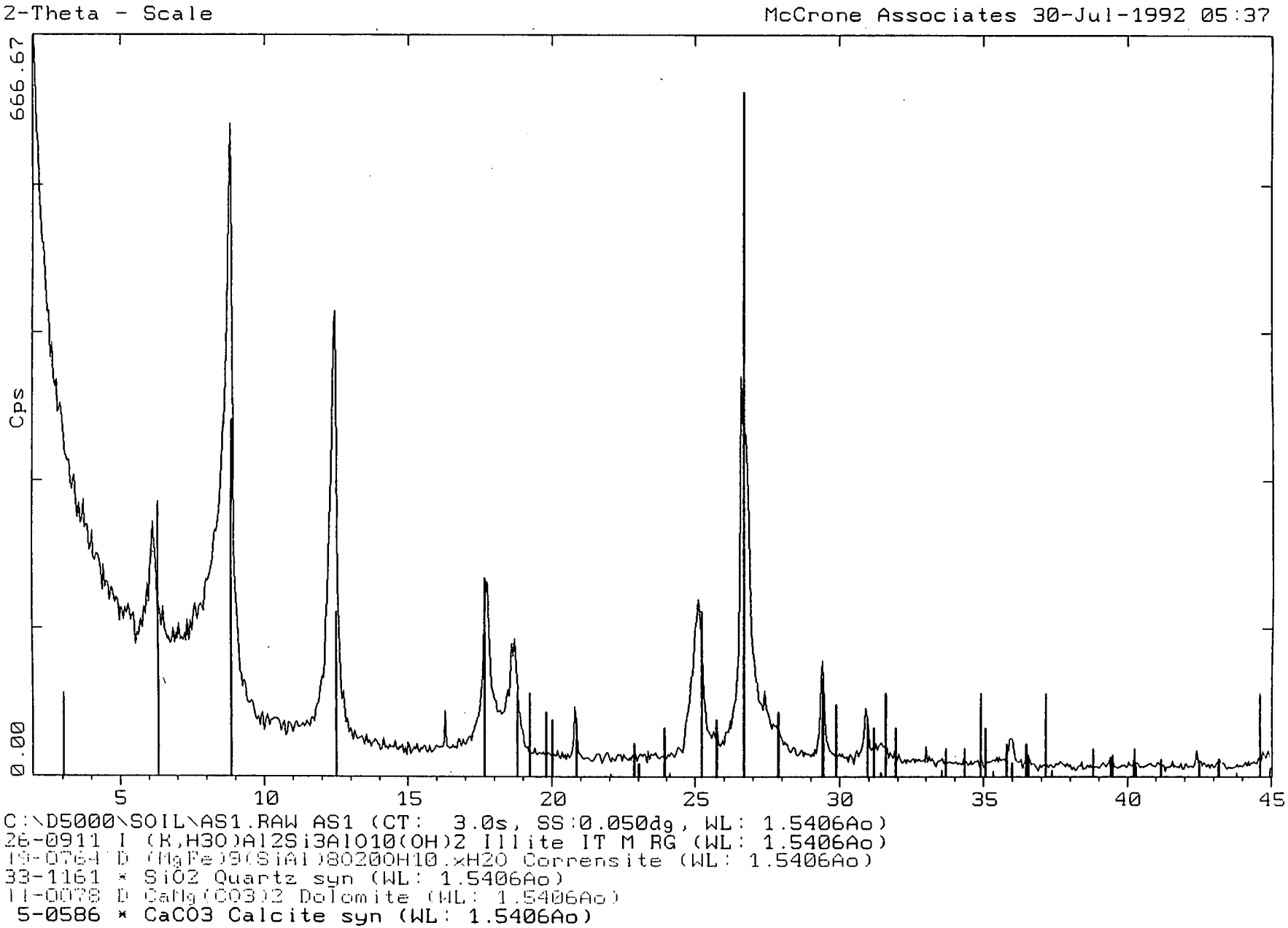

FIGURE 1
X-ray diffraction pattern of 101295.

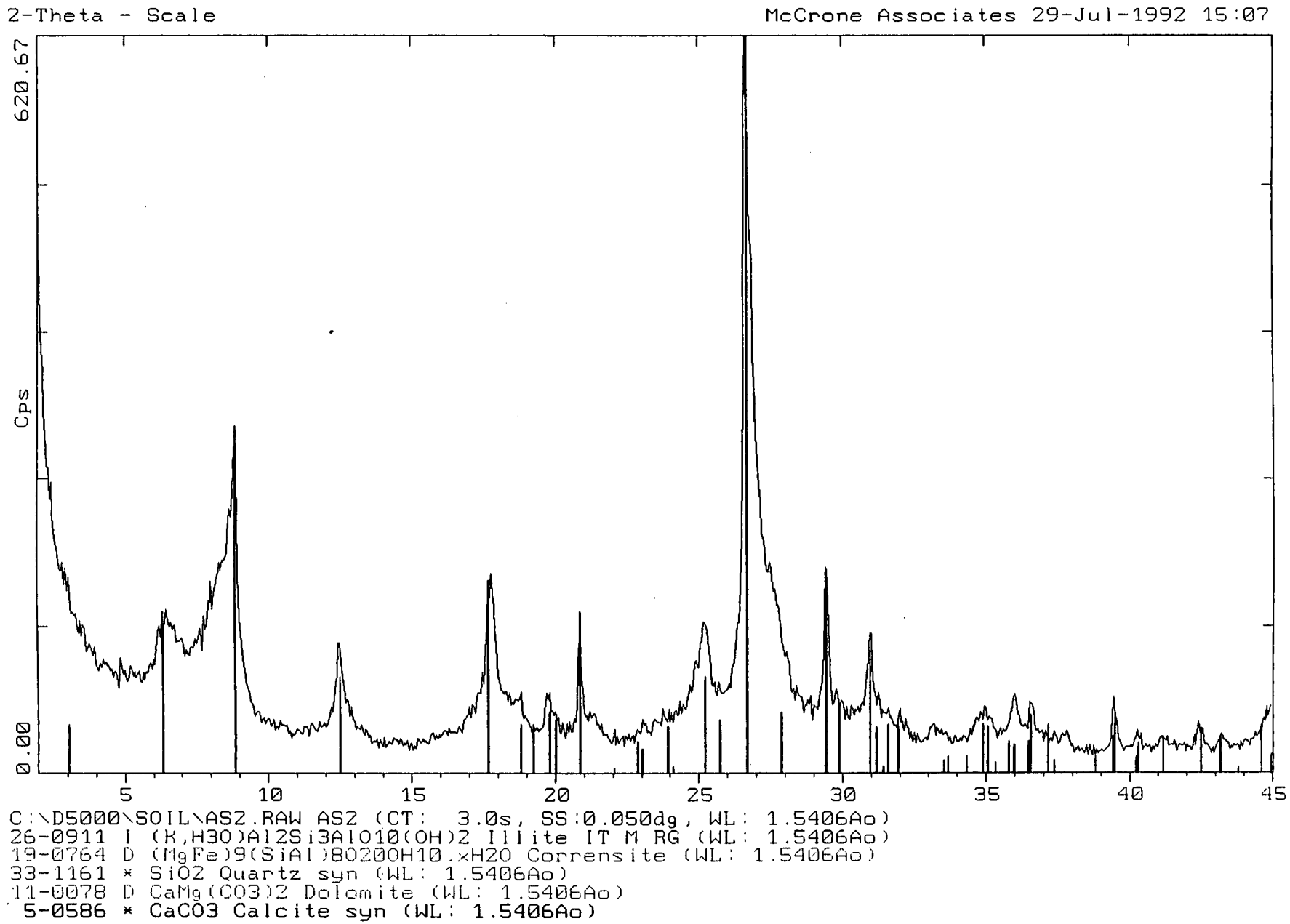

FIGURE 2
X-ray diffraction pattern of 100690.

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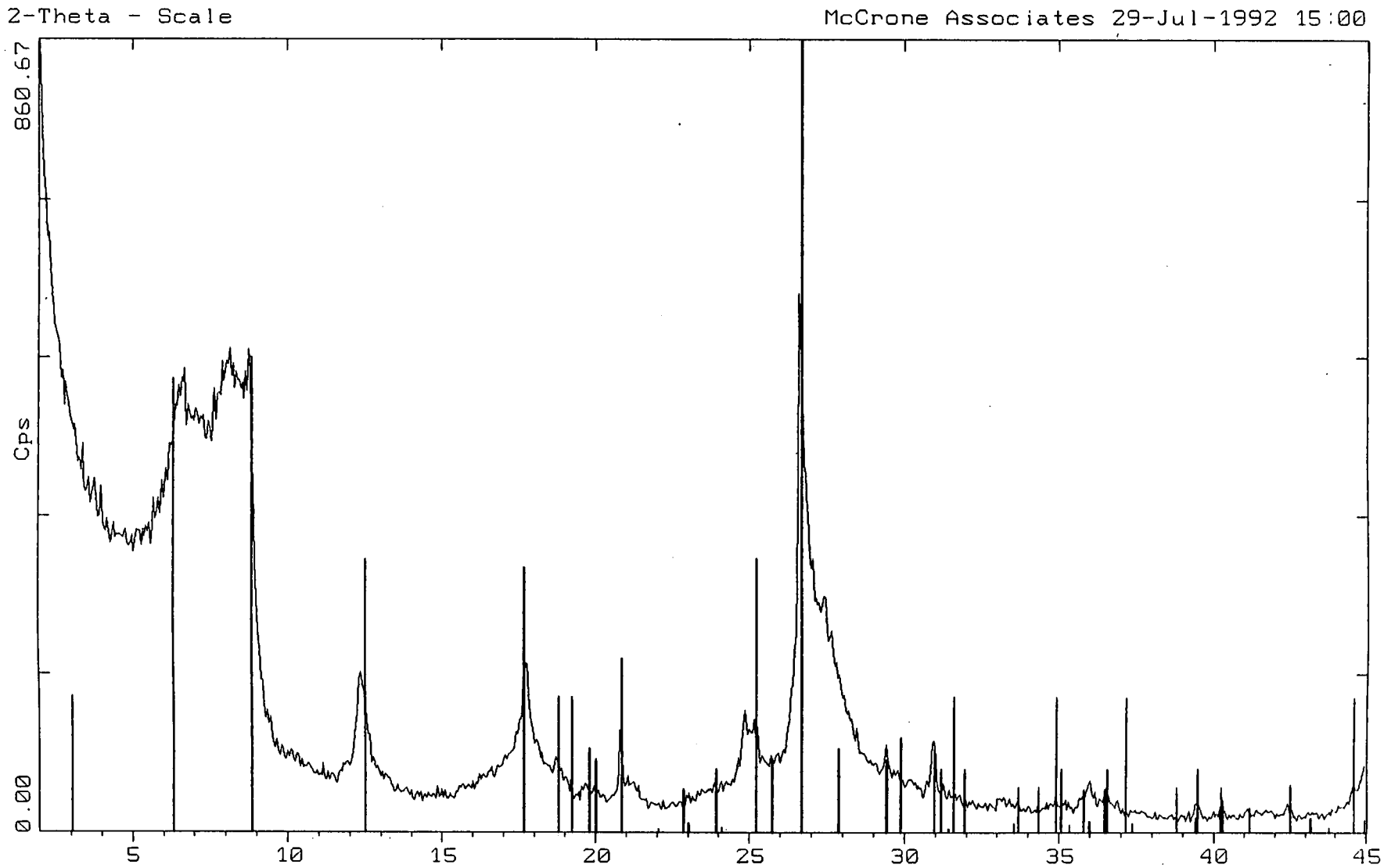

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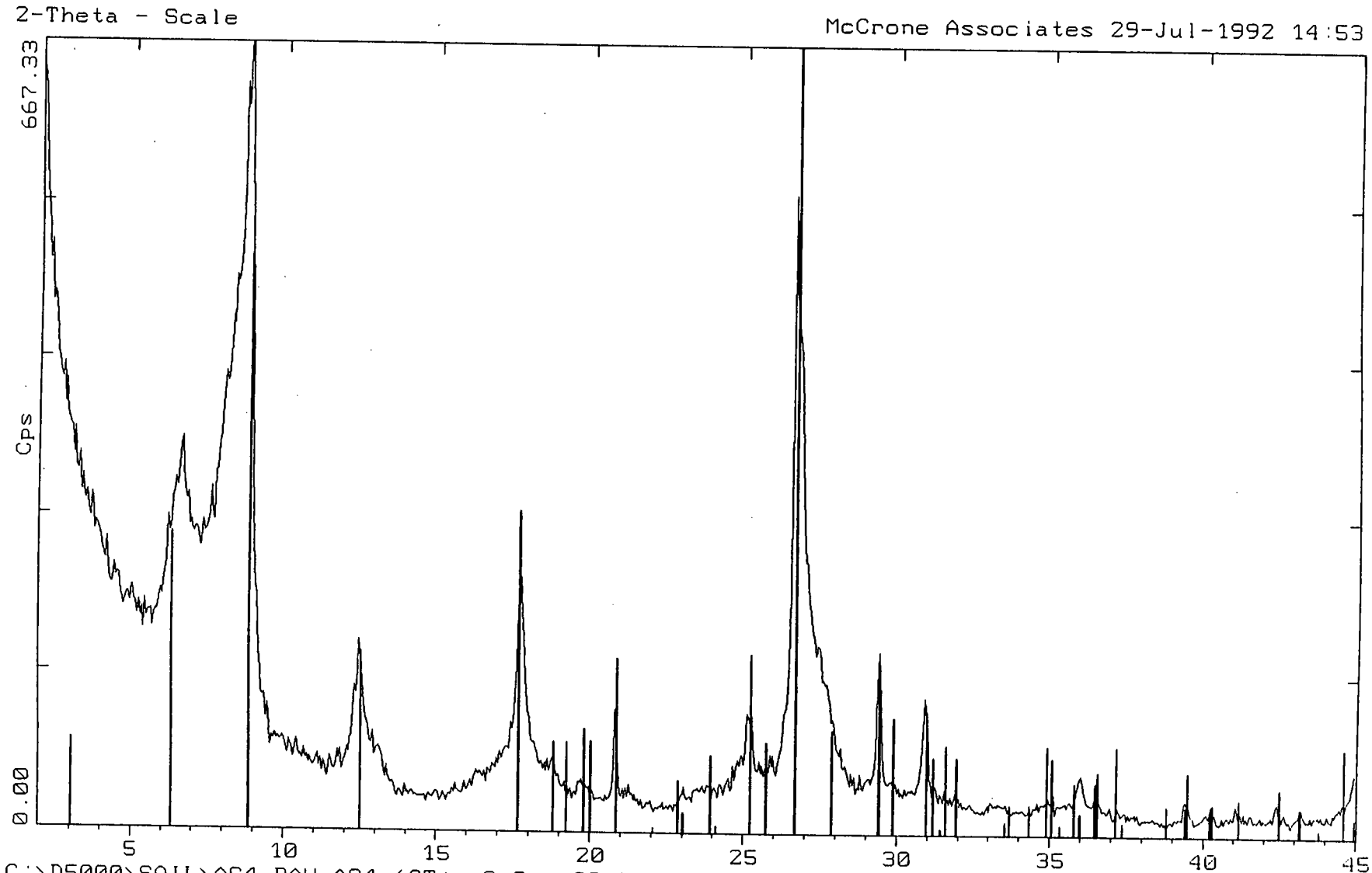
26-0911 I (K,H3O)Al2Si3AlO10(OH)2 Illite IT M RG (WL: 1.5406Ao)
19-0764 D (MgFe)9(SiAl)8O20OH10.xH2O Corrensite (WL: 1.5406Ao)
33-1161 * SiO2 Quartz syn (WL: 1.5406Ao)
11-0078 D CaMg(CO3)2 Dolomite (WL: 1.5406Ao)
5-0586 * CaCO3 Calcite syn (WL: 1.5406Ao)

FIGURE 3
X-ray diffraction pattern of 101366.



