Microprobe Analysis of WL 754 Sapphirine 29 June 1976

analysis of different grains of WL 754 to determine homogenity using grain 1-1 Morse's analysis as standard.

Each analysis represents an average of 3 individual analyses except whe

	FeO^T	Al_2O_3	SiO_2	MgO	Total	(+ MnO + TiO_2)
Morse Analysis	10.67	57.04	14.19	16.84	98.74	0.38
S-1	10.88	56.95	13.38	17.43	98.63	
1-1	10.18	57.62	13.25	17.94	98.99	
2-1	10.75	56.12	13.66	17.79	98.32	
3-1	10.82	56.61	13.40	17.60	98.43	
S-2	10.79	56.75	12.57	17.77	97.88	
4-1	10.43	57.30	12.63	17.66	98.01	
5-1	11.06	56.30	13.29	17.70	98.35	
6-1	10.62	56.98	12.96	17.67	98.23	
S-3	10.85	56.86	13.14	17.61	98.45	
7-1	10.28	57.88	13.06	17.82	99.03	
8-1	10.25	57.02	13.34	18.07	98.68	
9-1	10.53	57.21	13.00	17.73	98.46	
* S-4	10.66	56.66	12.96	17.54	97.82	
S-5	10.87	56.36	13.03	17.66	97.92	
** S-6	11.00	56.18	13.11	17.76	98.04	
Average	10.66	56.85	13.12	17.72		

* - three analyses on same spot

** - one analysis

~~[illegible]~~

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:SAPPHIRINE ANALYSIS  JUN 29 76:

REFERENCE CURRENT    150

KEY PRESET TIME(SEC.) AND COUNT:20,30000:

WHAT PROGRAM NEXT?
:ANALYSIS PROGRAM
NO. OF STD. REPEATS AND CORRECTION TYPE:3,0:
CH,EL NAME,PEAK POS,BF,OFFSET,CONC,BETA,GRP,BASE,WINDOW,STD NAME

:1,FE,19343,1.00,500,(
:2,AL,31498,1.00,500,;
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from John Hoegins

Sapphirine WL 754 Wilson Lake, Labrador, Canada

From: Dr. S.A. Morse, Univ. of Mass.

Mossbauer Analysis by: R.G. Burns

peaks	isomer shifts	Quadrupole Splitting	% Area	Assignment
1 + 8	1.12 mm/sec	2.68 mm/sec	35.3	Fe^{2+} in M5 + M6 ←
2 + 7	1.06	2.25	13.8	Fe^{2+} in M4
4 + 6	1.15	1.49	7.0	Fe^{2+} in M3
3 + 5	0.37	0.825	43.9	Fe^{3+} in predominantly oc

Chemical Analysis:

		at. wt.	at. pn.	oxygens	cations	
SiO_2	14.19	60.08	.2362	.4724	1.714	1.714
Al_2O_3	57.04	101.96	.5594	1.678	8.120	4.286
TiO_2	0.10	79.90	.0012	.0024	.0008	3.834
Fe_2O_3	5.16	159.69	.0323 $^{+3}$	.0969	.4689	
FeO	6.05	71.85	.0842 $^{+2}$	.0842	.6111	
MnO	0.28	70.94	.0039	.0039	.0283	
MgO	16.84	40.31	.4178	.4178	3.0324	
total	99.66			2.7556		

20/2.7556 = 7.2579

total Fe = 8.3 wt %
total FeO = 10.67 wt %
from Mossbauer results 43.5% of Fe is in ferric state
i.e. Fe_2O_3 = 5.16%, FeO = 6.05%

$[(Mg_{3.1}\ Fe_{.65})^{2+}\ (Al_{3.8}\ Fe_{.49})^{3+}]^{VI}\ [Si_{1.7}\ Al_{4.3}]^{IV}\ O_{20}$ - wet chem + mossba

