

XRF ANALYSIS OF CERAMIC RAW MATERIALS (CLAYS, FELDSPAR, KAOLIN)

Major and minor elements in clays were determined by X-ray fluorescence analysis (XRF) with the sequential X-ray spectrometer in the application laboratory in Karlsruhe. The measuring conditions are listed on the next page. This application data is also valid for similar materials like feldspars and kaolin.

For calibration certified clay standard samples were used (see copy). Fused beads (0.6 g sample and 6.0 g Spectromelt A12 = 66% $\text{Li}_2\text{B}_4\text{O}_7$ and 34% LiBO_2) had been prepared for XRF analysis.

Calibration curves and calibration data (correction models, standard deviation, absolute and relative deviation of standard samples) are presented for Fe_2O_3 , TiO_2 , SiO_2 , CaO , K_2O , Al_2O_3 , MgO and Na_2O .

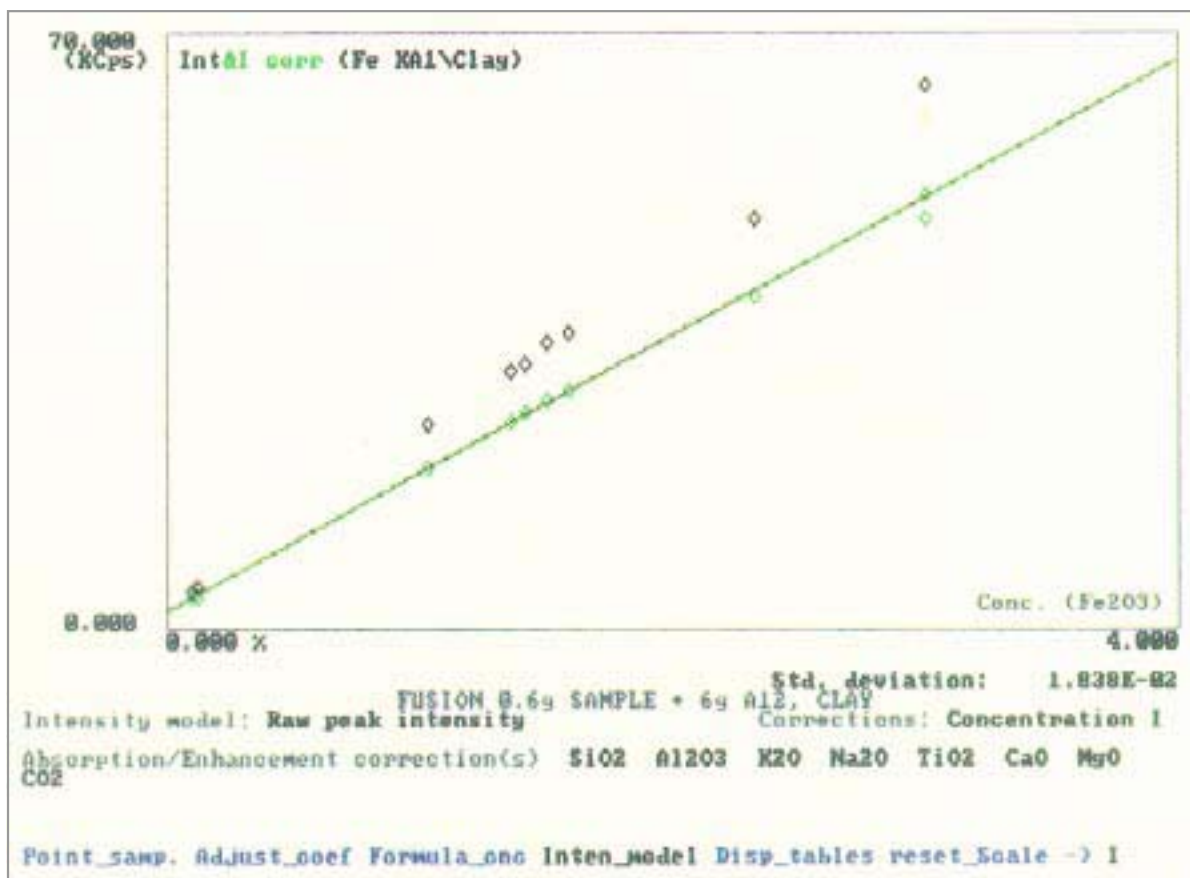


--- Standards	Fe2O3 %	TiO2 %	SiO2 %	CaO %	K2O %	Al2O3 %
1 BCS309	1.510	1.920	34.10	0.220	0.46	61.10
2 BCS348	1.040	1.080	51.13	0.173	2.23	31.59
3 BCS776-1	1.430	1.620	62.76	0.310	2.92	29.28
4 BCS315	3.010	1.230	51.20	0.430	0.52	42.40
5 BCS315A	3.010	1.230	51.20	0.430	0.52	42.40
6 BCS375	0.120	0.380	67.10	0.890	0.79	19.80
7 BCS376	0.100	0.020	67.10	0.540	11.20	17.70
8 NBS76A	1.600	2.030	54.90	0.220	1.33	38.70
9 FF5	1.370	2.200	27.65	1.250	0.91	65.93