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26-0911 I (K,H3O)Al2Si3AlO10(OH)2 Illite IT M RG (WL: 1.5406Ao)
19-0764 D (MgFe)9(SiAl)8O20OH10.xH2O Corrensite (WL: 1.5406Ao)
33-1161 × SiO2 Quartz syn (WL: 1.5406Ao)
11-0078 D CaMg(CO3)2 Dolomite (WL: 1.5406Ao)
5-0586 × CaCO3 Calcite syn (WL: 1.5406Ao)

FIGURE 4
X-ray diffraction pattern of 100719.

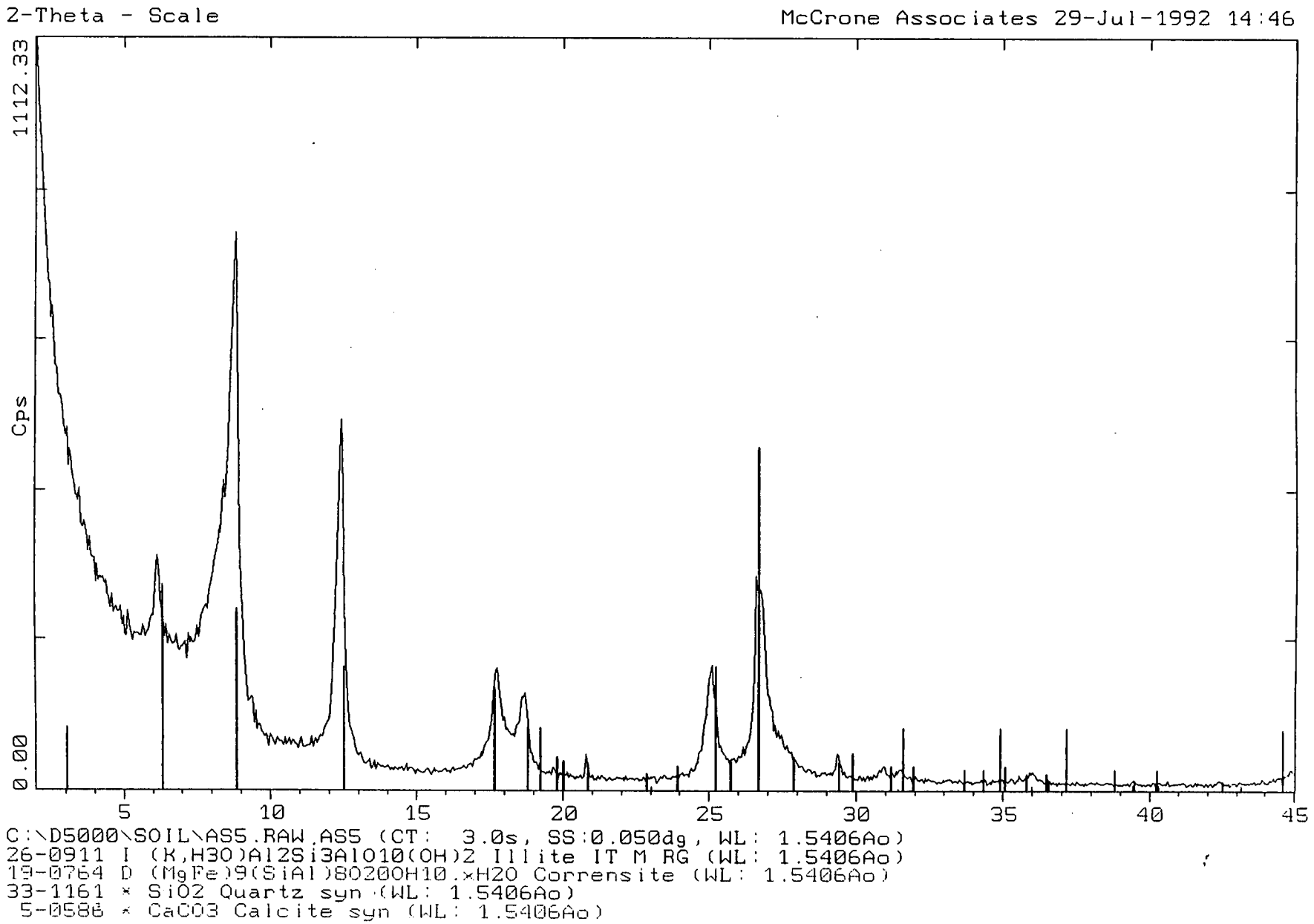

FIGURE 5
X-ray diffraction pattern of 100677.

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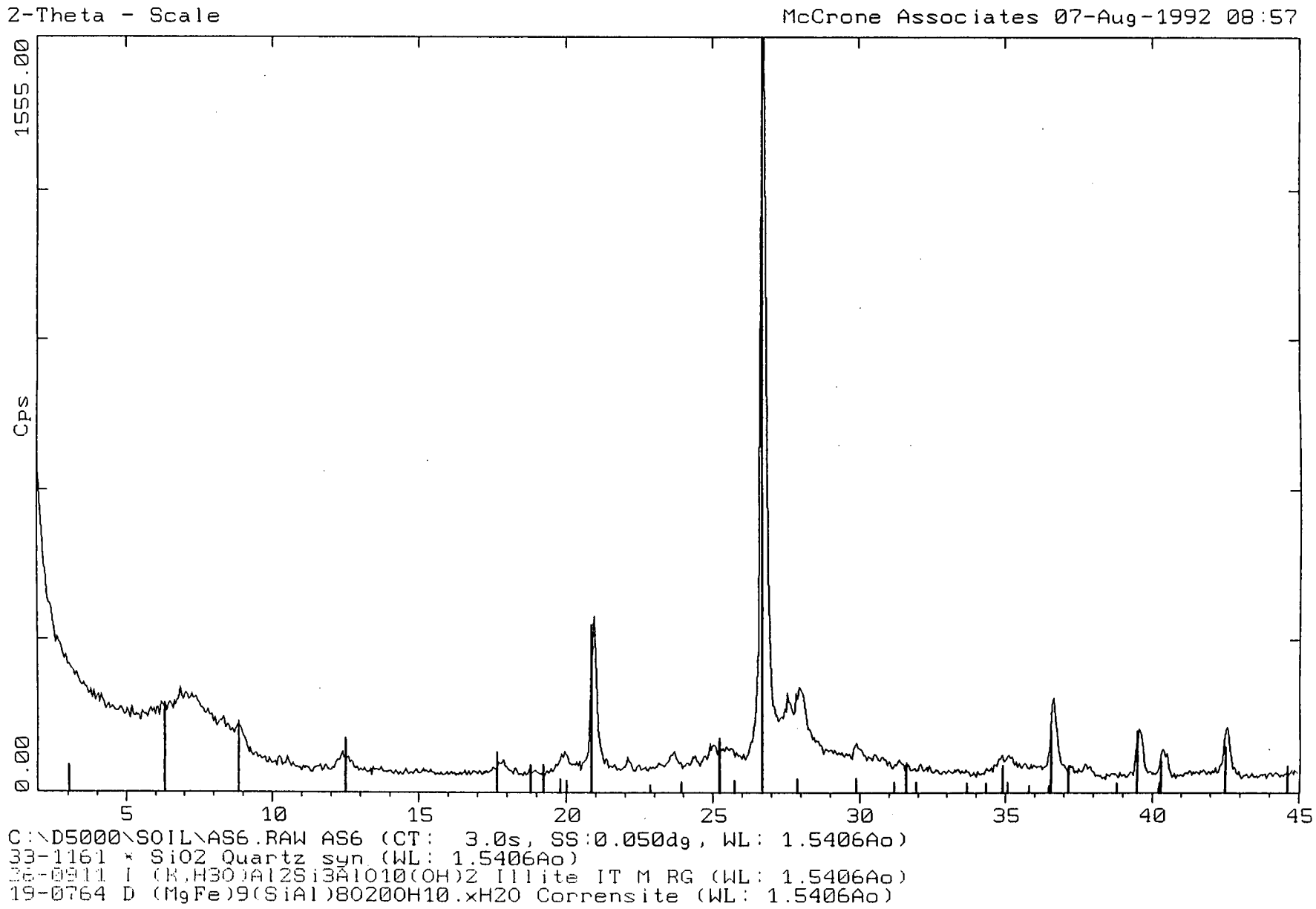

FIGURE 6
X-ray diffraction pattern of 100844.

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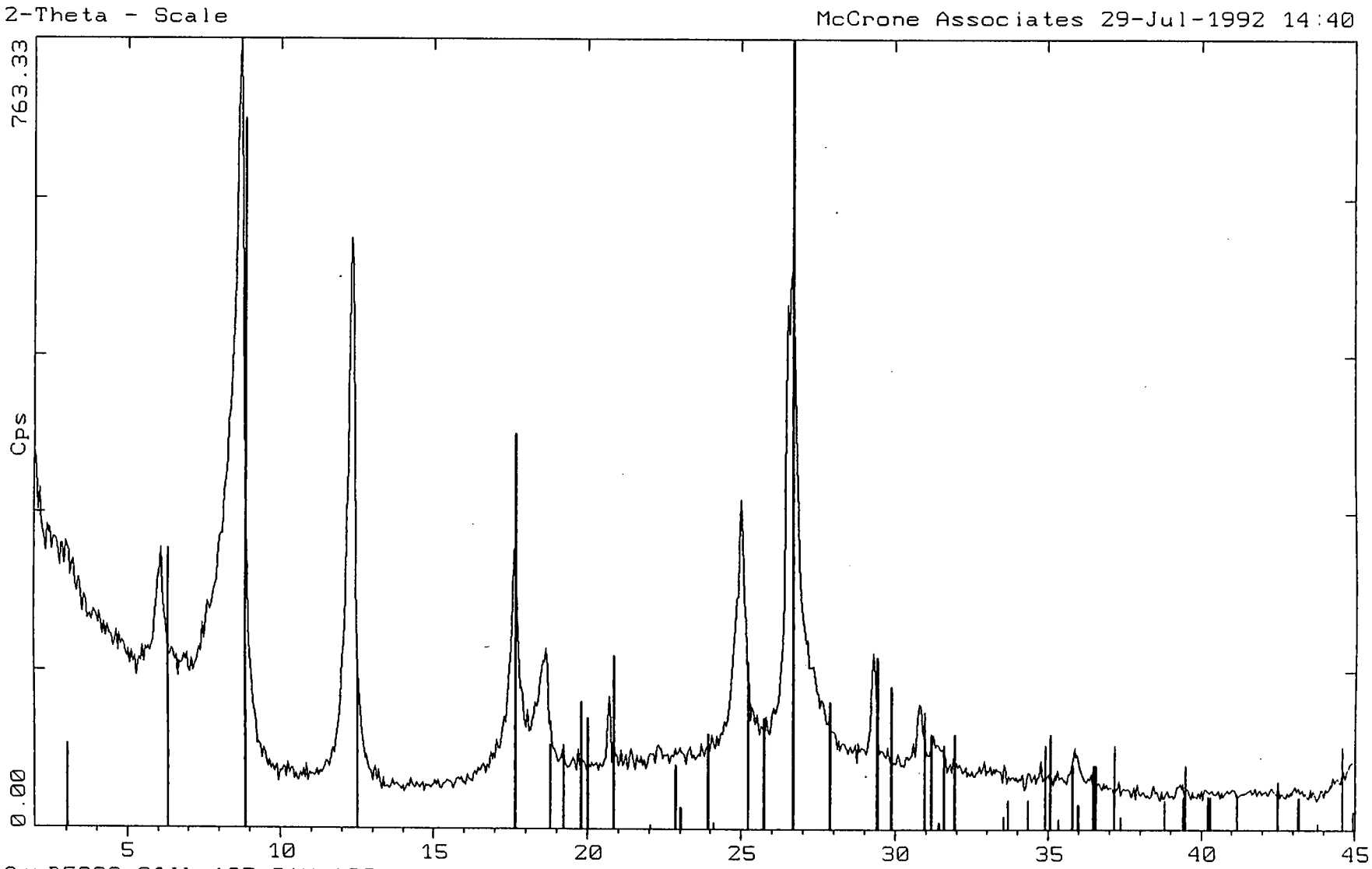

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26-0911 I (K,H3O)Al2Si3AlO10(OH)2 Illite IT M RG (WL: 1.5406Ao)
19-0764 D (MgFe)9(SiAl)8O20OH10.xH2O Corrensite (WL: 1.5406Ao)
33-1161 * SiO2 Quartz syn (WL: 1.5406Ao)
11-0078 D CaMg(CO3)2 Dolomite (WL: 1.5406Ao)
5-0586 * CaCO3 Calcite syn (WL: 1.5406Ao)

FIGURE 7
X-ray diffraction pattern of 100732.

