A Finkl & Sons Co

2011 Southport Avenue
Chicago, IL 60614-4079
Writer's Direct Dial Number:

Writer's Fax No:

Prof. C. W. Finkl Jr.
Department of Geology
Florida Atlantic University
P. O. Box 3091
Boca Raton, FL 33431-0991

Dear Dr. Finkl,

Enclosed are the scanning electron microscope (SEM) micrographs of the samples provided by your father. I have taken them at three different magnifications for each sample.

Energy dispersive spectroscopy (EDS) was also performed. The individual spectrums and their respective analysis are provided. The analysis was performed in a standardless, semi-quantitative mode due to the rough nature of the specimens. Full analysis with standards is possible only on flat surfaces, due to the fact that this is the only way to obtain identical take-off angles and paths for the escaping characteristic X-rays. Despite that, the results are quite accurate.

Unfortunately for your case, EDS is not able to detect trace elements in the amounts that Hg is present. The physical limit for the resolving power of this technique is approximately 1 g/kg. That is far above the Hg content in your sample which is less than 1 mg/kg, or less than 1ppm. For this kind of concentrations I think your best bet is wet chemical analysis.

The results show significant amounts of Mg, Al and Fe in the samples marked MWC6-A, S-13 and MWC6-A S-20. The matrix elements for these two are Ca and Si.

Sample MWC-2 S-8 and FAU MW-1 S-5 consist primarily of Si with a significant presence of Al. Fe is a trace and Ca is absent.

I hope this helps you in your research. If you have any questions do not hesitate to call me.

Sincerely,

Dr. Evgueni Y. Yankov

Coastal Education & Research Foundation, Inc. [CERF]
4310 Northeast 25th Avenue
Fort Lauderdale, FL 33308, U.S.A.

Telephone & FAX: (305) 565-1051
Second Line: (305) 564-5653
E-Mail: finkl@acc.fau.edu

3 August 1995

Steve Krupa
2806 SW 6th Stree
Boynton Beach, FL 33435

Dear Steve:

I got the SEM micrographs back from Dr. Yankov who works at my Dad's plant in Chicago. You will find the micrographs, X-ray scans, and results of the standardless analyses. I have a copy in case you misplace something.

If you get a chance, it might be worth our while to sit down and talk about the results. Briefly, it seems to me that the grains (silica) are very fractured and that some materials could be sequestered in the fractures. Other grains showed very complex surface structures and there could be microelements adsorbed there too. The best way to test for Hg presence is by chemical means, hot vs cold extractions. If there is interest or need, I can help you describe the grains in terms of the proper micro-morphological terminology.

Hope that this information will be of use in your thesis!

Kind regards,

Charlie

Charles W. Finkl
ED

Encl.

Copy

STANDARDLESS ANALYSIS

Spectrum Name: /imix/spectra/eugene.dir/MWC6-A,S-13.spt

ELM	RELATIVE K	Z	A	F	WT %
MG	0.0107	0.9674	1.8170	0.9928	1.87
AL	0.0039	0.9941	1.4817	0.9855	0.57
SI	0.1362	0.9630	1.2827	0.9920	16.69
S	0.0030	0.9774	1.2020	0.9754	0.34
CA	0.7024	0.9993	1.0283	0.9982	72.04
FE	0.0733	1.1040	1.0474	1.0000	8.48
TOTAL					100.00

This is a semi-quantitative analysis

STANDARDLESS ANALYSIS

Spectrum Name:
/imix/spectra/eugene.dir/MWC6-A S-20.spt

ELM	RELATIVE K	Z	A	F	WT %
MG	0.0015	0.9743	1.6163	0.9868	0.23
AL	0.0362	1.0019	1.3401	0.9776	4.75
SI	0.2189	0.9716	1.2460	0.9921	26.28
P	0.0142	1.0078	1.3997	0.9893	1.98
CA	0.6138	1.0073	1.0422	0.9995	64.38
FE	0.0205	1.1139	1.0442	1.0000	2.38
TOTAL					100.00