10 FF7	2.340	2.160	53.91	0.450	1.74	38.13

--- Standards	MgO %	Na2O %	CO2 %	Summe %
1 BCS309	0.170	0.340	0.08	99.9
2 BCS348	0.305	0.344	11.75	99.6
3 BCS776-1	0.480	0.490	0.30	99.6
4 BCS315	0.570	0.130	0.24	99.7
5 BCS315A	0.570	0.130	0.24	99.7
6 BCS375	0.050	10.400	0.39	99.9
7 BCS376	0.030	2.830	0.34	99.9
8 NBS76A	0.520	0.070	0.34	99.7
9 FF5	0.430	0.170	0.05	100.0
10 FF7	0.390	0.120	0.50	99.7

--- Standards	Fe2O3 KCps	TiO2 KCps	SiO2 KCps	CaO KCps	K2O KCps	Al2O3 KCps
1 BCS309	33.3343	7.8172	85.0924	4.3719	8.3835	192.9211
2 BCS348	23.6066	4.5482	133.4453	3.9618	37.3546	101.0997
3 BCS776-1	30.9443	6.3599	162.3989	5.6330	47.1648	92.8983
4 BCS315	63.5990	4.9391	127.6650	5.9501	9.6078	130.2466
5 BCS315A	60.1129	4.8592	128.6761	5.8577	9.4704	130.6770
6 BCS375	4.4452	1.6856	173.5695	12.2427	12.8464	63.0236
7 BCS376	4.1046	0.2258	177.0963	7.2386	171.9138	57.8825
8 NBS76A	34.5166	8.0259	138.6730	4.4483	22.3519	121.4320
9 FF5	29.8940	9.0239	68.8172	15.2779	15.8503	206.3272
10 FF7	48.0893	8.6073	132.0681	6.7464	30.2271	113.4893

--- Standards	MgO KCps	Na2O KCps	CO2 KCps	Summe KCps
1 BCS309	0.3004	0.9835		
2 BCS348	0.3730	1.0332		
3 BCS776-1	0.5165	1.1788		
4 BCS315	0.5581	0.7516		
5 BCS315A	0.5536	0.6219		
6 BCS375	0.1637	12.8212		
7 BCS376	0.1594	3.9877		
8 NBS76A	0.5522	0.7201		
9 FF5	0.5117	0.8350		
10 FF7	0.3925	0.7089		