Microprobe Analysis of WL 754 sapphirine 28 June 1976

Standards - M. olivine - Fe, Mg
Sillimanite - Al, Si

SAPPHIRINE ANALYSIS

SUBTITLE?:1-1:

	FE	AL	SI	MG	TOTAL
C1	8.67	26.97	6.40	10.55	
BC	11.16	50.96	13.70	17.49	
AC	11.07	58.27	14.46	17.30	101.09
FM	1.107	8.228	1.729	3.087	14.151

RESPONSE:1:

	FE	AL	SI	MG	TOTAL
C1	8.87	27.14	6.36	10.48	
BC	11.41	51.27	13.59	17.38	
AC	11.32	58.63	14.35	17.21	101.50
FM	1.127	8.249	1.712	3.061	14.149

RESPONSE:2:

	FE	AL	SI	MG	TOTAL
C1	8.59	26.67	6.43	10.65	
BC	11.05	50.39	13.75	17.66	
AC	10.96	57.69	14.50	17.46	100.61
FM	1.102	8.183	1.745	3.129	14.158

RESPONSE:N:

AVERAGE COMP.

	FE	AL	SI	MG	TOTAL
SD	.14	.23	.04	.09	
C1	8.71	26.93	6.39	10.56	
BC	11.20	50.88	13.68	17.51	
AC	11.11	58.19	14.44	17.32	101.06
FM	1.111	8.218	1.730	3.091	14.150

Mg is too high with olivine std.

SUBTITLE?:2-1:

	FE	AL	SI	MG	TOTAL
C1	8.64	26.15	6.54	11.00	
BC	11.11	49.41	13.98	18.23	
AC	11.03	56.75	14.73	18.03	100.5
FM	1.110	8.062	1.775	3.240	14.18

RESPONSE:1:

	FE	AL	SI	MG	TOTAL
C1	8.73	26.14	6.40	11.10	
BC	11.23	49.40	13.70	18.41	
AC	11.14	56.81	14.45	18.21	100.6
FM	1.122	8.076	1.741	3.273	14.21

RESPONSE:2:

	FE	AL	SI	MG	TOTAL
C1	8.73	26.33	6.37	11.14	
BC	11.23	49.75	13.63	18.48	
AC	11.14	57.20	14.38	18.27	101.0
FM	1.117	8.098	1.727	3.271	14.21

RESPONSE:3:

	FE	AL	SI	MG	TOTAL
C1	8.64	26.30	6.27	11.03	
BC	11.12	49.70	13.41	18.28	
AC	11.04	57.11	14.16	18.07	100.3
FM	1.114	8.139	1.710	3.257	14.21

RESPONSE:4:

	FE	AL	SI	MG	TOTAL
C1	8.61	26.37	6.41	11.08	
BC	11.08	49.83	13.71	18.37	
AC	11.00	57.23	14.47	18.15	100.8
FM	1.103	8.104	1.737	3.250	14.19

RESPONSE: A:

AVERAGE COMP.

	FE	AL	SI	MG	TOTAL
SD	.05	.11	.09	.06	
C1	8.67	26.26	6.39	11.07	
BC	11.15	49.61	13.68	18.35	
AC	11.07	57.02	14.43	18.14	100.6
FM	1.113	8.094	1.726	3.254	14.20

Microprobe Analysis of WL 754 sapphirine 28 June 1976

standards - K. pyrope for Si, Al, Mg, Fe.

SAPPHIRINE ANALYSIS

SUBTITLE?:2-1:

	FE	AL	SI	MG	TOTAL
C1	8.67	30.59	5.90	10.59	
BC	11.15	57.80	12.62	17.56	
AC	11.11	56.65	14.07	17.15	98.98
FM	1.136	8.180	1.722	3.132	14.170

RESPONSE::

	FE	AL	SI	MG	TOTAL
C1	8.67	30.50	5.99	10.45	
BC	11.15	57.63	12.82	17.32	
AC	11.11	56.43	14.28	16.92	98.74
FM	1.139	8.170	1.752	3.097	14.158

RESPONSE::

	FE	AL	SI	MG	TOTAL
C1	8.84	29.88	5.93	10.59	
BC	11.37	56.45	12.68	17.55	
AC	11.32	55.46	14.12	17.18	98.08
FM	1.171	8.098	1.749	3.171	14.189

RESPONSE:A:

AVERAGE COMP.