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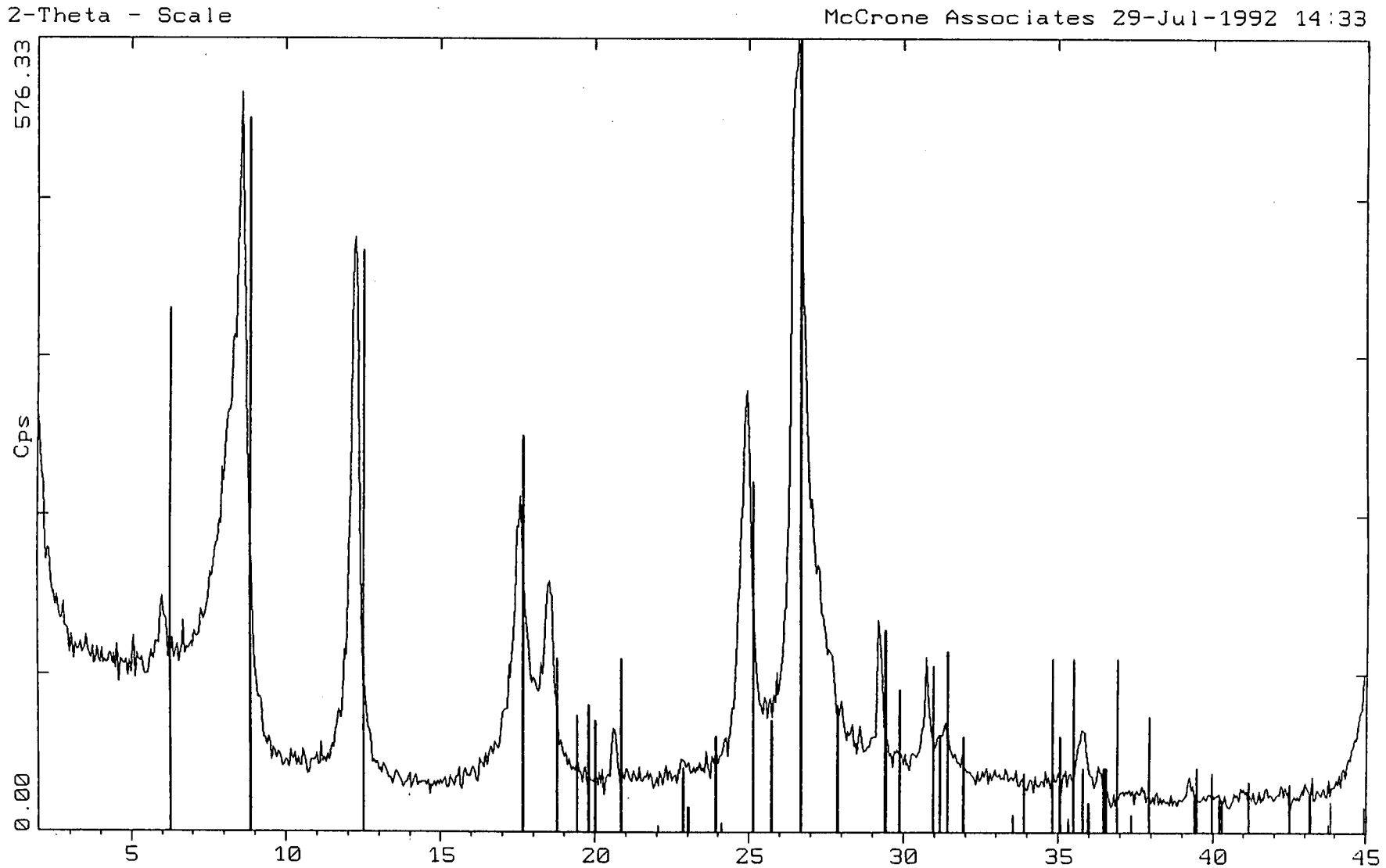

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26-0911 I (K,H3O)Al2Si3AlO10(OH)2 Illite IT M RG (WL: 1.5406Ao)
7-0078 (Mg,Fe,Al)6(Si,Al)4O10(OH)8 Clinochlore IT M I I b RG ferrian (WL: 1.5406Ao)
33-1161 * SiO2 Quartz syn (WL: 1.5406Ao)
11-0078 D CaMg(CO3)2 Dolomite (WL: 1.5406Ao)
5-0586 * CaCO3 Calcite syn (WL: 1.5406Ao)

FIGURE 8
X-ray diffraction pattern of 100813.

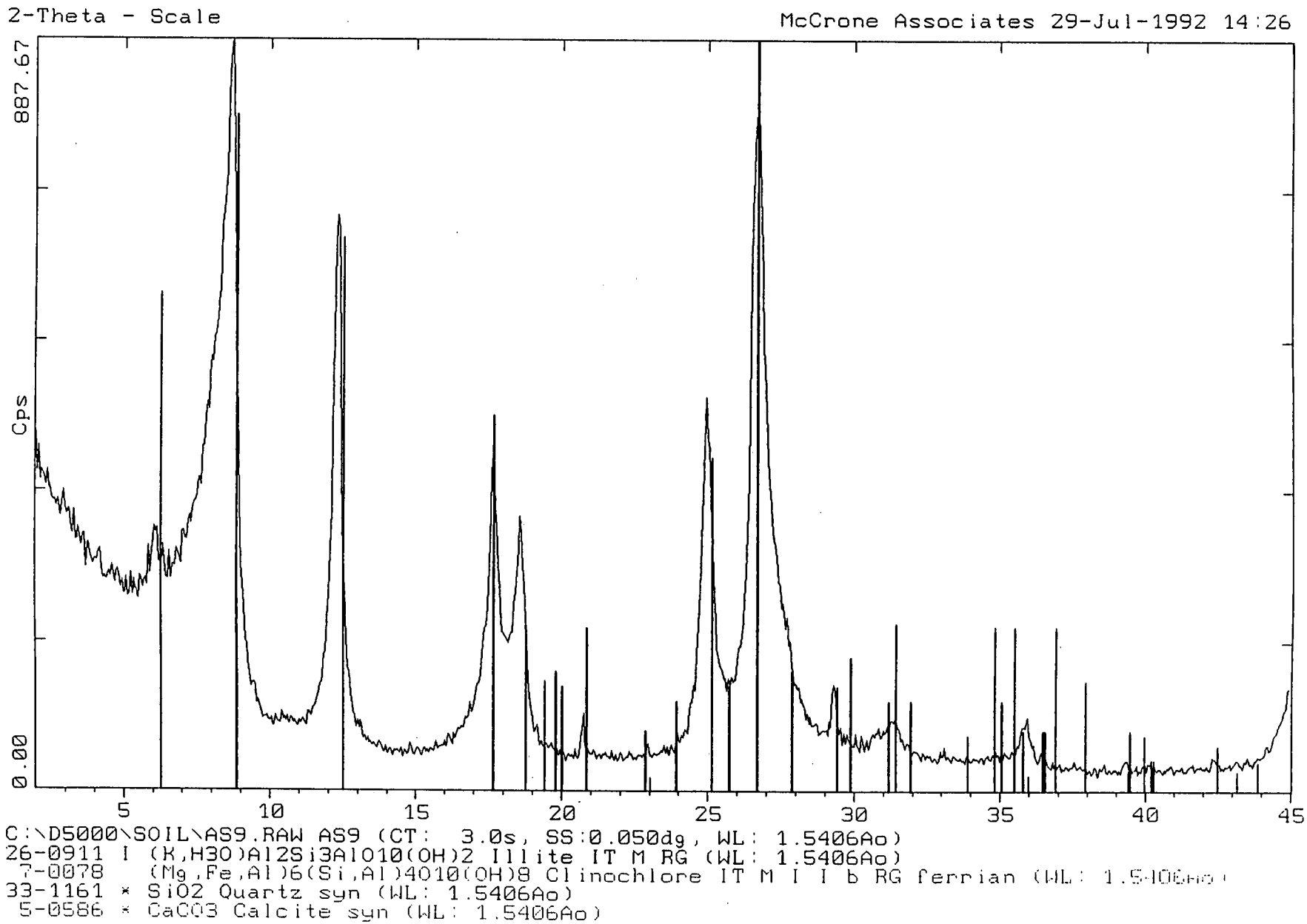

FIGURE 9
X-ray diffraction pattern of 101329.

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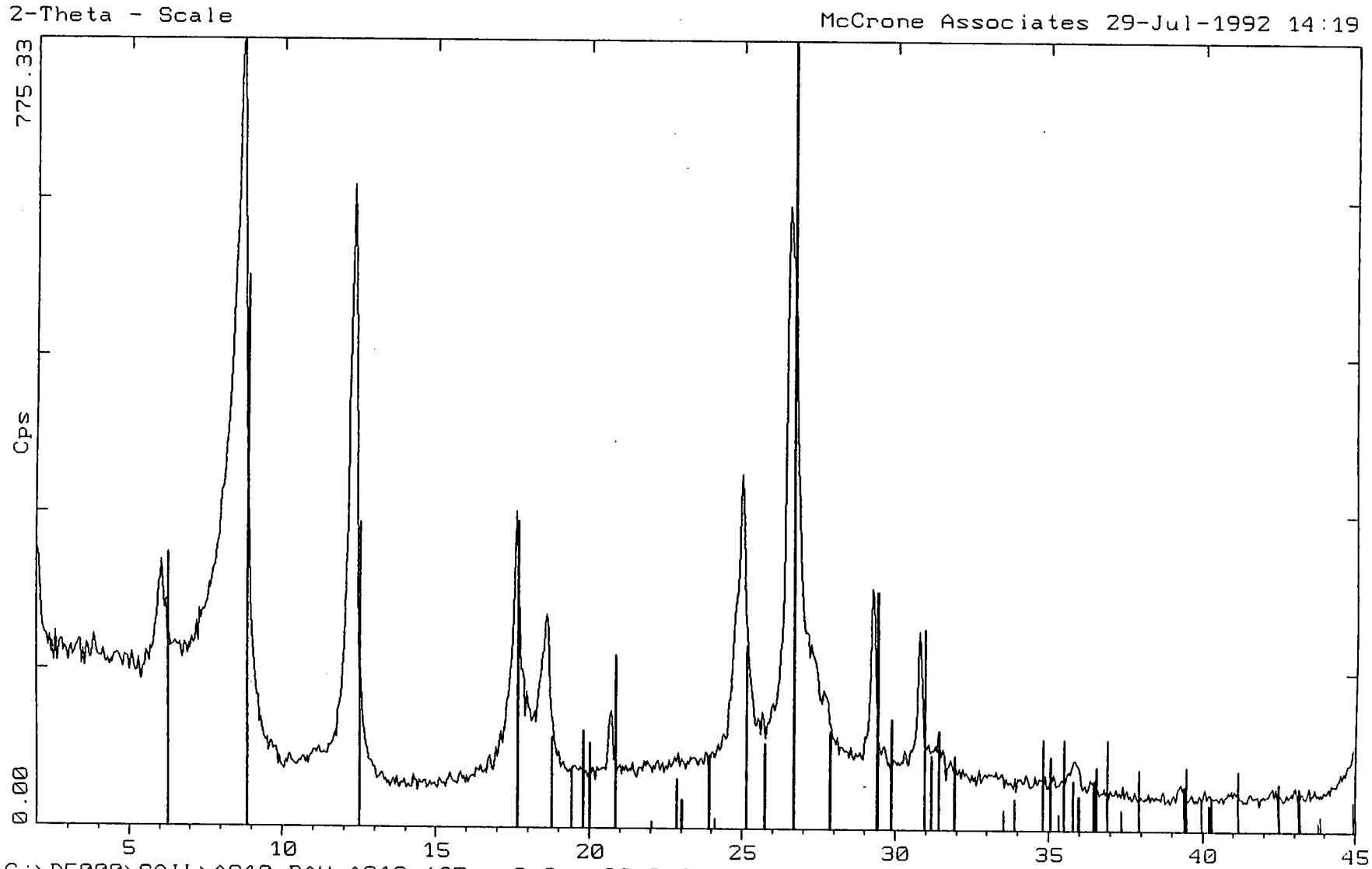

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26-0911 I (K,H3O)Al2Si3AlO10(OH)2 Illite IT M RG (WL: 1.5406Ao)
?-0078 (Mg,Fe,Al)6(Si,Al)4O10(OH)8 Clinochlore IT M I I b RG ferrian (WL: 1.5406Ao)
33-1161 * SiO2 Quartz syn (WL: 1.5406Ao)
11-0078 D CaMg(CO3)2 Dolomite (WL: 1.5406Ao)
5-0586 * CaCO3 Calcite syn (WL: 1.5406Ao)

FIGURE 10
X-ray diffraction pattern of 101277.