Program file: CLAY-F.QAN
 Compound: Fe2O3

Std. deviation: 1.838E-02

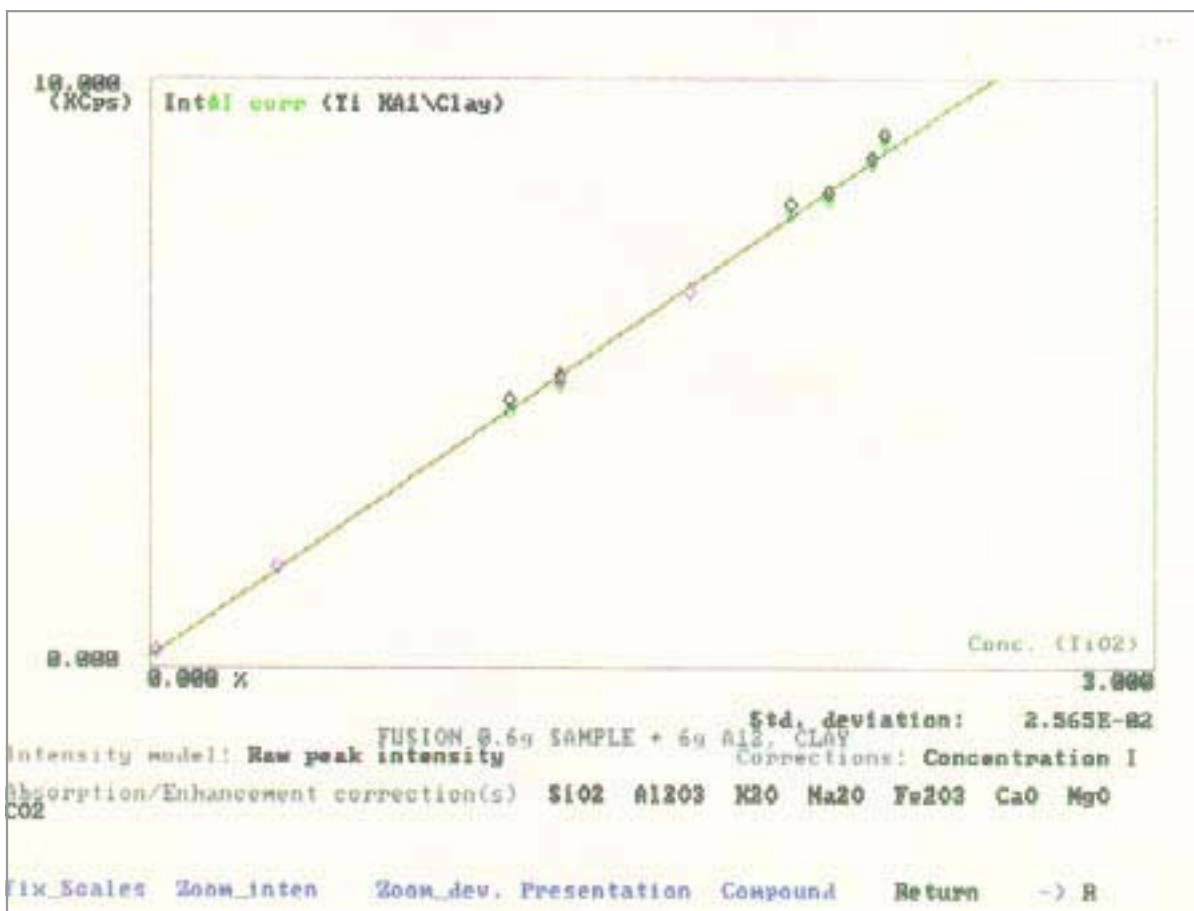
Net intensity model: Raw peak intensity
 Dead time correction is On

Concentration correction model: Concentration I Regression weighting: Absolute
 Intensity at 100 % : 1620.214 KCps - Slope : 6.17878E-02 % / KCps
 Intensity at 0.0 % : +1.772 KCps - Offset:-0.10951 %

Absorption / Secondary emission corrections

SiO2	-0.21236	(fixed)
Al2O3	-0.23494	(fixed)
K2O	0.36585	(fixed)
Na2O	-0.27580	(fixed)
TiO2	0.42834	(fixed)
CaO	0.36163	(fixed)
MgO	-0.24804	(fixed)
CO2	-0.36000	(fixed)

--- Standard	Status	Measured KCps	Chemical %	Computed %	Deviation %	Rel.
1 BCS309		33.3343	1.510	1.524	0.014	0.93
2 BCS348		23.6066	1.040	1.038	-0.002	-0.21
3 BCS776-1		30.9443	1.430	1.445	0.015	1.05
4 BCS315		63.5990	3.010	3.025	0.015	0.51
5 BCS315A	UN	60.1129	3.010	2.854	-0.156	-5.20
6 BCS375		4.4452	0.120	0.107	-0.013	-10.78
7 BCS376		4.1046	0.100	0.106	0.006	6.02
8 NBS76A		34.5166	1.600	1.605	0.005	0.34
9 FF5		29.8940	1.370	1.372	0.002	0.13
10 FF7		48.0893	2.340	2.298	-0.042	-1.82