	FE	AL	SI	MG	TOTAL
SD	.10	.39	.05	.08	
C1	8.72	30.32	5.94	10.54	
BC	11.22	57.30	12.70	17.47	
AC	11.18	56.18	14.15	17.08	98.59
FM	1.149	8.153	1.742	3.133	14.177

→ Converting to tal Fe as FeO to correct proportions of FeO and Fe_2O_3

Total FeO = 11.18

Total Fe = 8.69

Fe^{3+} = 8.69 × .435 = 3.78

Fe^{2+} = 4.91

$Fe^{2+} \times 1.4297 = Fe_2O_3$ - 3.78 × 1.4297 = 5.40 % Fe_2O_3

$Fe^{2+} \times 1.2865 = FeO$ - 4.91 × 1.2865 = 6.32 % FeO

SAPPHIRINE ANALYSIS

SUBTITLE?:2-2: = 1-1 grain

	FE	AL	SI	MG	TOTAL
C1	8.78	30.71	5.83	10.50	
BC	11.30	58.02	12.47	17.41	
AC	11.25	56.85	13.91	17.02	99.(
FM	1.151	8.215	1.706	3.109	14.1(

RESPONSE::

	FE	AL	SI	MG	TOTAL
C1	8.24	30.79	5.88	10.47	
BC	10.60	58.18	12.57	17.36	
AC	10.57	56.87	14.03	16.90	98.3
FM	1.086	8.242	1.725	3.096	14.14

RESPONSE::

	FE	AL	SI	MG	TOTAL
C1	8.60	30.77	5.87	10.39	
BC	11.06	58.14	12.55	17.23	
AC	11.03	56.88	14.00	16.82	98.7
FM	1.131	8.229	1.718	3.076	14.15

RESPONSE:A:

AVERAGE COMP.

	FE	AL	SI	MG	TOTAL
SD	.27	.05	.02	.06	
C1	8.54	30.76	5.86	10.45	
BC	10.98	58.12	12.53	17.33	
AC	10.95	56.86	13.98	16.91	98.7
FM	1.121	8.230	1.715	3.095	14.16

SELECT ANALYSIS POSITION AND PUSH BUTTON WHEN READY

DATA REDUCTION BY METHOD OF BENCE & ALBEE:

ON SPECIMEN: WILSON LAKE SAPPHIRINE

ELEMENT		WEIGHT% (OXIDE)	STD.DEVI. (PERCENT)	FORMULA	K-RATIO	UNKN PEAK (COUNTS)	UNKN BKGD (COUNTS)	COUNTING TIME(SEC)	STD (COU
TI	KA	0.011	186.07	0.001	0.0003	700.0	680.0	10.00	72828
MN	KA	0.397	12.59	0.049	0.0053	217.0	80.0	10.00	25981
NA	KA	0.010	132.56	0.003	0.0008	46.0	39.0	10.00	859(
CA	KA	0.026	67.49	0.004	0.0013	257.5	225.0	10.00	25522
SI	KA	13.333	3.02	1.941	0.2680	1439.7	20.0	10.00	5316
AL	KA	58.737	1.97	10.076	1.4383	6373.7	18.0	10.00	4437
K	KA	0.000	141.16	0.000	0.0000	157.2	170.0	10.00	31765
MG	KA	17.308	1.17	3.755	0.3714	10338.5	100.0	10.00	27663
FE	KA	9.806	2.03	1.194	0.1360	2979.0	80.0	10.00	21398