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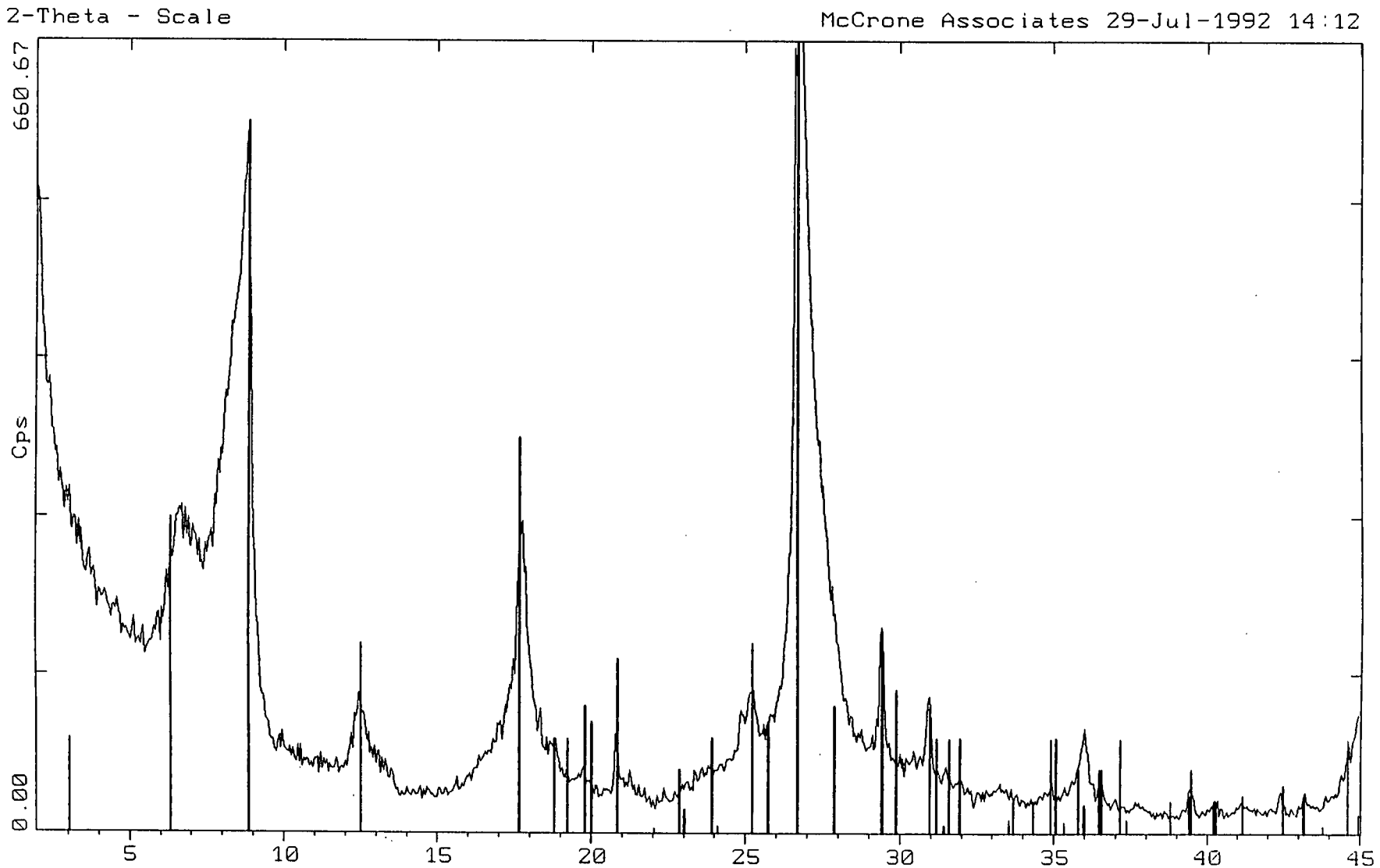

C:\D5000\SOIL\AS11.RAW AS11 (CT: 3.0s, SS:0.050dg, WL: 1.5406Ao)
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19-0764 D (MgFe)9(SiAl)8O20OH10.xH2O Corrensite (WL: 1.5406Ao)
33-1161 * SiO2 Quartz syn (WL: 1.5406Ao)
11-0078 D CaMg(CO3)2 Dolomite (WL: 1.5406Ao)
5-0586 * CaCO3 Calcite syn (WL: 1.5406Ao)

FIGURE 11
X-ray diffraction pattern of 100787.

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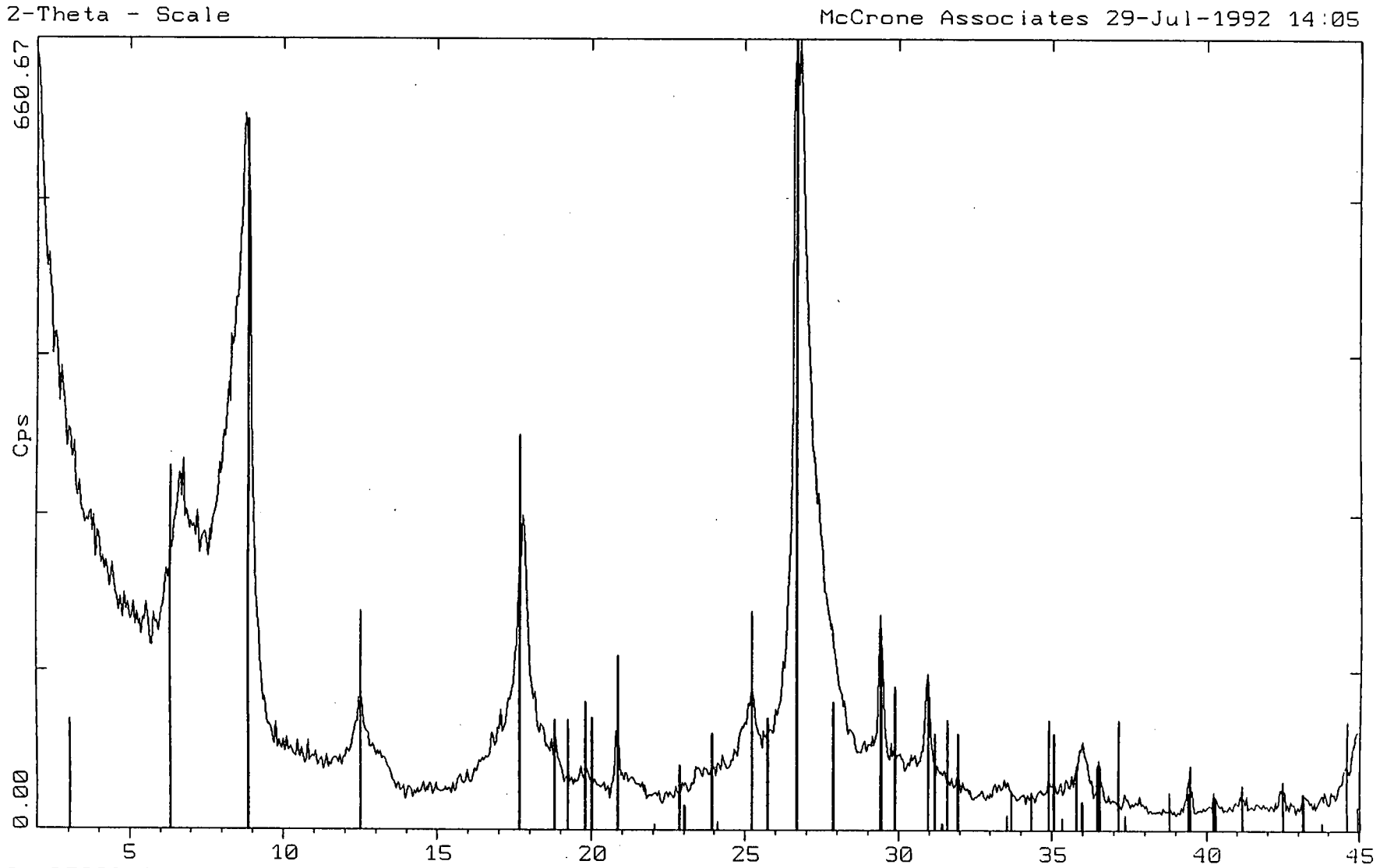

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19-0764 D (MgFe)9(SiAl)8O20OH10.xH2O Corrensite (WL: 1.5406Ao)
33-1161 * SiO2 Quartz syn (WL: 1.5406Ao)
11-0078 D CaMg(CO3)2 Dolomite (WL: 1.5406Ao)
5-0586 * CaCO3 Calcite syn (WL: 1.5406Ao)

FIGURE 12
X-ray diffraction pattern of 100758.

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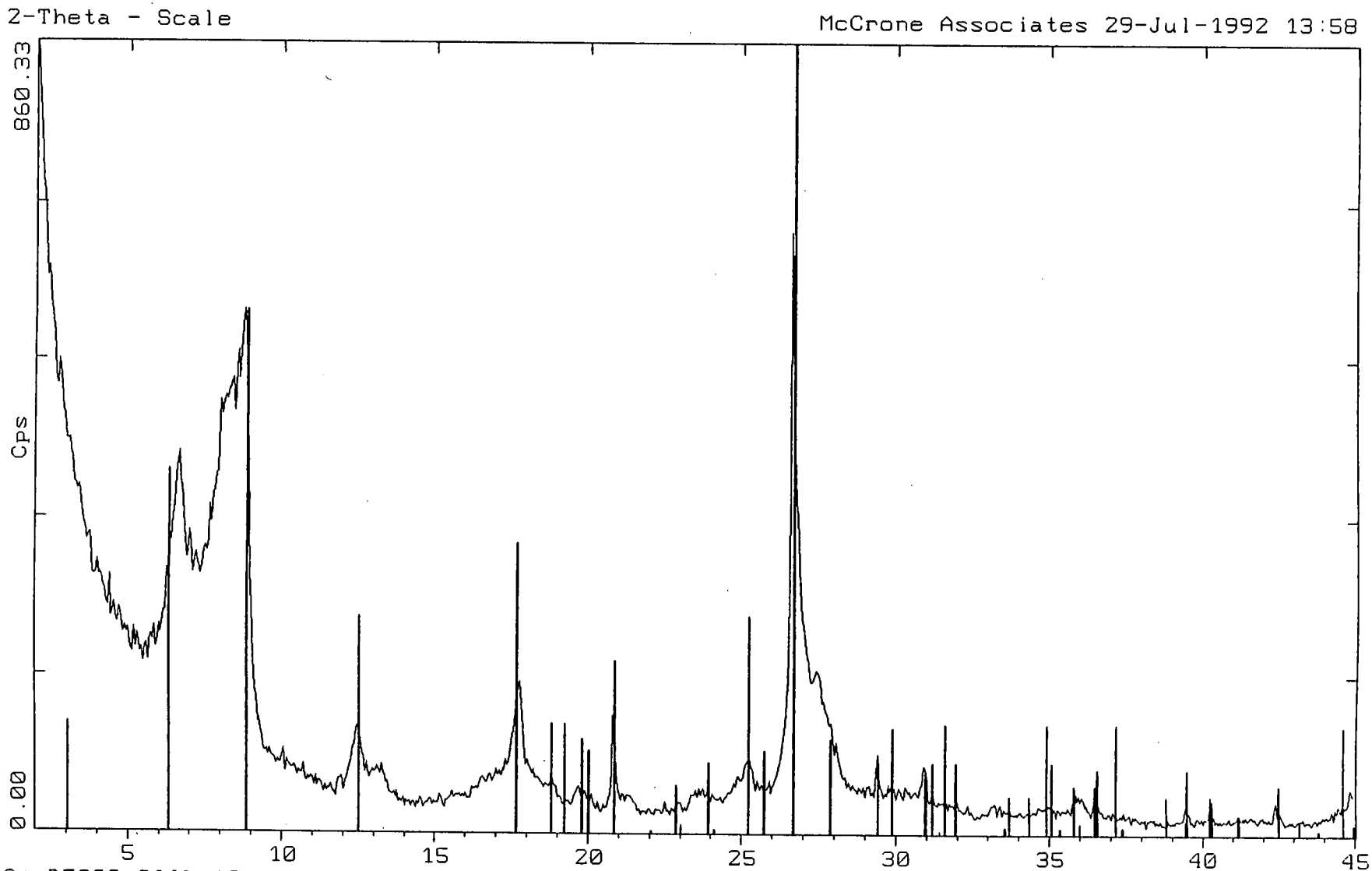

C:\D5000\SOIL\AS13.RAW AS13 (CT: 3.0s, SS:0.050dg, WL: 1.5406Ao)
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19-0764 D (MgFe)9(SiAl)8O20OH10.xH2O Corrensite (WL: 1.5406Ao)
33-1161 * SiO2 Quartz syn (WL: 1.5406Ao)
5-0586 * CaCO3 Calcite syn (WL: 1.5406Ao)
11-0078 D CaMg(CO3)2 Dolomite (WL: 1.5406Ao)

FIGURE 13
X-ray diffraction pattern of 100704.

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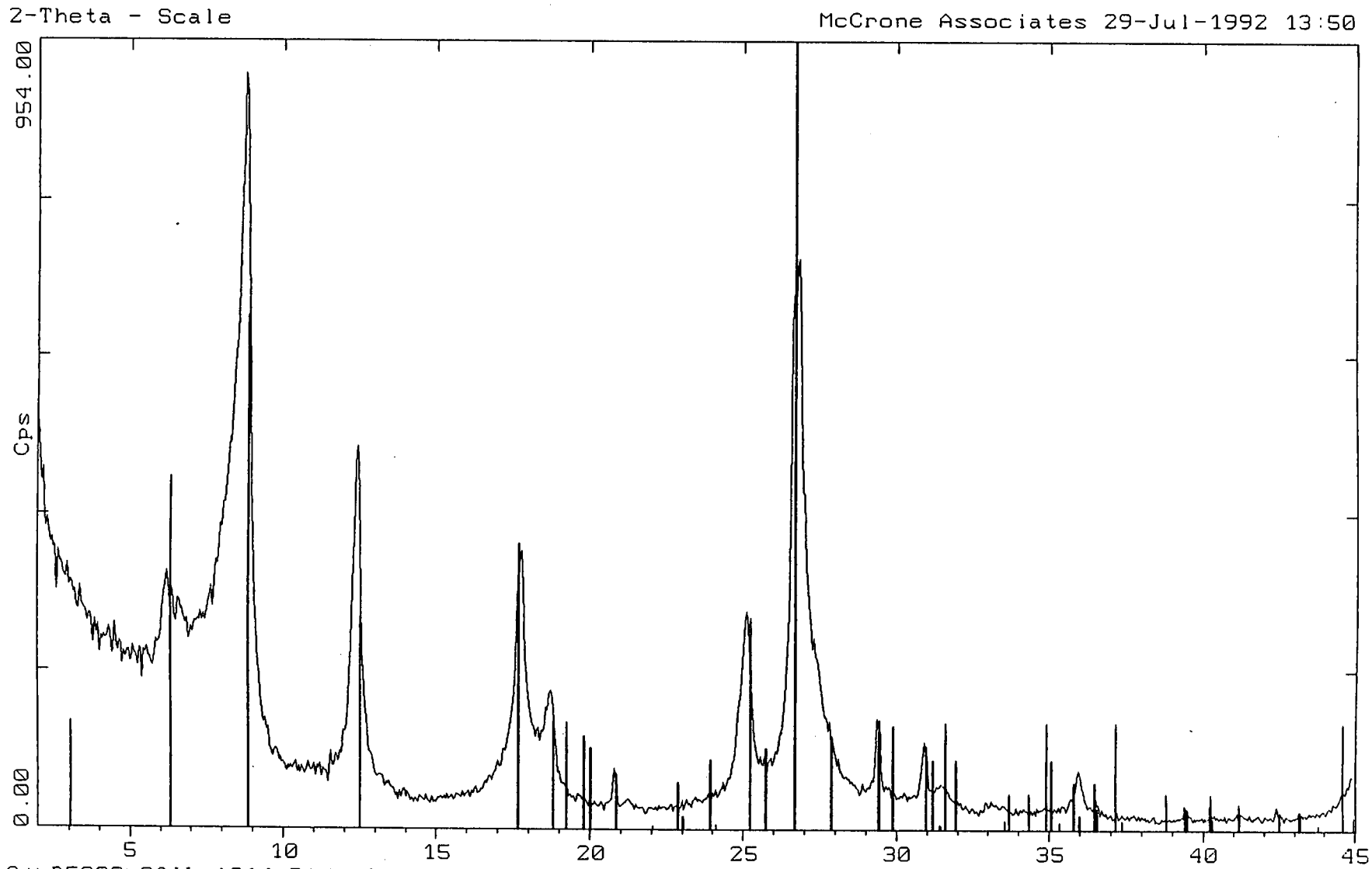

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19-0764 D (MgFe)9(SiAl)8O20OH10.xH2O Corrensite (WL: 1.5406Ao)
33-1161 * SiO2 Quartz syn (WL: 1.5406Ao)
11-0078 D CaMg(CO3)2 Dolomite (WL: 1.5406Ao)
5-0586 * CaCO3 Calcite syn (WL: 1.5406Ao)

FIGURE 14
X-ray diffraction pattern of 101234.