Program file: CLAY-F.QAN
 Compound: TiO2

Std. deviation: 2.565E-02

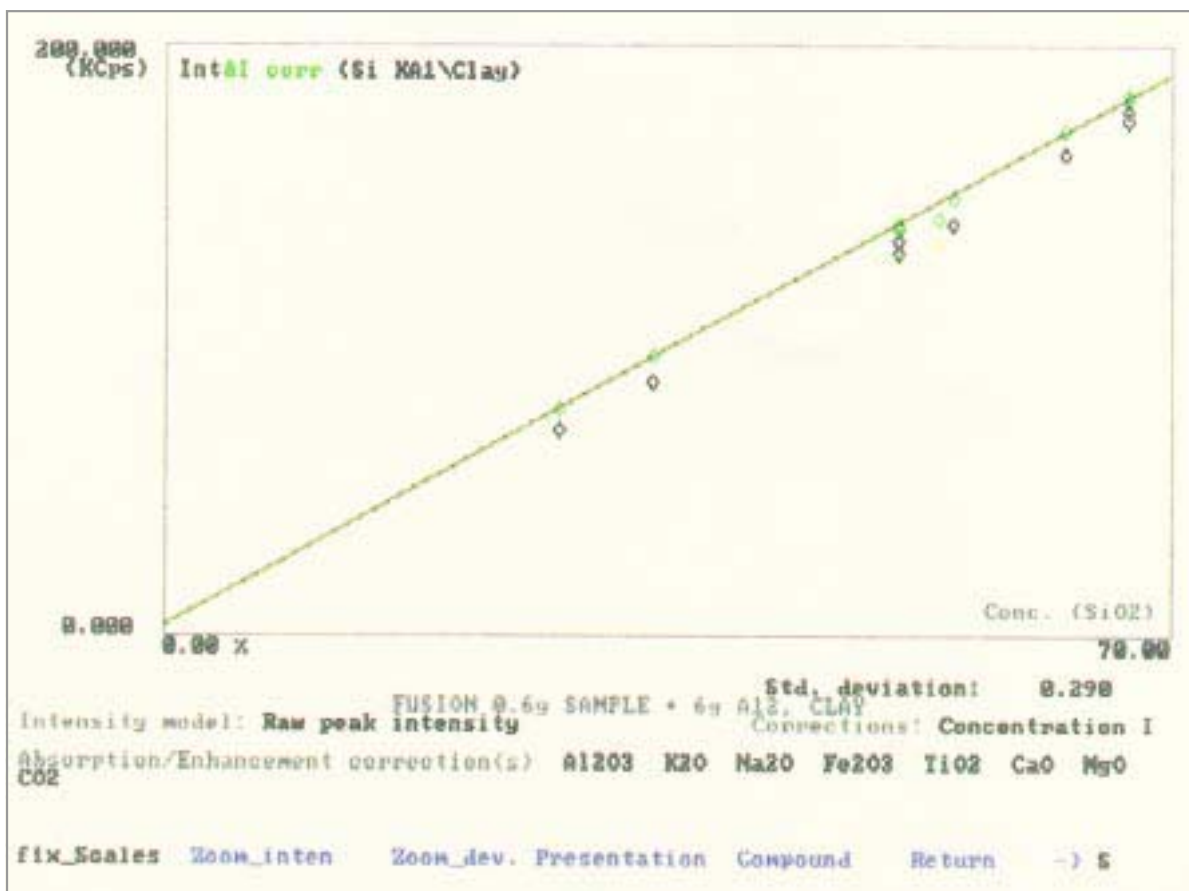
Net intensity model: Raw peak intensity
 Dead time correction is On

Concentration correction model: Concentration I Regression weighting: Absolute
 Intensity at 100 % : 391.022 KCps - Slope : 0.25581 % / KCps
 Intensity at 0.0 % : +0.108 KCps - Offset:-2.76202E-02 %

Absorption / Secondary emission corrections

SiO2	-1.11589E-02 (fixed)
Al2O3	-3.30830E-02 (fixed)
K2O	0.64539 (fixed)
Na2O	-7.62819E-02 (fixed)
Fe2O3	-4.52306E-02 (fixed)
CaO	0.64121 (fixed)
MgO	-5.65454E-02 (fixed)
CO2	-0.37000 (fixed)