This is a semi-quantitative analysis

STANDARDLESS ANALYSIS

Spectrum Name:
/imix/spectra/eugene.dir/MWC2-A S-8.spt

ELM	RELATIVE K	Z	A	F	WT %
AL	0.1098	1.0241	1.0372	0.9107	10.62
SI	0.7782	0.9969	1.1171	0.9991	86.44
S	0.0181	1.0087	1.6121	1.0000	2.94
FE	0.0000	1.1427	1.0116	1.0000	0.00
TOTAL					100.00

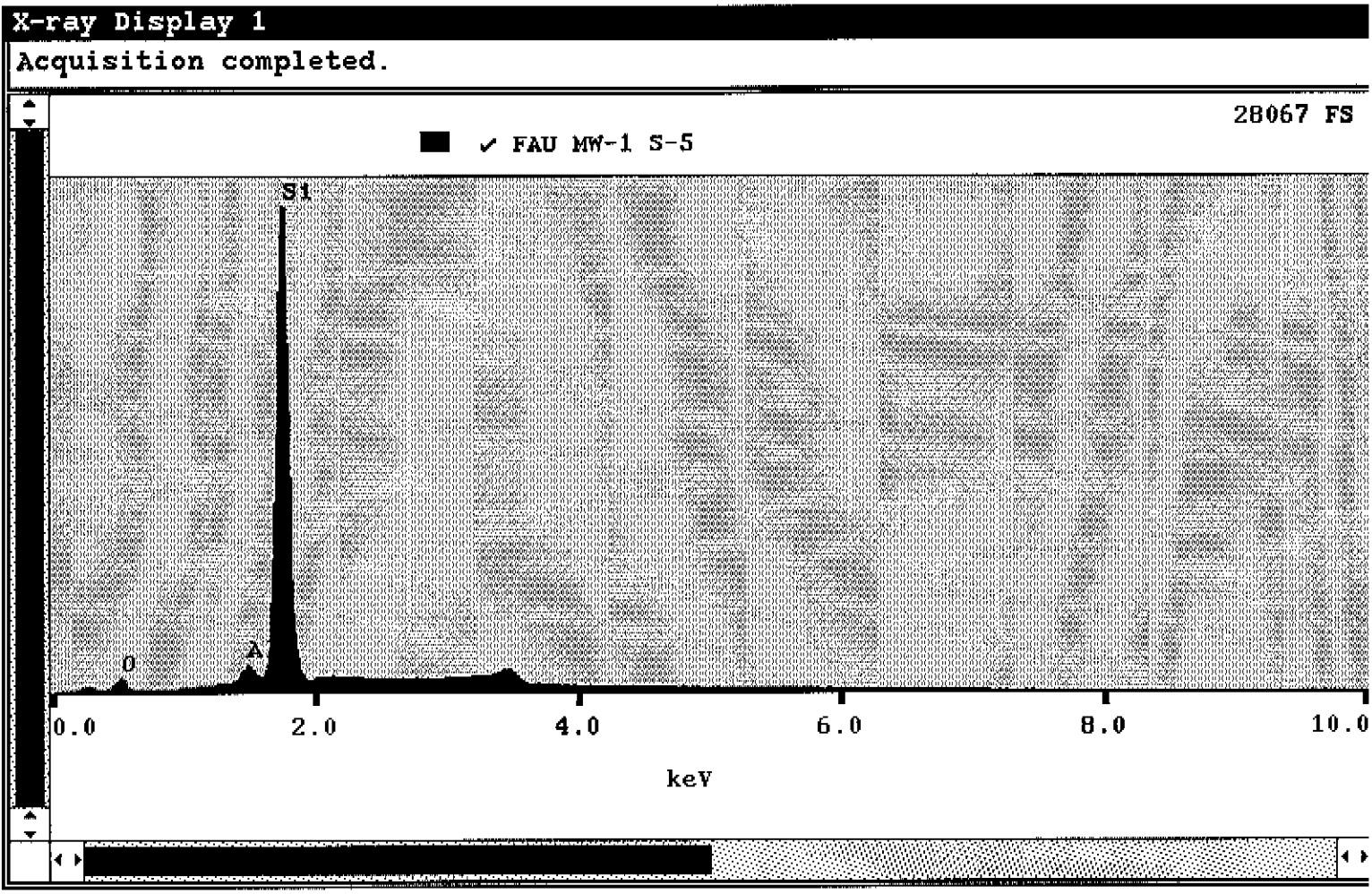