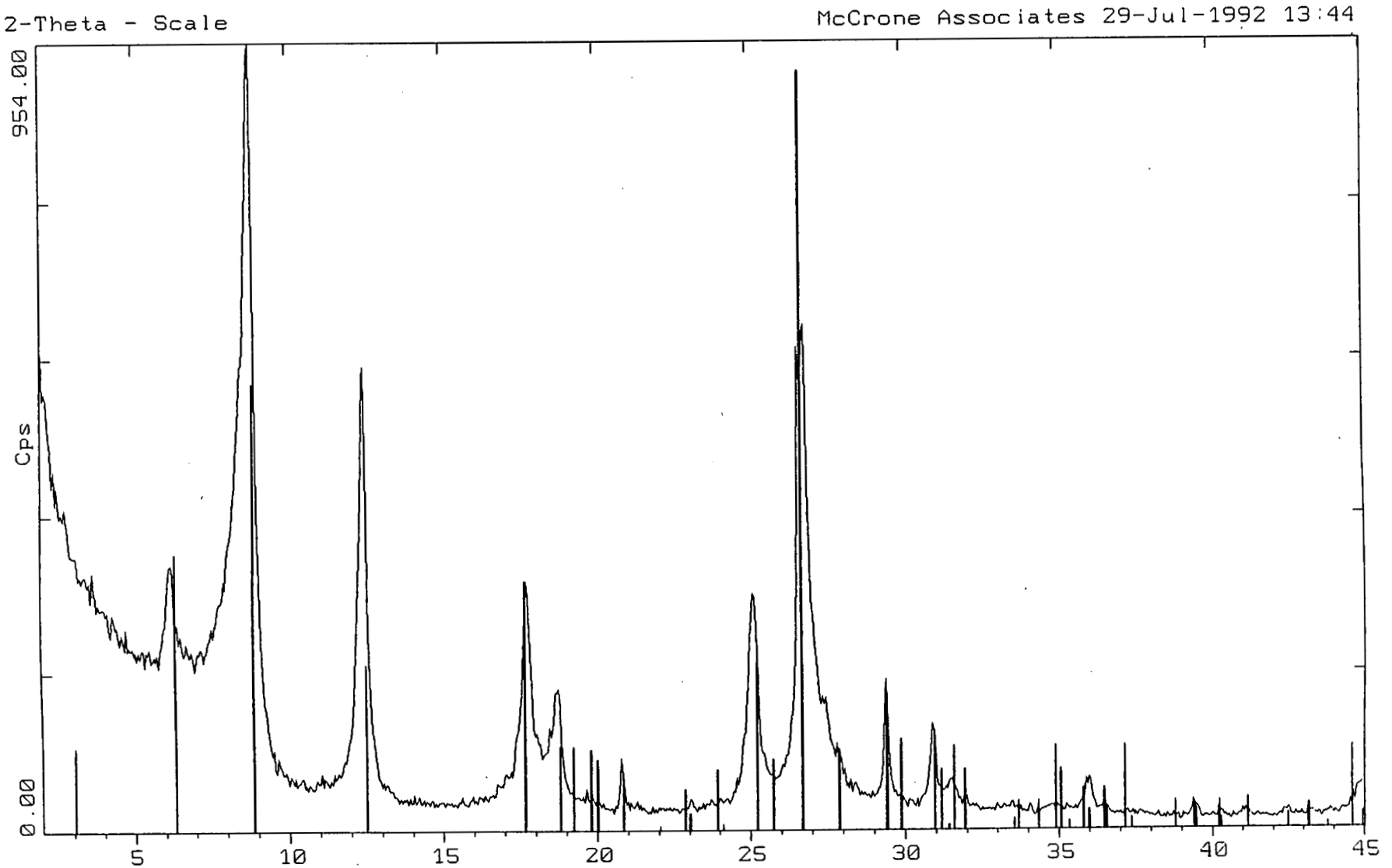
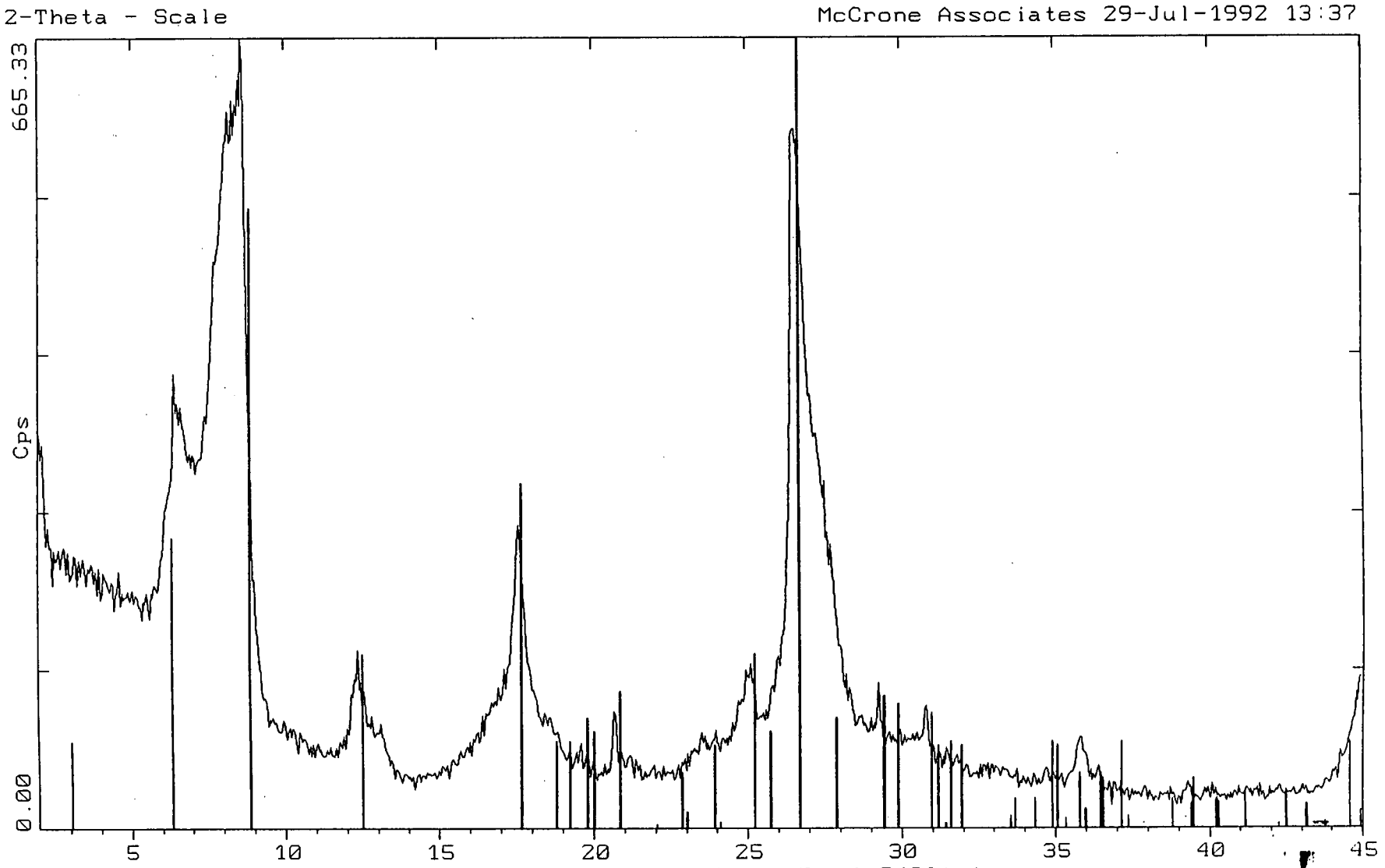


FIGURE 15
X-ray diffraction pattern of 100771.

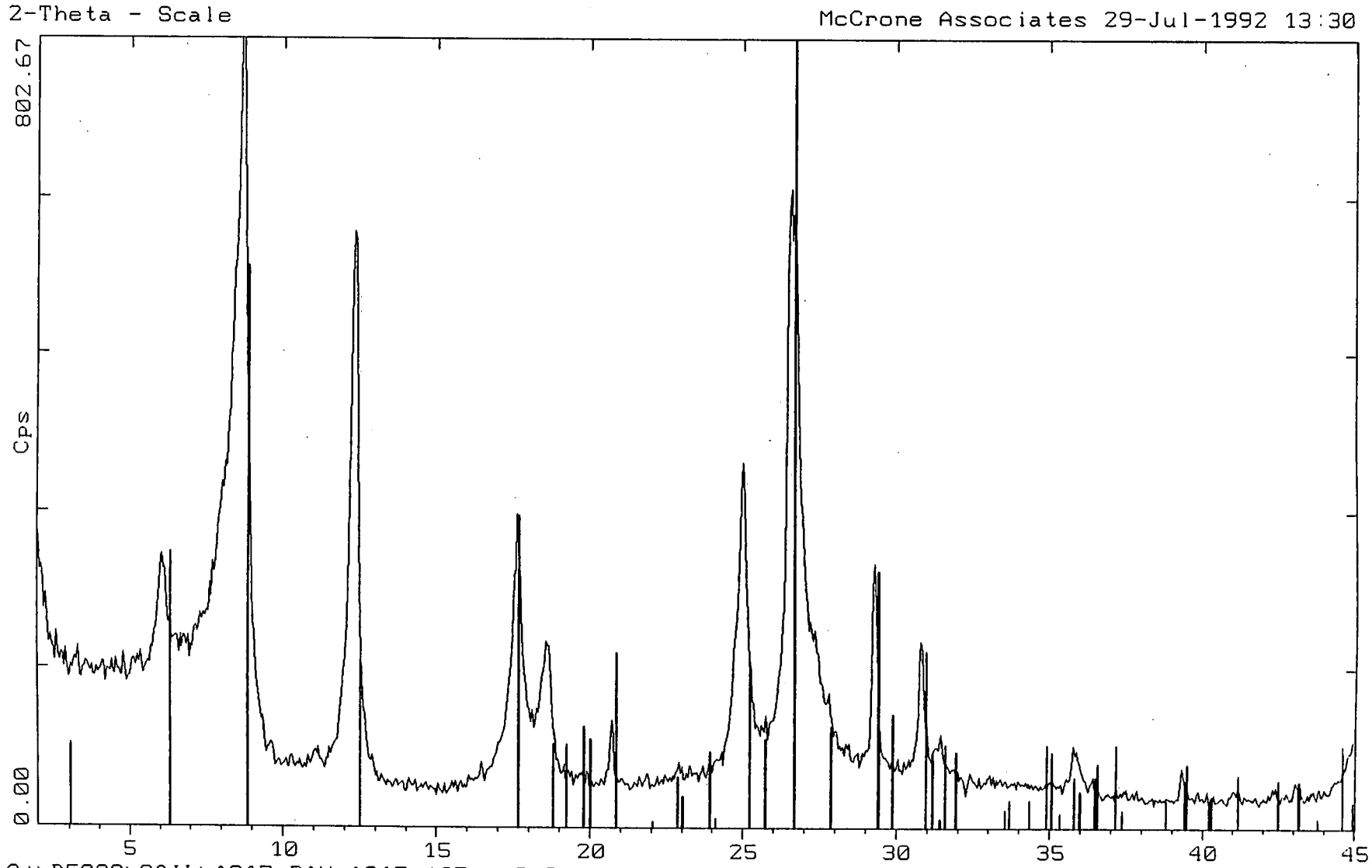
mccrone associates, inc.