Standard	Status	Measured KCps	Chemical %	Computed %	Deviation %	Rel.
1 BCS309		7.8172	1.920	1.930	0.010	0.53
2 BCS348		4.5482	1.080	1.083	0.003	0.32
3 BCS776-1		6.3599	1.620	1.602	-0.018	-1.10
4 BCS315		4.9391	1.230	1.215	-0.015	-1.20
5 BCS315A		4.8592	1.230	1.195	-0.035	-2.83
6 BCS375		1.6856	0.380	0.398	0.018	4.76
7 BCS376		0.2258	0.020	0.034	0.014	67.75
8 NBS76A		8.0259	2.030	2.002	-0.028	-1.36
9 FF5		9.0239	2.200	2.253	0.053	2.39
10 FF7		8.6073	2.160	2.157	-0.003	-0.13



Program file: CLAY-F.QAN
Compound: SiO2

Std. deviation: 0.290

Net intensity model: Raw peak intensity
Dead time correction is On

Concentration correction model: Concentration I Regression weighting: Absolute

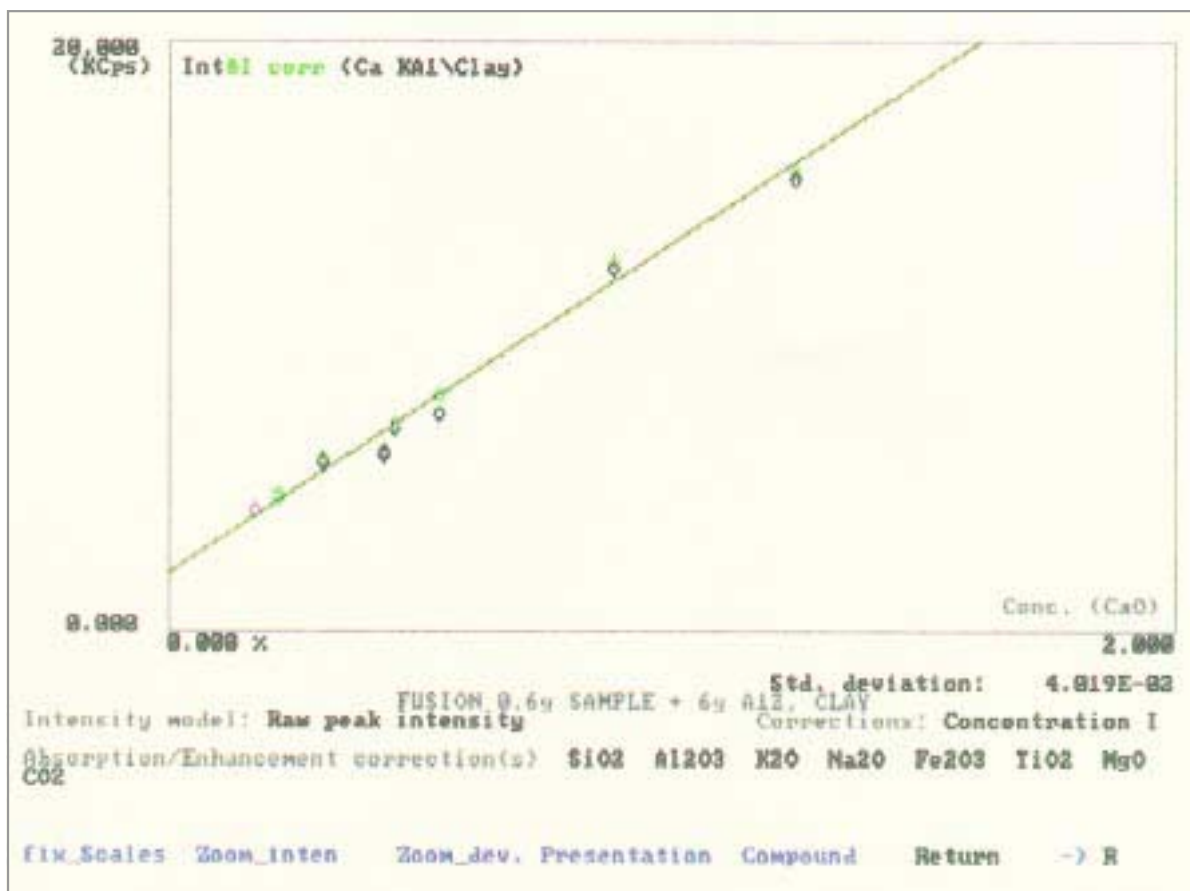
Intensity at 100 % : 269.509 KCps - Slope : 0.37388 % / KCps