This is a semi-quantitative analysis

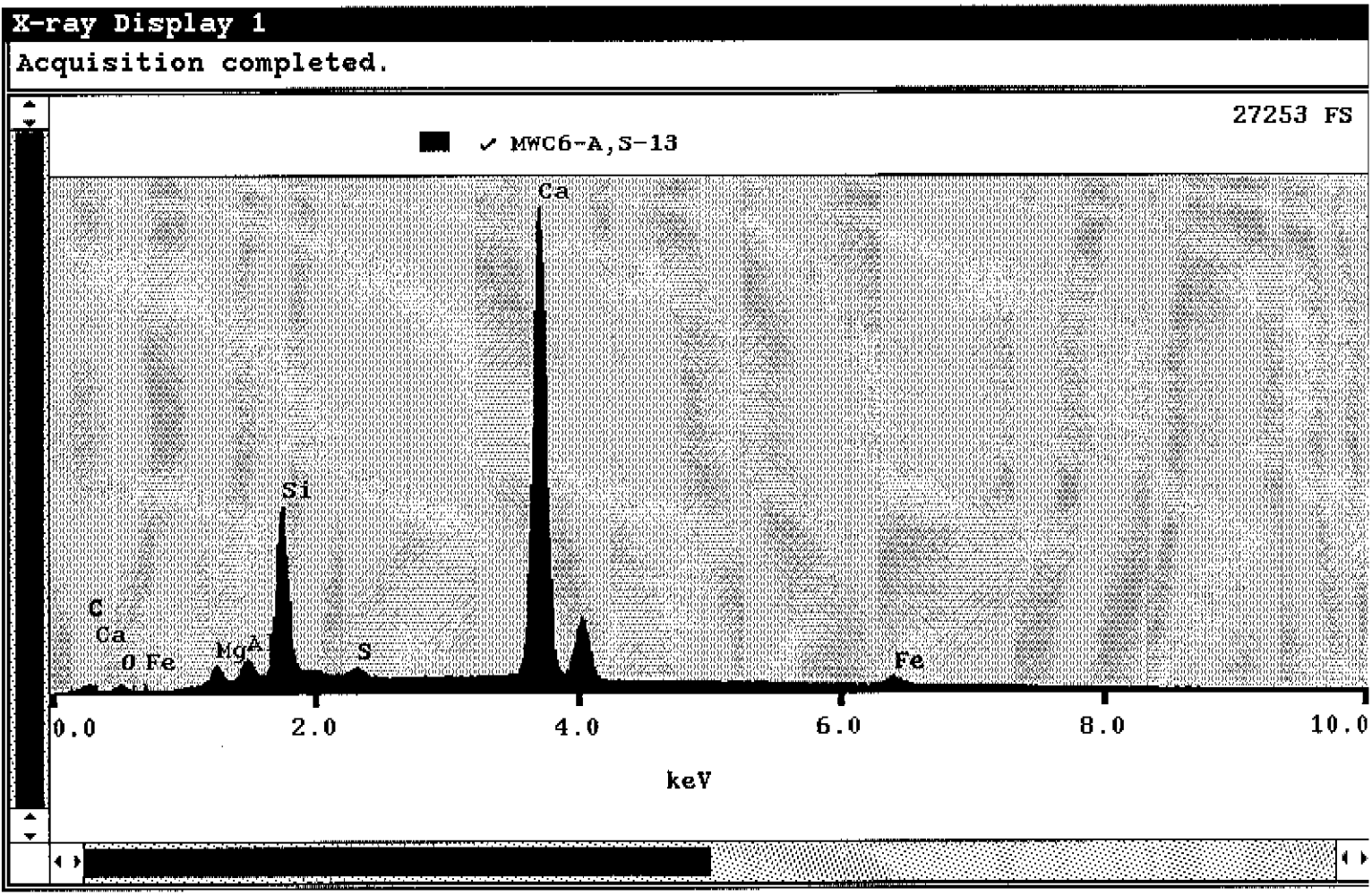
STANDARDLESS ANALYSIS

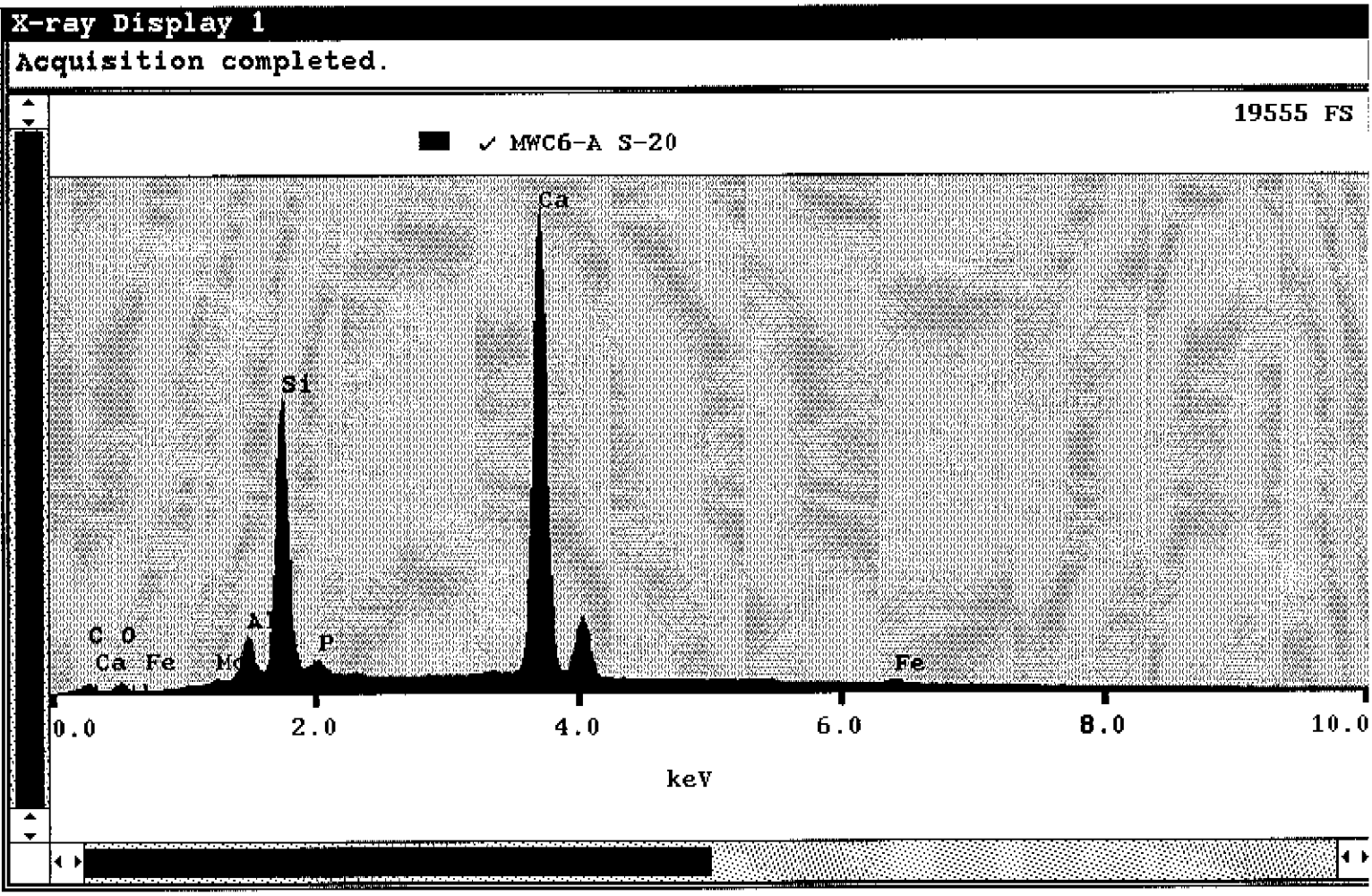
Spectrum Name:
/imix/spectra/eugene.dir/FAU MW-1 S-5.spt