C:\D5000\SOIL\AS16.RAW AS16 (CT: 3.0s, SS:0.050dg, WL: 1.5406Ao)
26-0911 I (K,H3O)Al2Si3AlO10(OH)2 Illite IT M RG (WL: 1.5406Ao)
19-0764 D (MgFe)9(SiAl)8O20OH10.xH2O Corrensite (WL: 1.5406Ao)
33-1161 * SiO2 Quartz syn (WL: 1.5406Ao)
11-0078 D CaMg(CO3)2 Dolomite (WL: 1.5406Ao)
5-0586 * CaCO3 Calcite syn (WL: 1.5406Ao)

FIGURE 16
X-ray diffraction pattern of 101285.

mccrone associates, inc.
000032
644



C:\D5000\SOIL\AS17.RAW AS17 (CT: 3.0s, SS:0.050dg, WL: 1.5406Ao)
26-0911 I (K,H3O)Al2Si3AlO10(OH)2 Illite IT M RG (WL: 1.5406Ao)
19-0764 D (MgFe)9(SiAl)8O20OH10.xH2O Corrensite (WL: 1.5406Ao)
33-1161 * SiO2 Quartz syn (WL: 1.5406Ao)
11-0078 D CaMg(CO3)2 Dolomite (WL: 1.5406Ao)
5-0586 * CaCO3 Calcite syn (WL: 1.5406Ao)

FIGURE 17
X-ray diffraction pattern of 100567.

mccrone associates, inc.
C00033
6413

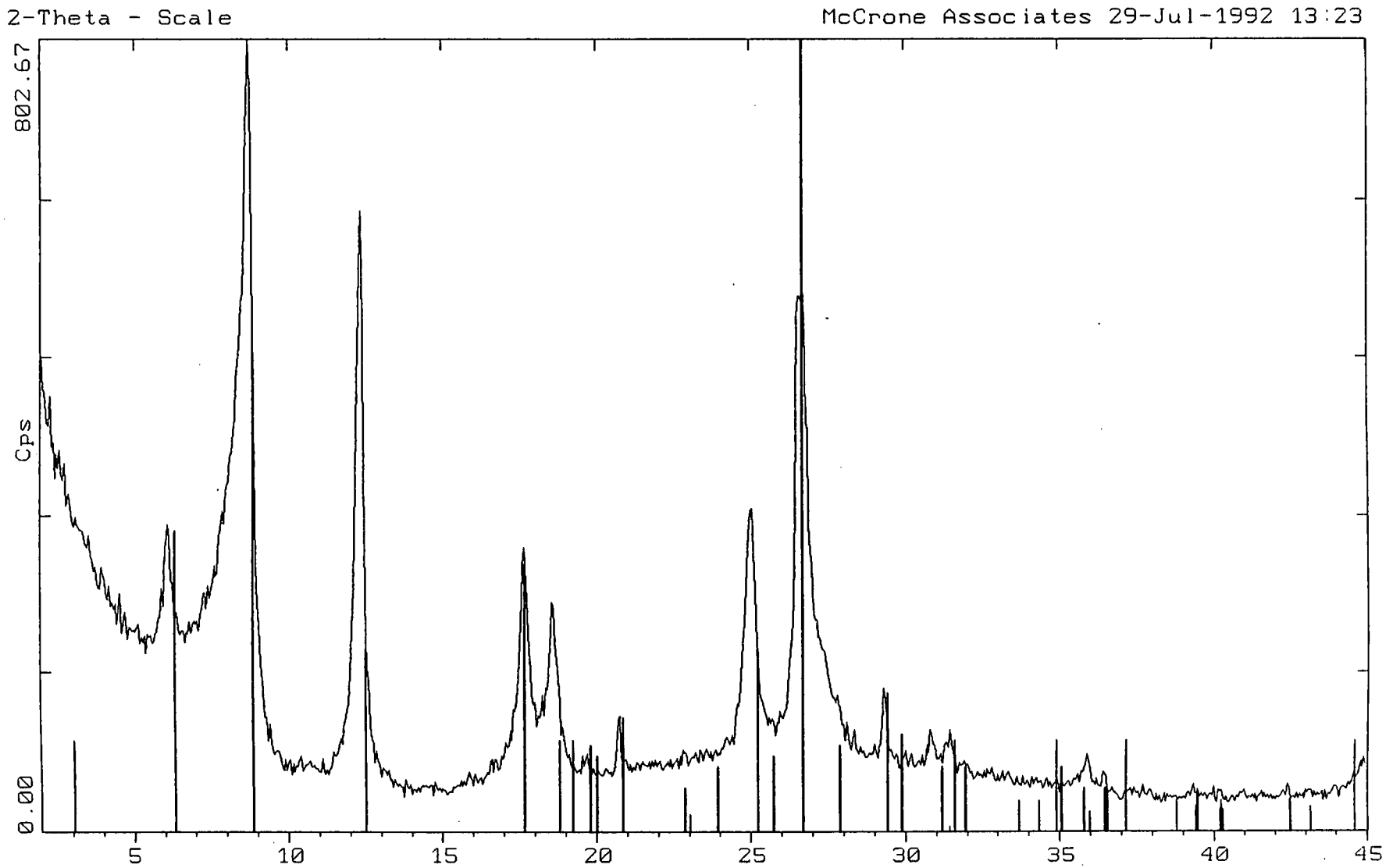


FIGURE 18
X-ray diffraction pattern of 100882.

mccrone associates, inc.
000034
0449

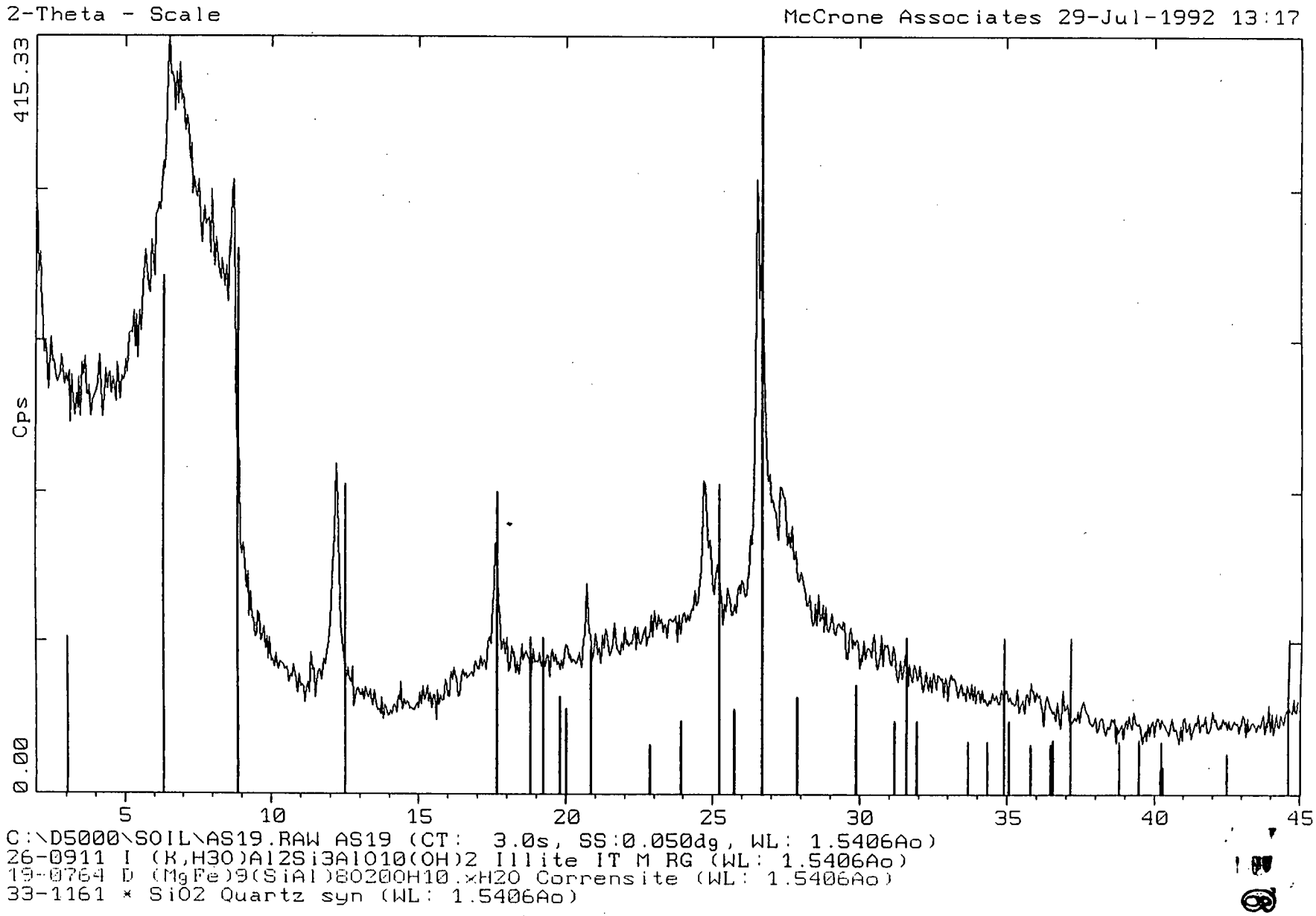


FIGURE 19
X-ray diffraction pattern of 100552.

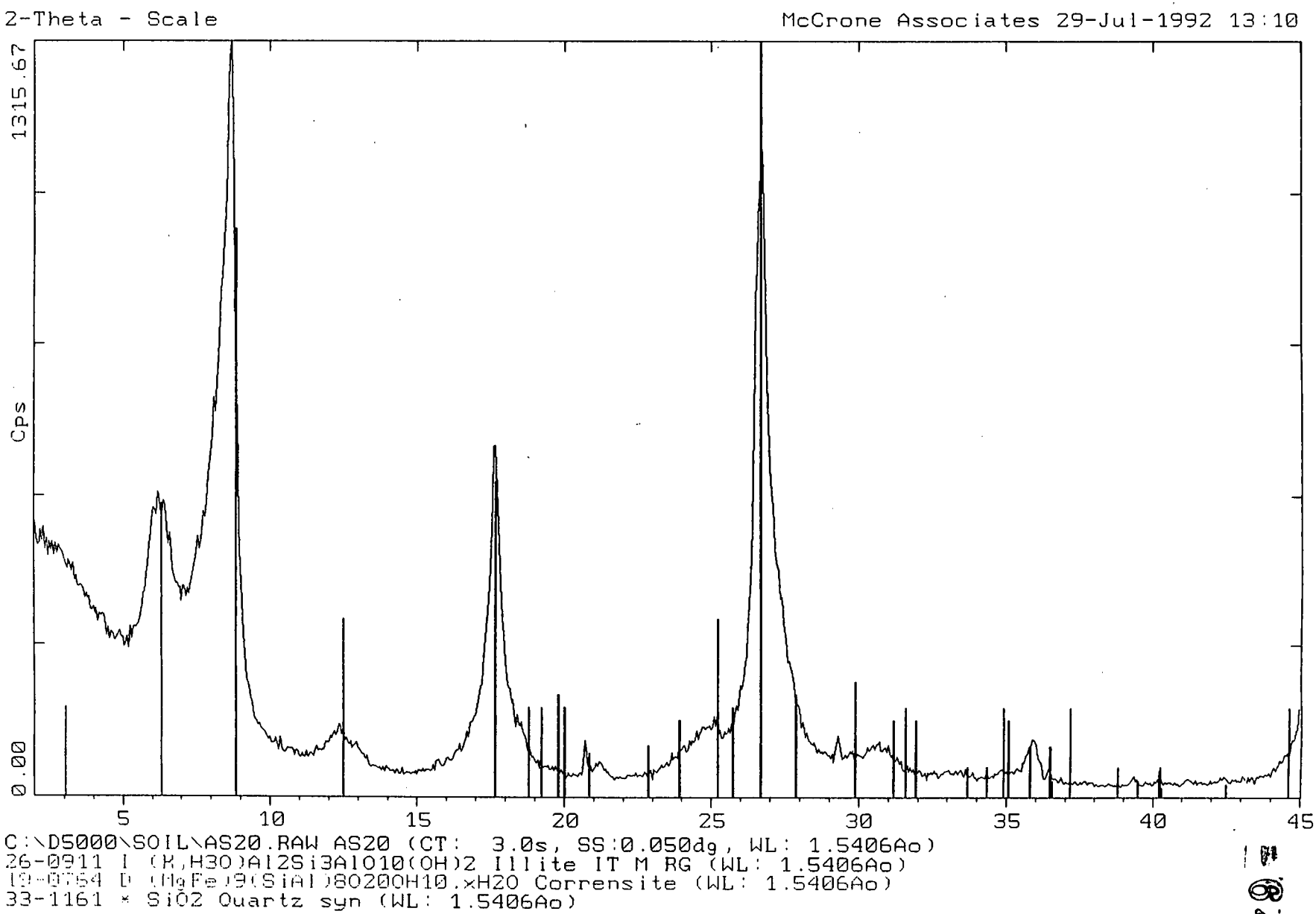


FIGURE 20
X-ray diffraction pattern of 101403.

mccrone associates, inc.

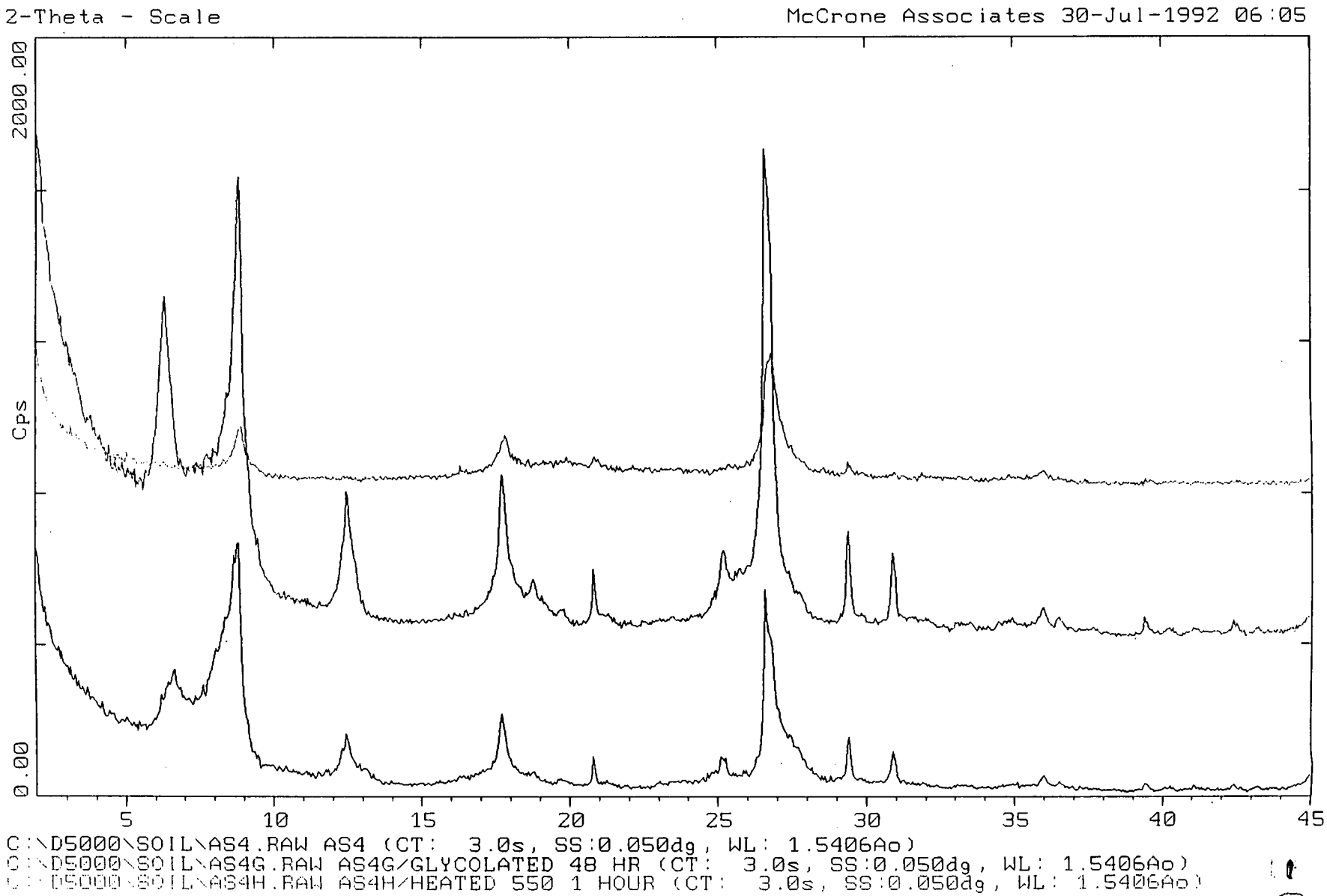


FIGURE 21
X-ray diffraction patterns produced by air-dried (black), glycolated (green) and heated (blue) oriented mounts of 100719.