Intensity at 0.0 % : +2.043 KCps - Offset:-0.76380 %

Absorption / Secondary emission corrections

Al2O3	0.16032	(fixed)
K2O	-5.13547E-03	(fixed)
Na2O	0.11375	(fixed)
Fe2O3	0.12394	(fixed)
TiO2	3.75615E-02	(fixed)
CaO	1.21811E-02	(fixed)
MgO	0.13449	(fixed)
CO2	-0.10800	(fixed)

Standard	Status	Measured KCps	Chemical %	Computed %	Deviation %	Rel.
1 BCS309		85.0924	34.10	34.27	0.17	0.49
2 BCS348		133.4453	51.13	51.14	0.01	0.02
3 BCS776-1		162.3989	62.76	63.00	0.24	0.37
4 BCS315	UN	127.6650	51.20	50.44	-0.76	-1.47
5 BCS315A		128.6761	51.20	50.85	-0.35	-0.68
6 BCS375		173.5695	67.10	66.96	-0.14	-0.21
7 BCS376		177.0963	67.10	67.49	0.39	0.59
8 NBS76A		138.6730	54.90	54.46	-0.44	-0.80
9 FF5		68.8172	27.65	27.77	0.12	0.44
10 FF7	UN	132.0681	53.91	51.82	-2.09	-3.88



Program file: CLAY-F.QAN
Compound: CaO

Std. deviation: 4.019E-02

Net intensity model: Raw peak intensity
Dead time correction is On

Concentration correction model: Concentration I Regression weighting: Absolute

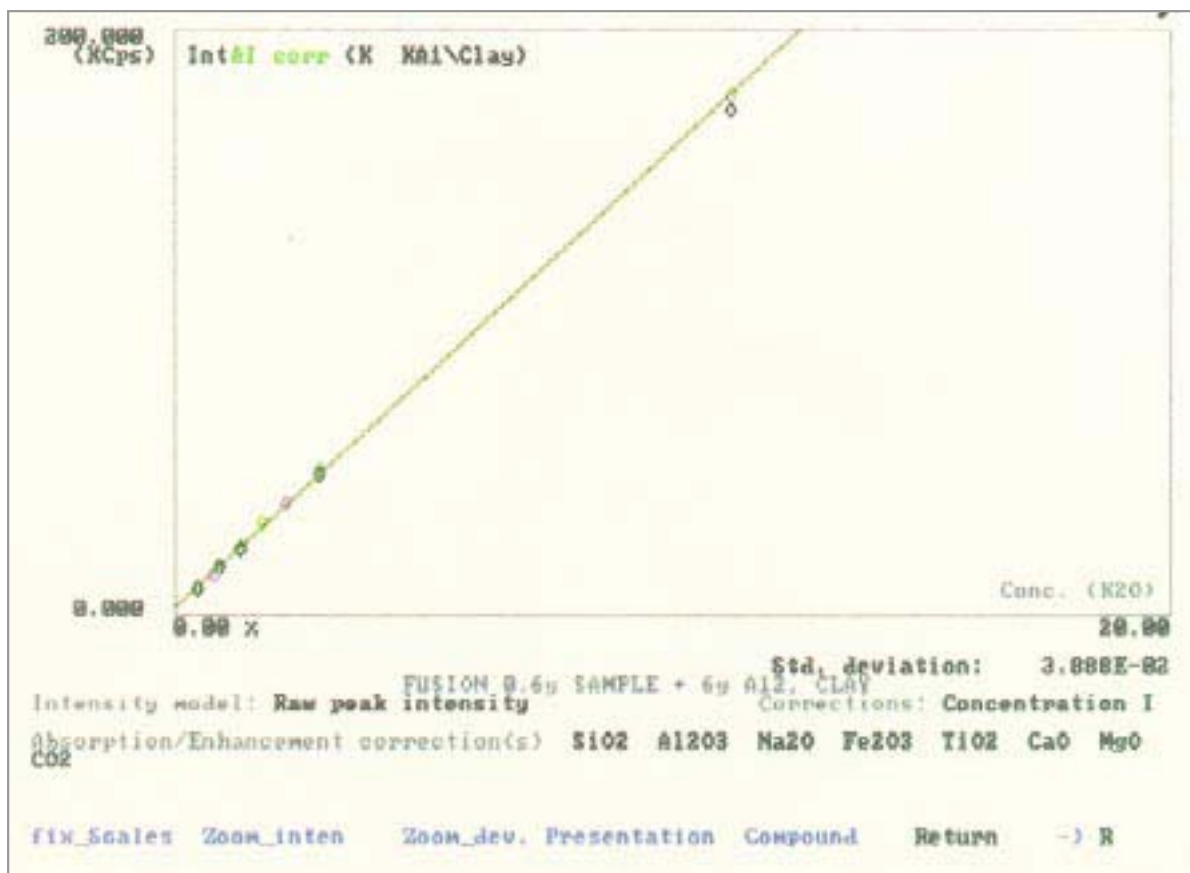
Intensity at 100 % : 1119.410 KCps - Slope : 8.94822E-02 % / KCps