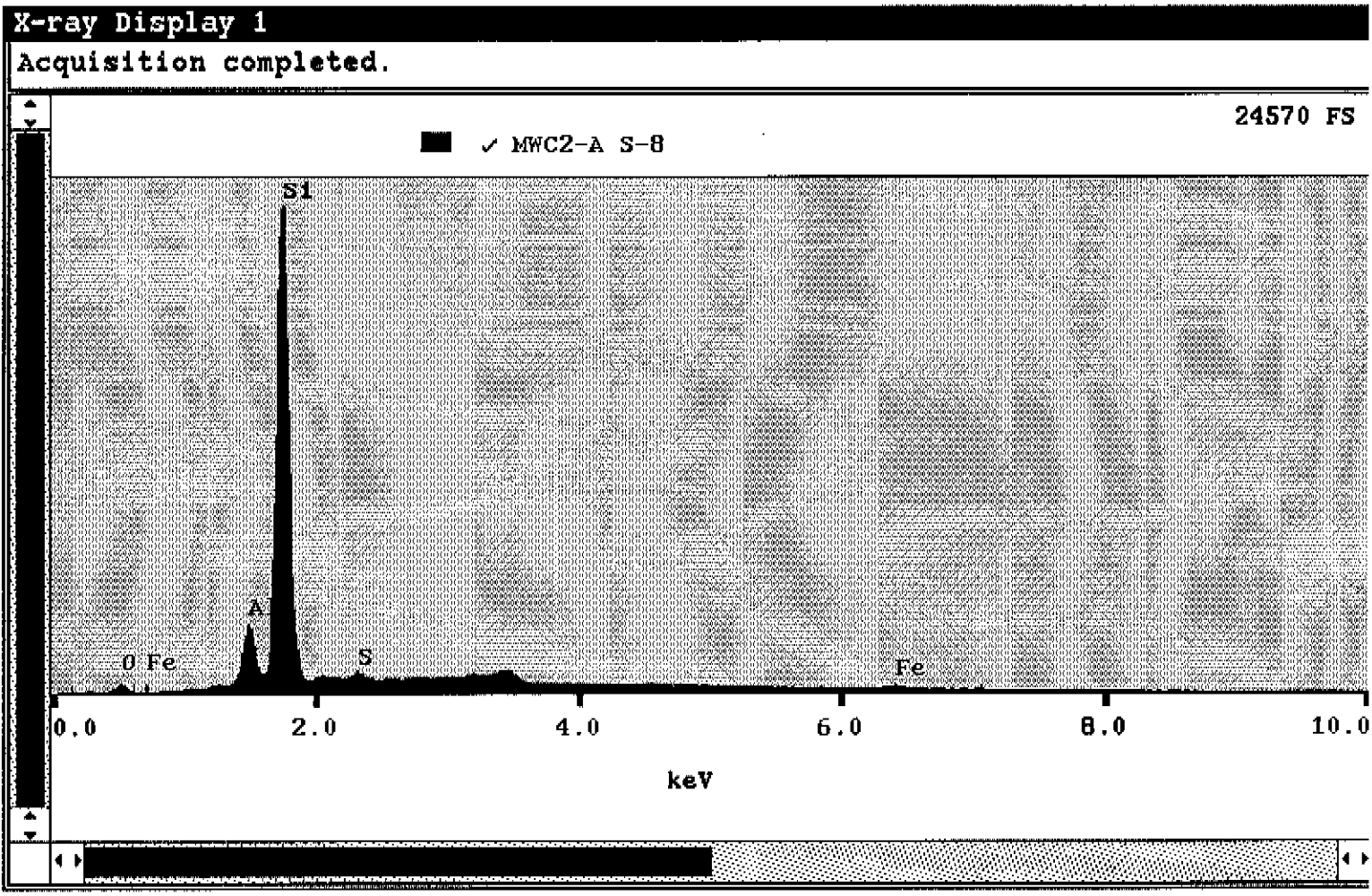
ELM	RELATIVE K	Z	A	F	WT %
AL	0.0366	1.0264	1.0371	0.8781	3.41
SI	0.9377	0.9991	1.0364	1.0000	96.59
TOTAL					100.00