mccrone associates, inc.
000037
1-8443

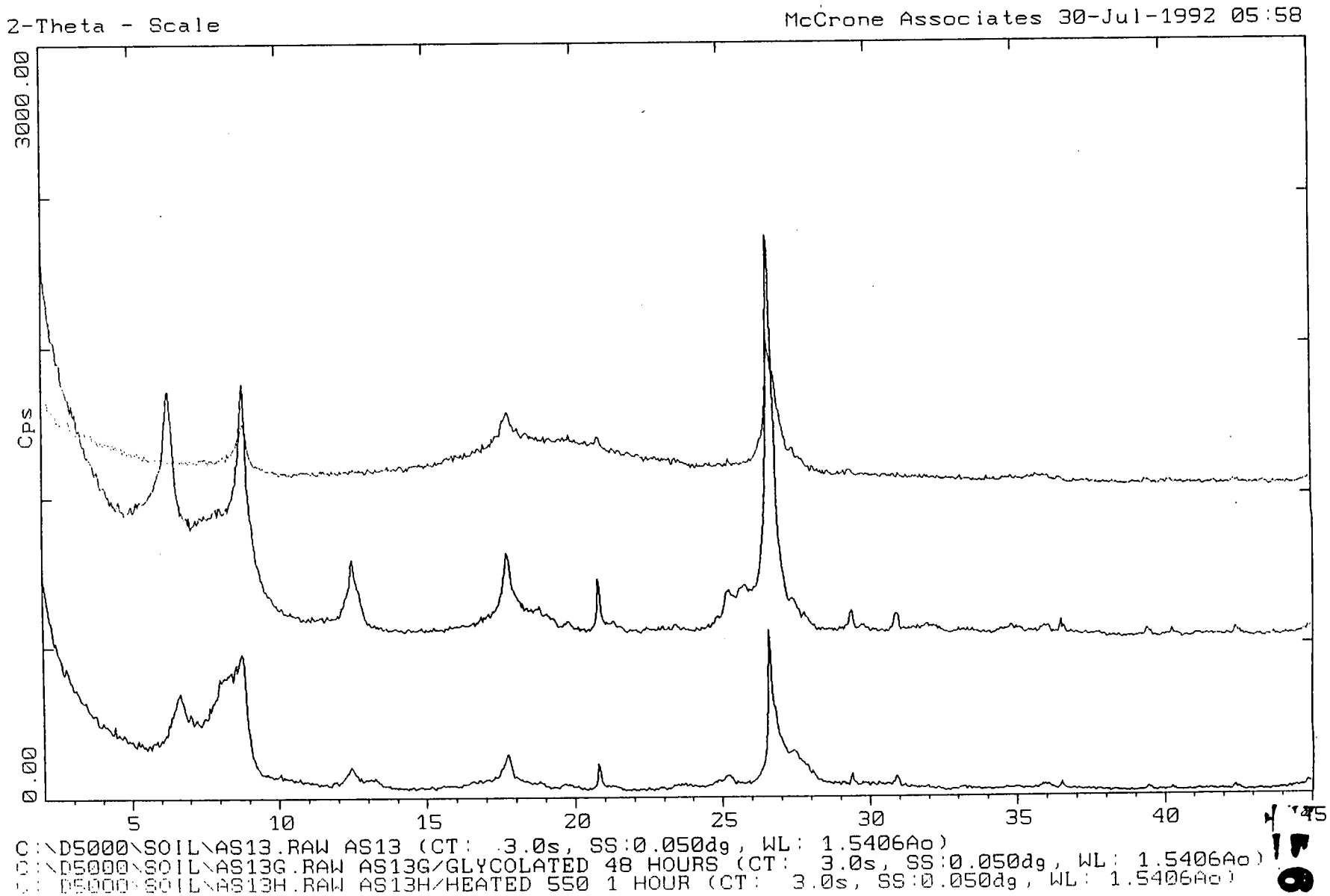


FIGURE 22
X-ray diffraction patterns produced by air-dried (black), glycolated (green) and heated (blue) oriented mounts of 100704.

mccrone associates, inc.

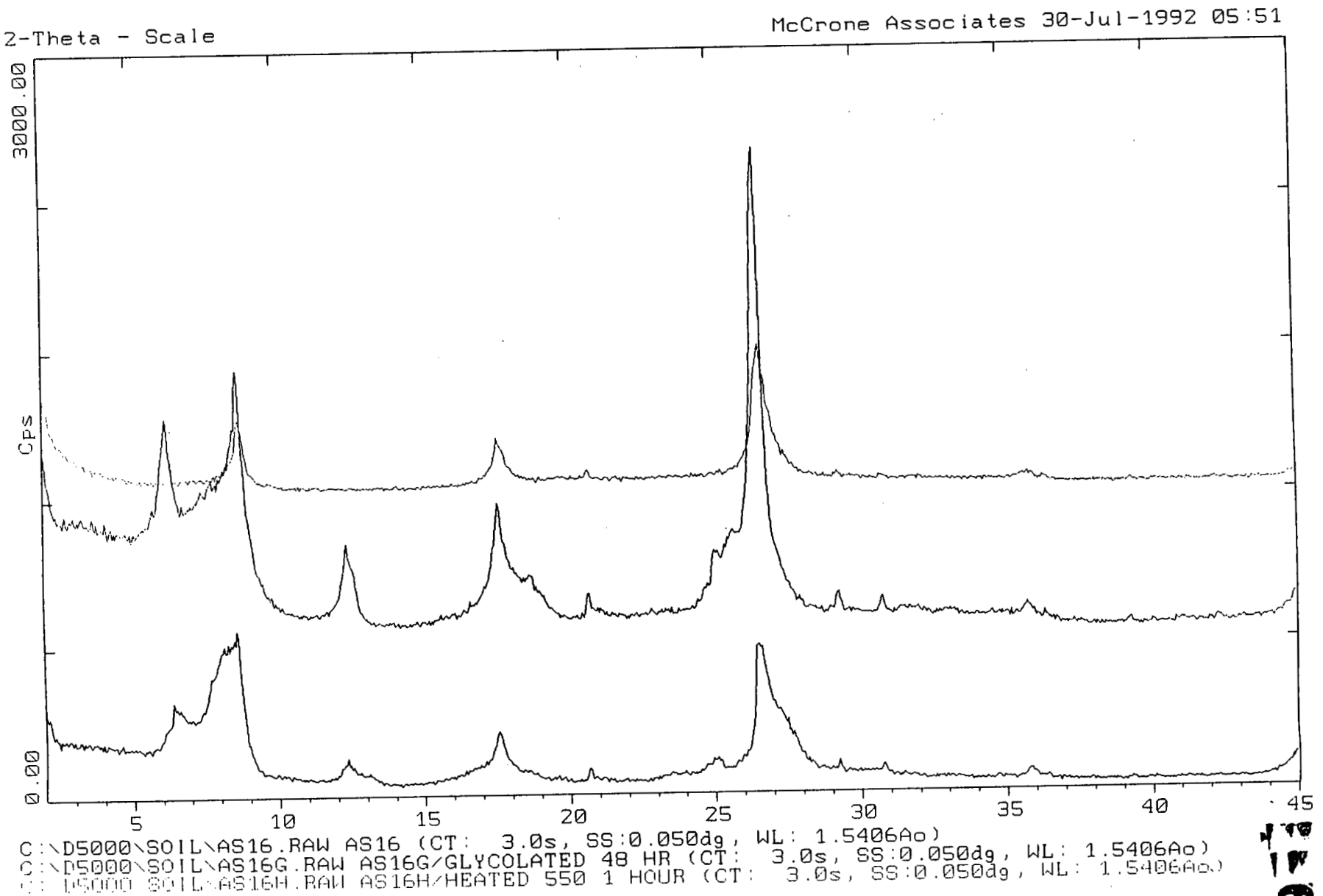


FIGURE 23
X-ray diffraction patterns produced by air-dried (black), glycolated (green) and heated (blue) oriented mounts of 101285.

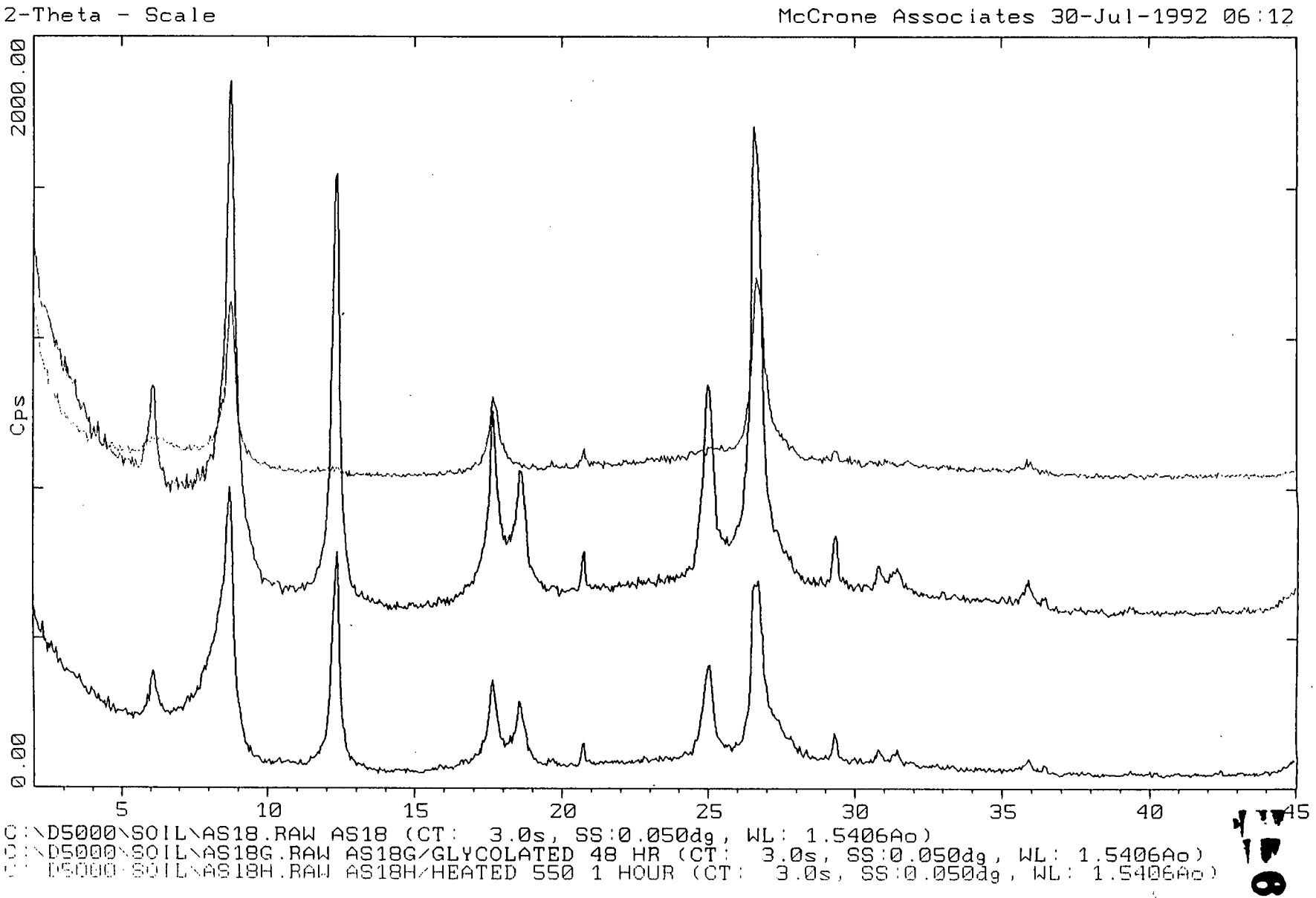


FIGURE 24
X-ray diffraction patterns produced by air-dried (black), glycolated (green) and heated (blue) oriented mounts of 100882.