Intensity at 0.0 % : +1.869 KCps - Offset:-0.16725 %

Absorption / Secondary emission corrections

SiO2	2.60907E-02 (fixed)
Al2O3	4.21709E-03 (fixed)
K2O	0.67290 (fixed)
Na2O	-3.86457E-02 (fixed)
Fe2O3	-3.24686E-02 (fixed)
TiO2	-6.93846E-02 (fixed)
MgO	-1.95502E-02 (fixed)
CO2	-0.13500 (fixed)

Standard	Status	Measured KCps	Chemical %	Computed %	Deviation %	Rel.
1 BCS309		4.3719	0.220	0.229	0.009	4.02
2 BCS348		3.9618	0.173	0.192	0.019	10.82
3 BCS776-1		5.6330	0.310	0.354	0.044	14.34
4 BCS315		5.9501	0.430	0.374	-0.056	-13.05
5 BCS315A		5.8577	0.430	0.365	-0.065	-15.01
6 BCS375		12.2427	0.890	0.949	0.059	6.61
7 BCS376		7.2386	0.540	0.540	0.000	0.01
8 NBS76A		4.4483	0.220	0.240	0.020	8.96
9 FF5		15.2779	1.250	1.219	-0.031	-2.49
10 FF7		6.7464	0.450	0.451	0.001	0.25



Program file: CLAY-F.QAN
 Compound: K2O

Std. deviation: 3.888E-02

Net intensity model: Raw peak intensity
 Dead time correction is On

Concentration correction model: Concentration I Regression weighting: Absolute
 Intensity at 100 % : 1573.442 KCps - Slope : 6.36287E-02 % / KCps
 Intensity at 0.0 % : +1.824 KCps - Offset:-0.11605 %

Absorption / Secondary emission corrections

SiO2	4.46612E-02 (fixed)
Al2O3	2.28059E-02 (fixed)
Na2O	-2.01667E-02 (fixed)
Fe2O3	-2.10151E-02 (fixed)
TiO2	-6.98223E-02 (fixed)
CaO	-6.35101E-02 (fixed)
MgO	-1.05731E-03 (fixed)
CO2	-0.18990 (fixed)

--- Standard	Status	Measured KCps	Chemical %	Computed %	Deviation %	Rel.
1 BCS309		8.3835	0.46	0.43	-0.03	-6.12
2 BCS348		37.3546	2.23	2.28	0.05	2.08
3 BCS776-1		47.1648	2.92	2.98	0.06	2.13
4 BCS315		9.6078	0.52	0.51	-0.01	-1.19
5 BCS315A		9.4704	0.52	0.50	-0.02	-2.93
6 BCS375		12.8464	0.79	0.73	-0.06	-8.04
7 BCS376		171.9138	11.20	11.18	-0.02	-0.20
8 NBS76A		22.3519	1.33	1.35	0.02	1.50
9 FF5		15.8503	0.91	0.92	0.01	0.81
10 FF7	UN	30.2271	1.74	1.86	0.12	7.13