This is a semi-quantitative analysis


X-ray Display 1
Acquisition completed.
28067 FS
✔ FAU MW-1 S-5
Si
O
A
0.0
2.0
4.0
6.0
8.0
10.0
keV


X-ray Display 1
Acquisition completed.
27253 FS
✓ MWC6-A,S-13
Ca
Si
C
Ca
O Fe
Mg Al
S
Fe
0.0
2.0
4.0
6.0
8.0
10.0
keV


X-ray Display 1
Acquisition completed.
19555 FS
✓ MWC6-A S-20
Ca
Si
C O
Ca Fe
P
Fe
0.0
2.0
4.0
6.0
8.0
10.0
keV


X-ray Display 1
Acquisition completed.
24570 FS
✓ MWC2-A S-8
S1
A
O Fe
S
Fe
0.0
2.0
4.0
6.0
8.0
10.0
keV

STANDARDLESS ANALYSIS

Spectrum Name: /imix/spectra/eugene.dir/MWC6-A,S-13.spt

ELM	RELATIVE K	Z	A	F	WT %
MG	0.0107	0.9674	1.8170	0.9928	1.87
AL	0.0039	0.9941	1.4817	0.9855	0.57
SI	0.1362	0.9630	1.2827	0.9920	16.69
S	0.0030	0.9774	1.2020	0.9754	0.34
CA	0.7024	0.9993	1.0283	0.9982	72.04
FE	0.0733	1.1040	1.0474	1.0000	8.48
TOTAL					100.00

This is a semi-quantitative analysis

STANDARDLESS ANALYSIS

Spectrum Name:
/imix/spectra/eugene.dir/MWC6-A S-20.spt

ELM	RELATIVE K	Z	A	F	WT %
MG	0.0015	0.9743	1.6163	0.9868	0.23
AL	0.0362	1.0019	1.3401	0.9776	4.75
SI	0.2189	0.9716	1.2460	0.9921	26.28
P	0.0142	1.0078	1.3997	0.9893	1.98
CA	0.6138	1.0073	1.0422	0.9995	64.38
FE	0.0205	1.1139	1.0442	1.0000	2.38
TOTAL					100.00

This is a semi-quantitative analysis

STANDARDLESS ANALYSIS

Spectrum Name:
/imix/spectra/eugene.dir/MWC2-A S-8.spt

ELM	RELATIVE K	Z	A	F	WT %
AL	0.1098	1.0241	1.0372	0.9107	10.62
SI	0.7782	0.9969	1.1171	0.9991	86.44
S	0.0181	1.0087	1.6121	1.0000	2.94
FE	0.0000	1.1427	1.0116	1.0000	0.00
TOTAL					100.00