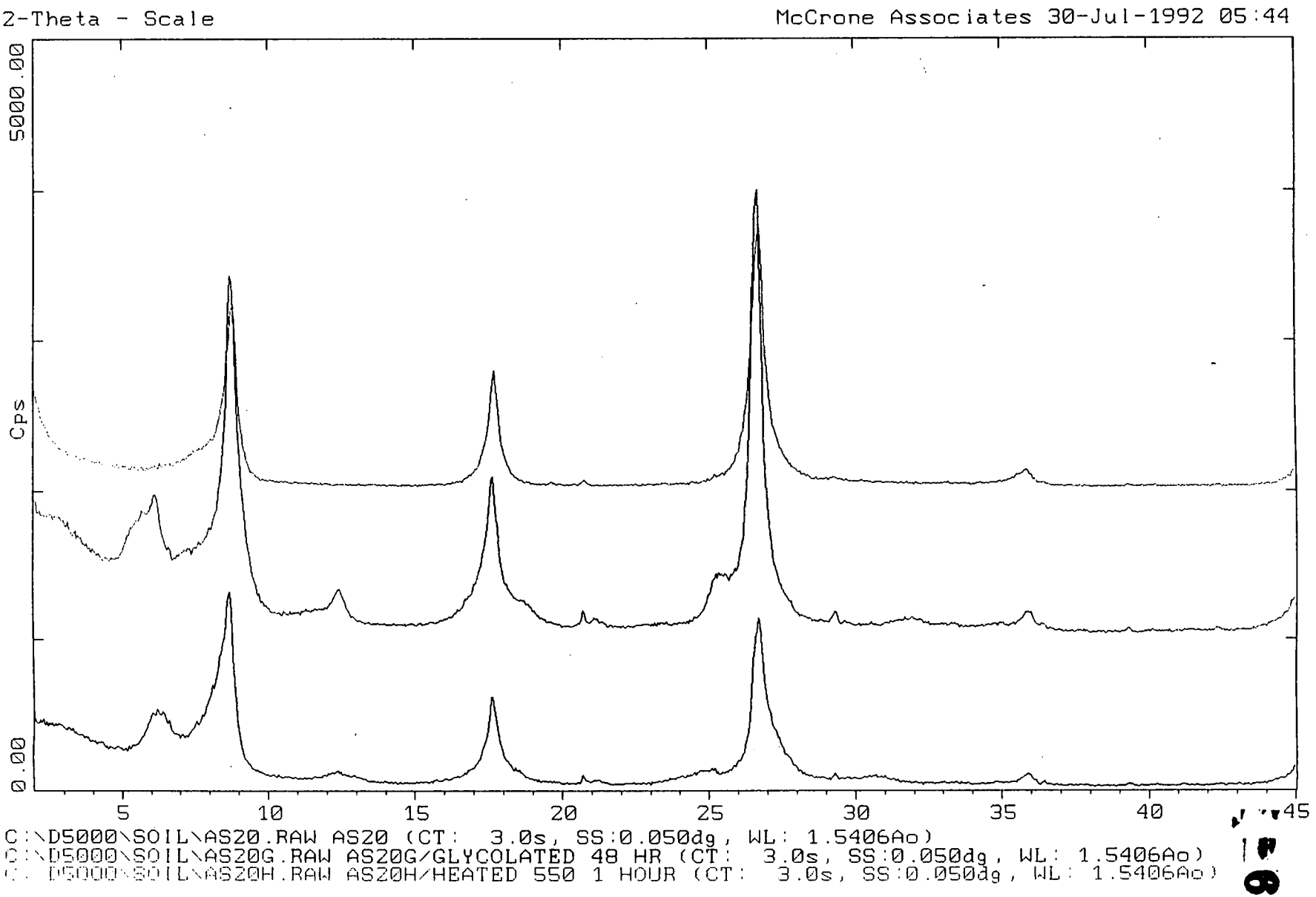


FIGURE 25
X-ray diffraction patterns produced by air-dried (black), glycolated (green) and heated (blue) oriented mounts of 101403.

mccrone associates, inc.
000041
6449

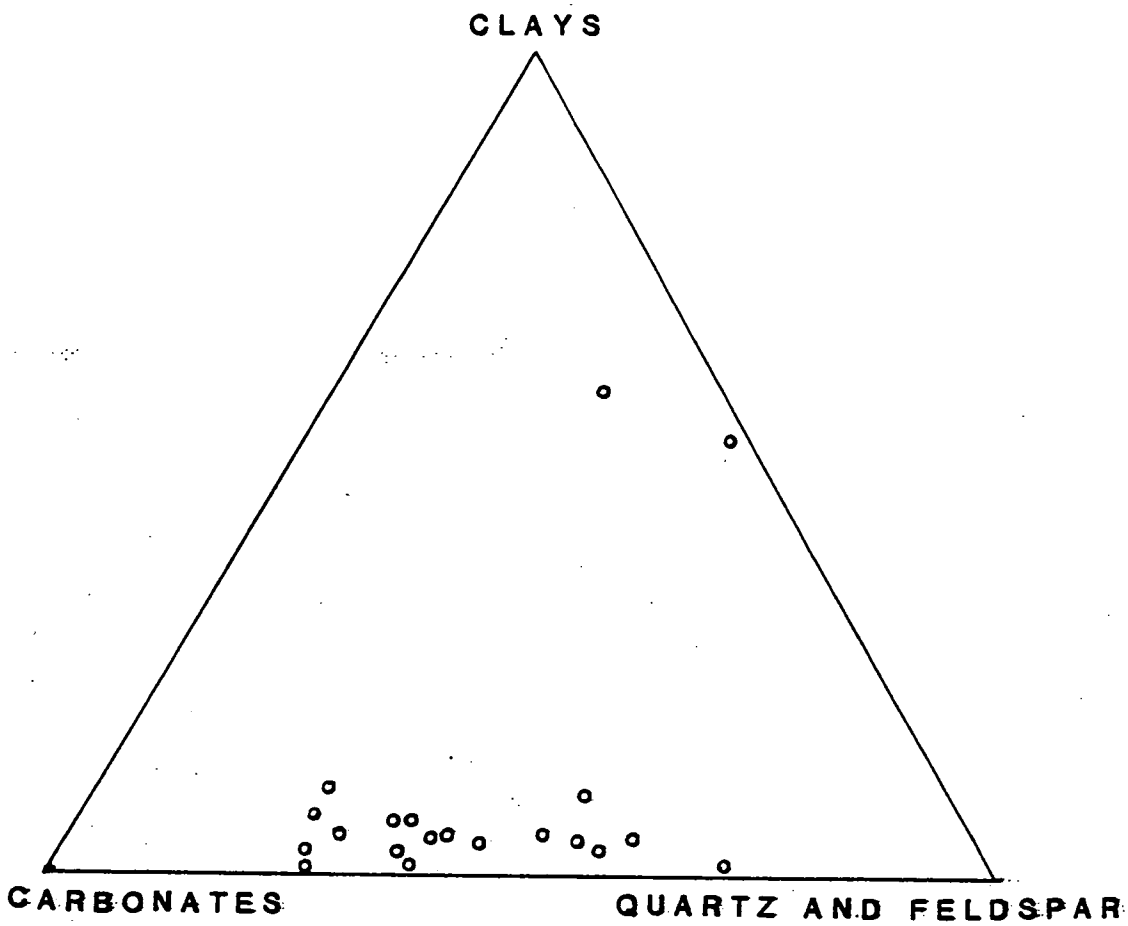
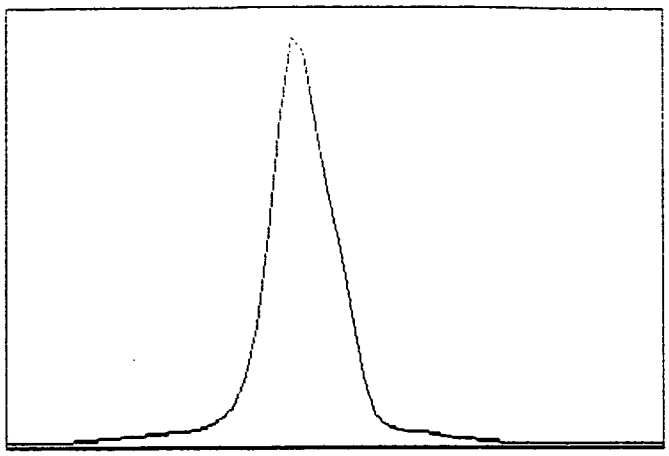


FIGURE 26
Carbonate-clay-quartz/feldspar ternary diagram.

SIEMENS Diffrac / AT
Online Adjustment Program
03.05

Id. QUARTZ
Position 1
Rotation S.C. spin

Detector 60.000
Tube 30.000L
Chi
Phi
"x"
"y"
Oscil. None
Amplitude
Speed
Divergence slit 0.996
Antiscatter slit 0.996
Detector slit
Tube window Closed



26.200 S: 0.020° Cps MT 27.300

Measuring channel
Amplification 2
High voltage 750
Base level 0.800
Upper level 2.000
Tube voltage
Tube current

Pointer status
Cancel: Select:

Scanning mode Normal, coupled scan
Data collection Stopped Restart
Direct command to D5000
Evaluation Store data Adjust reference EXIT

McCrone Associates
EVA Version 3.0
Data file: C:\D5000\DATA\QUARTZ.RAW QUARTZ

Measured range: 26.200 to 27.300 Step: 0.020 Time: 6.600

Auto Background

2-theta	:	26.260	-	27.160 Peak:	26.688
Background:		114.0	-	81.4 Peak:	18950.2
Raw Area	:	2647.36	-	87.93 Net :	2559.43
FWHM	:	0.1210	Integral Width :		0.1358
Chord	:	26.699	Gravity center :		26.696

FIGURE 27
Scan across primary quartz peak of quartz standard.

FERNALD
RI/FS

REQUEST FOR ANALYSIS AND CHAIN OF CUSTODY RECORD

Reference Document No. 70305

6443

PROJECT/TASK NAME: FEMP RI/FS EWMF
PROJECT/TASK NO.: 602.03.01.01
PROJECT MANAGER: JOHN WOOD
SAMPLE TEAM MEMBERS: VARIOUS - SEE ORIG CC
PROJECT CONTACT: TOM TANK / RICH ABITZ
PHONE NUMBER: 513 738-3100 / 505 262-8800
OPERABLE UNIT NO.: OU-5

DATE SAMPLES SHIPPED: 5-21-92
CARRIER/WAYBILL NUMBER: FEDEX 0093345490
LAB DESTINATION: McCRONE ASSOCIATES
LABORATORY CONTACT: JESSICA ELZEA
DATE REPORT REQUIRED: 8-10-92
PURCHASE ORDER NUMBER: 602.03.01.01

BILL TO: Advanced Sciences, Inc.
6739 Academy Drive, N.E.
Albuquerque, NM 87109

ORIGINAL DATA REPORT: Advances Sciences, Inc. Attn: Pam Rajic
165 Mitchell Road, Oak Ridge, TN 37830

EDT TO: ASI, 11003 Hamilton-Cleves Road
P.O. Box 475, Ross, Ohio 45061 /Attn: Database Mgt.

	SAMPLE NUMBER	SAMPLE LOCATION AND DESCRIPTION	DATE	TIME	SAMPLE TYPE	NO. OF CNTNRS.	SAMPLE VOLUME (each)	CONTAINER TYPE	PRESERVATIVE	TAL NUMBER	REQUESTED ANALYSES	CLP Pkg.	CONDITION ON RECEIPT (INITIALS AND DATE)	DISPOSAL RECORD NO.
1	100882	B-1730 17-17.5'	01-09-92	1430	SOIL	1	150 ml	6" SS LINER	NONE	3.22J	PLM, XRD	N		
2	101403	B-1732 19-19.5'	01-09-92	0945										
3	100844	B-1734 4-4.5'	01-08-92	0820										
4	101366	B-1737 5-5.5'	01-06-92	1455										
5	100787	B-1738 4.5-5'	01-02-92	1015										
6	100771	B-1740 17-17.5'	12-21-91	1330										
7	100758	B-1740 6.5-7'	12-21-91	1012										
8	101329	B-1741 28-28.5'	12-21-91	0940										
9	100719	B-1742 5-5.5'	12-18-91	1125										
10	100732	B-1742 16.5-17'	12-18-91	1620										
11	101285	B-1743 4-4.5'	12-18-91	1400	SOIL	1	150 ml	6" SS LINER	NONE	3.22J	PLM, XRD	N		

NOTE: If more than 11 lines are needed for one sample number, use a separate RFA/CC for the remaining sample parameters.

Special Instructions: ALL SAMPLES WERE SCREENED FOR ALPHA AND BETA RAD ACTIVITY AND DETERMINED TO BE AT NATURAL BACKGROUND LEVELS.

SCREENED CLEAN

Possible Sample Hazards: ☐ Radionuclides ☐ Volatile Organics
Non-hazard ☑ Flammable ☐ Skin Irritant ☐ Poison B ☐

Sample Disposal: Return to Client ☑ Disposal by Lab ☐

Turnaround Time Required Normal ☑ Rush ☐

1. Relinquished by (Name, Company, Date, Time) Bill Westerman, ASI, 5-21-91, 1500
1. Received by (Name, Company, Date, Time) Louis P. Sciabello, McCrone Associates, 5/26/92 1300.
2. Relinquished by (Name, Company, Date, Time)
2. Received by (Name, Company, Date, Time)
3. Relinquished by (Name, Company, Date, Time)
3. Received by (Name, Company, Date, Time)

Comments:

000044

Original - To Laboratory Yellow - Field Technical Coordinator/Quality Assurance Pink - Database Management Goldenrod - Sample Coordination Field Review _____ Date _____ /QA Review _____ Date _____

ASI FORM 0145 REV.(0) 4/92

ORIGINALLY RECORDED ON FOLLOWING ~~RFA~~/CC #'s: 100882: 52039; 101403: 52007; 100844: 52037; 101366: 52489; 100787: 52504; 100771: 52577; 100758: 52576; 101329: 52478; 100719: 52495; 100732: 52496; 101285: 52469.

FERNALD
RI/FS

REQUEST FOR ANALYSIS AND CHAIN OF CUSTODY RECORD (Cont.)

Reference Document No. 70305

6443

PROJECT NUMBER 602.03.01.01 PROJECT/TASK NAME FEMP RI/FS EWMF

	SAMPLE NUMBER	SAMPLE LOCATION AND DESCRIPTION	DATE	TIME	SAMPLE TYPE	NO. OF CNTNRS.	SAMPLE VOLUME (each)	CONTAINER TYPE	PRESERVATIVE	TAL NUMBER	REQUESTED ANALYSES	CLP Pkg.	CONDITION ON RECEIPT (INITIALS AND DATE)	DISPOSAL RECORD NO.
12	101295	B-1743 14-14.5'	12-18-91	1630	SOIL	1	150 ml	6" SS LINER	NONE	3.22J	PLM, XRD	N		
13	100704	B-1744 4.5-5'	12-17-91	1038	↓	↓	↓	↓	↓	↓	↓	↓		
14	101277	B-1745 26-26.5'	12-17-91	1415										
15	100690	B-1746 4.5-5'	12-16-91	1400										
16	101234	B-1747 17-17.5'	12-11-91	1340										
17	100677	B-1748 31-31.5'	12-11-91	1632										
18	100552	B-2731 6-6.5'	01-08-92	1035										
19	100567	B-2731 16-16.5'	01-08-92	1530										
20	100813	B-1738 29-29.5'	01-04-92 ~~01-5-21-92~~	1130										
21	101427	B-1729 13-13.5'	01-13-92	1120	↓	↓	↓	↓	↓	↓	↓	↓		
22	101256	B-1745 5-5.5'	12-16-91	1400	SOIL	1	150 ml	6" SS LINER	NONE	3.22J	PLM, XRD	N		

*NOTE: SAMPLES 101427 AND 101256 ARE CONTINGENCY SAMPLES TO REPLACE ANY OTHER SAMPLES THAT MAY NOT BE ANALYZED.

000045

Original - To Laboratory Yellow - Field Technical Coordinator/Quality Assurance Pink - Database Management Goldenrod - Sample Coordination Field Review _____ Date _____ /QA Review _____ Date _____

ASI FORM 0145 REV.(0) 4/92 PAGE 2 ORIGINALLY RECORDED ON FOLLOWING CC #: 101295:52469; 100704:52319; 101277:52461; 100690:52316; 101234:52436; 100677:51947; 100552, 100567:52060, 100813:51947; 101427 51866.