TOTAL 99.627 24.000 OXYGENS ITERATIONS= 3

16-APR-79 15:34:13

ANOTHER PT (Y,YES,K,NO) ?Y

SELECT ANALYSIS POSITION AND PUSH BUTTON WHEN READY

DATA REDUCTION BY METHOD OF BENCE & ALBEE:

ON SPECIMEN: WILSON LAKE SAPPHIRINE

ELEMENT		WEIGHT% (OXIDE)	STD.DEVI. (PERCENT)	FORMULA	K-RATIO	UNKN PEAK (COUNTS)	UNKN BKGD (COUNTS)	COUNTING TIME(SEC)	STD P (COUN
TI	KA	0.007	272.45	0.001	0.0002	693.6	680.0	10.00	72828
MN	KA	0.408	12.32	0.050	0.0054	221.0	80.0	10.00	25981
NA	KA	0.017	84.05	0.005	0.0013	50.2	39.0	10.00	8590
CA	KA	0.000	143.72	0.000	0.0000	210.5	225.0	10.00	25522
SI	KA	14.193	2.95	2.041	0.2862	1535.8	20.0	10.00	5316
AL	KA	58.297	1.97	9.879	1.4230	6306.1	18.0	10.00	4437
K	KA	0.000	137.20	0.000	0.0000	156.8	170.0	10.00	31765
MG	KA	17.512	1.16	3.753	0.3736	10396.7	100.0	10.00	27663
FE	KA	10.763	1.94	1.294	0.1494	3263.9	80.0	10.00	21398

TOTAL 101.196 24.000 OXYGENS ITERATIONS= 3

16-APR-79 15:35:21

ANOTHER PT (Y,YES,K,NO) ?

N WHEN READY

EE:

IO	UNKN PEAK (COUNTS)	UNKN BKGD (COUNTS)	COUNTING TIME(SEC)	STD PEAK (COUNTS)	STD BKGD (COUNTS)	COUNTING TIME(SEC)	STANDARD FILENAME	OXIDE FORMULA
3	700.0	680.0	10.00	72828.8	680.0	10.00	%SPHN	TIO2
3	217.0	80.0	10.00	25981.9	80.0	10.00	%TEPH	MNO
3	46.0	39.0	10.00	8590.3	39.0	10.00	%TAB	NA2O
3	257.5	225.0	10.00	25522.5	225.0	10.00	%AN	CAO
0	1439.7	20.0	10.00	5316.7	20.0	10.00	%AN	SIO2
3	6373.7	18.0	10.00	4437.0	18.0	10.00	%AN	AL2O3
0	157.2	170.0	10.00	31765.3	170.0	10.00	%ORTH	K2O
4	10338.5	100.0	10.00	27663.9	100.0	10.00	%MARJ	MGO
0	2979.0	80.0	10.00	21398.1	80.0	10.00	%FAY	FEO

NS ITERATIONS= 3

N WHEN READY

IE:

IO	UNKN PEAK (COUNTS)	UNKN BKGD (COUNTS)	COUNTING TIME(SEC)	STD PEAK (COUNTS)	STD BKGD (COUNTS)	COUNTING TIME(SEC)	STANDARD FILENAME	OXIDE FORMULA
2	693.6	680.0	10.00	72828.8	680.0	10.00	%SPHN	TIO2
4	221.0	80.0	10.00	25981.9	80.0	10.00	%TEPH	MNO
3	50.2	39.0	10.00	8590.3	39.0	10.00	%TAB	NA2O
0	210.5	225.0	10.00	25522.5	225.0	10.00	%AN	CAO
2	1535.8	20.0	10.00	5316.7	20.0	10.00	%AN	SIO2
0	6306.1	18.0	10.00	4437.0	18.0	10.00	%AN	AL2O3
0	156.8	170.0	10.00	31765.3	170.0	10.00	%ORTH	K2O
6	10396.7	100.0	10.00	27663.9	100.0	10.00	%MARJ	MGO
4	3263.9	80.0	10.00	21398.1	80.0	10.00	%FAY	FEO

NS ITERATIONS= 3