This is a semi-quantitative analysis

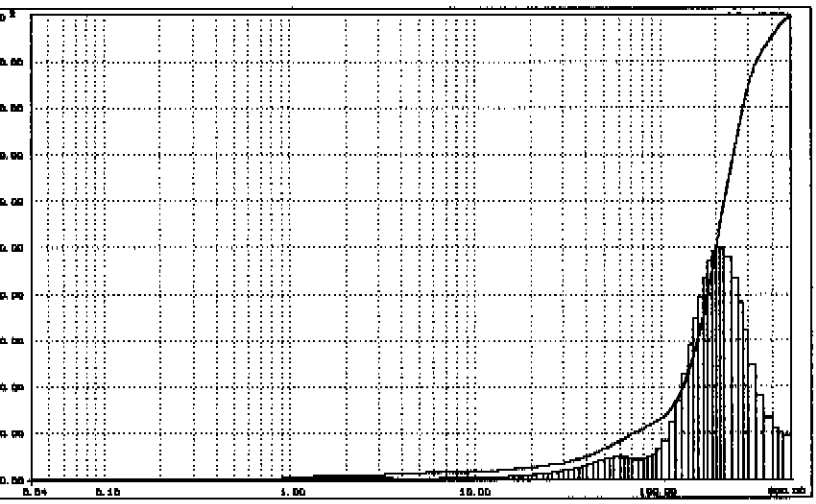
STANDARDLESS ANALYSIS

Spectrum Name:
/imix/spectra/eugene.dir/FAU MW-1 S-5.spt

ELM	RELATIVE K	Z	A	F	WT %
AL	0.0366	1.0264	1.0371	0.8781	3.41
SI	0.9377	0.9991	1.0364	1.0000	96.59
TOTAL					100.00

This is a semi-quantitative analysis

Granulometer 1064 number 145
Version V 3.30
File name : C:\CILAS330\$$$$$001.MES
03/22/1996 13:25:11



C:\CILAS330\$$$$$001.MES

CILAS 1064 N.145

H = 7.58

Granulometer 1064 number 145 Version : 3.30
03/22/1996 13:25:11 Ref. CILAS : 456147000197F003C71A2
File name : C:\CILAS330\$$$$$001.MES

Sample : S-5 (Sample #4)

Liquid :
Ultrasonic mixer : 0 s.
Comment :
User name :
Plant :
Place :
Concentration : 58

Median size : 198.66 mu
Diameter at 10.0 % : 72.99 mu
Diameter at 90.0 % : 333.59 mu
Cumul. at 100.00 mu : 13.09 %
Number of measur. : 20 Number of cleaning : 4
automatic dilution : No US mixer / measur. : No
Option : ---------- To top up : No

Results : Weight distribution / Undersize

D	0.04	0.10	0.25	0.40	0.50	0.60	0.70	0.80	0.90	1.00
C%	0.00	0.00	0.00	0.00	0.04	0.09	0.14	0.21	0.27	0.33
D	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	2.00	2.20
C%	0.39	0.45	0.50	0.55	0.60	0.65	0.69	0.73	0.80	0.86
D	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.80	4.00	4.30
C%	0.92	0.97	1.02	1.06	1.09	1.13	1.16	1.19	1.22	1.25
D	4.60	5.00	5.30	5.60	6.00	6.50	7.00	7.50	8.00	8.50
C%	1.29	1.33	1.36	1.38	1.42	1.46	1.50	1.54	1.58	1.61
D	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00
C%	1.65	1.71	1.78	1.84	1.91	1.98	2.05	2.13	2.21	2.30
D	19.00	20.00	21.50	23.00	24.50	26.00	28.00	30.00	32.00	34.00
C%	2.39	2.48	2.63	2.79	2.94	3.10	3.32	3.56	3.80	4.06
D	36.00	38.00	40.00	43.00	46.00	50.00	53.00	56.00	60.00	63.00
C%	4.34	4.62	4.92	5.39	5.88	6.55	7.06	7.56	8.21	8.67
D	66.00	70.00	75.00	80.00	85.00	90.00	95.00	100.00	110.00	120.00
C%	9.11	9.64	10.23	10.77	11.31	11.86	12.44	13.09	14.69	16.78
D	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00
C%	19.46	22.79	26.72	31.11	35.80	40.70	45.69	50.65	55.45	60.01
D	240.00	260.00	280.00	300.00	330.00	360.00	400.00	430.00	460.00	500.00
C%	68.20	75.05	80.62	84.99	89.62	92.70	95.48	97.07	98.42	100.00

(M)

Granulometer 1064 number 145 Version : 3.30
03/22/1996 13:49:41 Ref. CILAS : 456147000197F003C71A2
File name : C:\CILAS330\FAU23.MES

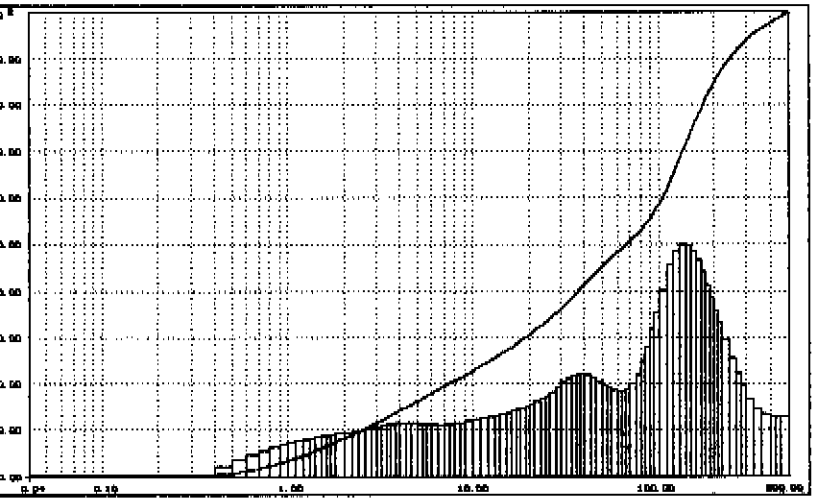
Sample : SB-9

Liquid : WATER
Ultrasonic mixer : 30 s. / Dispersing agent : CALGON
Comment : S-43
User name : FAU
Plant :
Place :
Concentration : 65

Median size : 66.90 mu
Diameter at 10.0 % : 2.55 mu
Diameter at 90.0 % : 241.83 mu
Cumul. at 100.00 mu : 58.57 %
Number of measur. : 20 Number of cleaning : 6
automatic dilution : No US mixer / measur. : Yes
Option : ---------- To top up : No
Results : Weight distribution / Undersize

D	0.04	0.10	0.25	0.40	0.50	0.60	0.70	0.80	0.90	1.00
C%	0.00	0.00	0.00	0.00	0.39	0.91	1.48	2.08	2.68	3.27
D	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	2.00	2.20
C%	3.85	4.40	4.93	5.44	5.93	6.40	6.84	7.27	8.07	8.82
D	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.80	4.00	4.30
C%	9.51	10.17	10.79	11.39	11.97	12.53	13.06	13.57	14.06	14.74
D	4.60	5.00	5.30	5.60	6.00	6.50	7.00	7.50	8.00	8.50
C%	15.38	16.17	16.72	17.24	17.88	18.61	19.30	19.94	20.54	21.12
D	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00
C%	21.67	22.72	23.70	24.61	25.48	26.29	27.07	27.82	28.53	29.22
D	19.00	20.00	21.50	23.00	24.50	26.00	28.00	30.00	32.00	34.00
C%	29.88	30.53	31.47	32.37	33.25	34.10	35.22	36.32	37.41	38.47
D	36.00	38.00	40.00	43.00	46.00	50.00	53.00	56.00	60.00	63.00
C%	39.51	40.50	41.45	42.78	43.99	45.42	46.38	47.26	48.33	49.07
D	66.00	70.00	75.00	80.00	85.00	90.00	95.00	100.00	110.00	120.00
C%	49.79	50.71	51.86	53.04	54.28	55.62	57.06	58.57	61.78	65.09
D	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00
C%	68.35	71.45	74.33	76.95	79.32	81.43	83.29	84.94	86.39	87.68
D	240.00	260.00	280.00	300.00	330.00	360.00	400.00	430.00	460.00	500.00
C%	89.84	91.55	92.92	94.04	95.37	96.42	97.59	98.38	99.10	100.00

Granulometer 1064 number 145
Version V 3.30
File name : C:\CILAS330\FAU23.MES
03/22/1996 13:49:41



CILAS 1064 N.145

H = 17.40