Program file: CLAY-F.QAN
 Compound: Al2O3

Std. deviation: 0.211

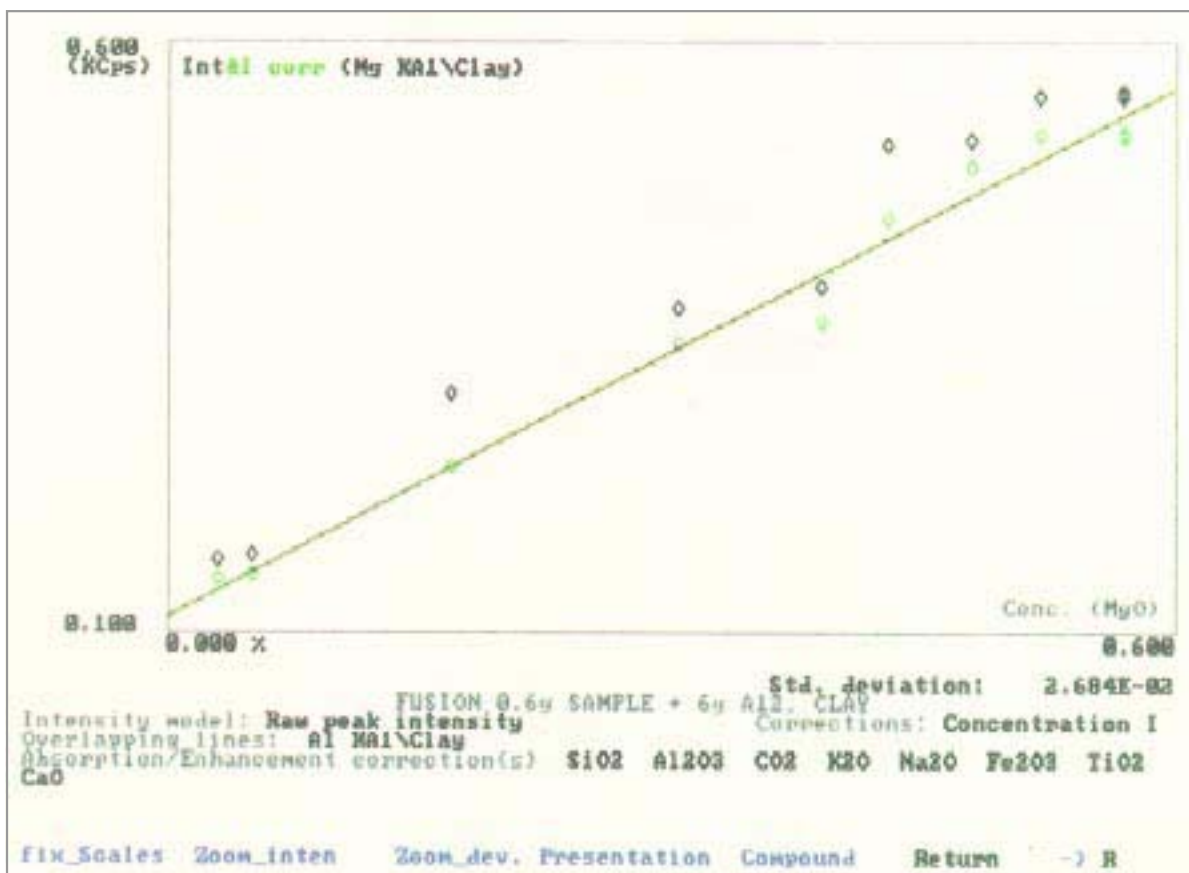
Net intensity model: Raw peak intensity
 Dead time correction is On

Concentration correction model: Concentration I Regression weighting: Absolute
 Intensity at 100 % : 314.547 KCps - Slope : 0.32057 % / KCps
 Intensity at 0.0 % : +2.600 KCps - Offset:-0.83347 %

Absorption / Secondary emission corrections

SiO2	7.80304E-03 (fixed)
K2O	1.57176E-02 (fixed)
Na2O	0.13821 (fixed)
Fe2O3	0.14839 (fixed)
TiO2	6.02668E-02 (fixed)
CaO	3.39123E-02 (fixed)
MgO	0.15934 (fixed)
CO2	-8.00000E-02 (fixed)

---	Standard	Status	Measured KCps	Chemical %	Computed %	Deviation %	Rel.
1	BCS309		192.9211	61.10	61.44	0.34	0.55
2	BCS348		101.0997	31.59	31.52	-0.07	-0.23
3	BCS776-1		92.8983	29.28	29.24	-0.04	-0.15
4	BCS315	UN	130.2466	42.40	41.35	-1.05	-2.48
5	BCS315A	UN	130.6770	42.40	41.49	-0.91	-2.15
6	BCS375		63.0236	19.80	19.78	-0.02	-0.11
7	BCS376		57.8825	17.70	17.93	0.23	1.28
8	NBS76A		121.4320	38.70	38.44	-0.26	-0.68
9	FF5		206.3272	65.93	65.77	-0.16	-0.24
10	FF7	UN	113.4893	38.13	35.90	-2.23	-5.84



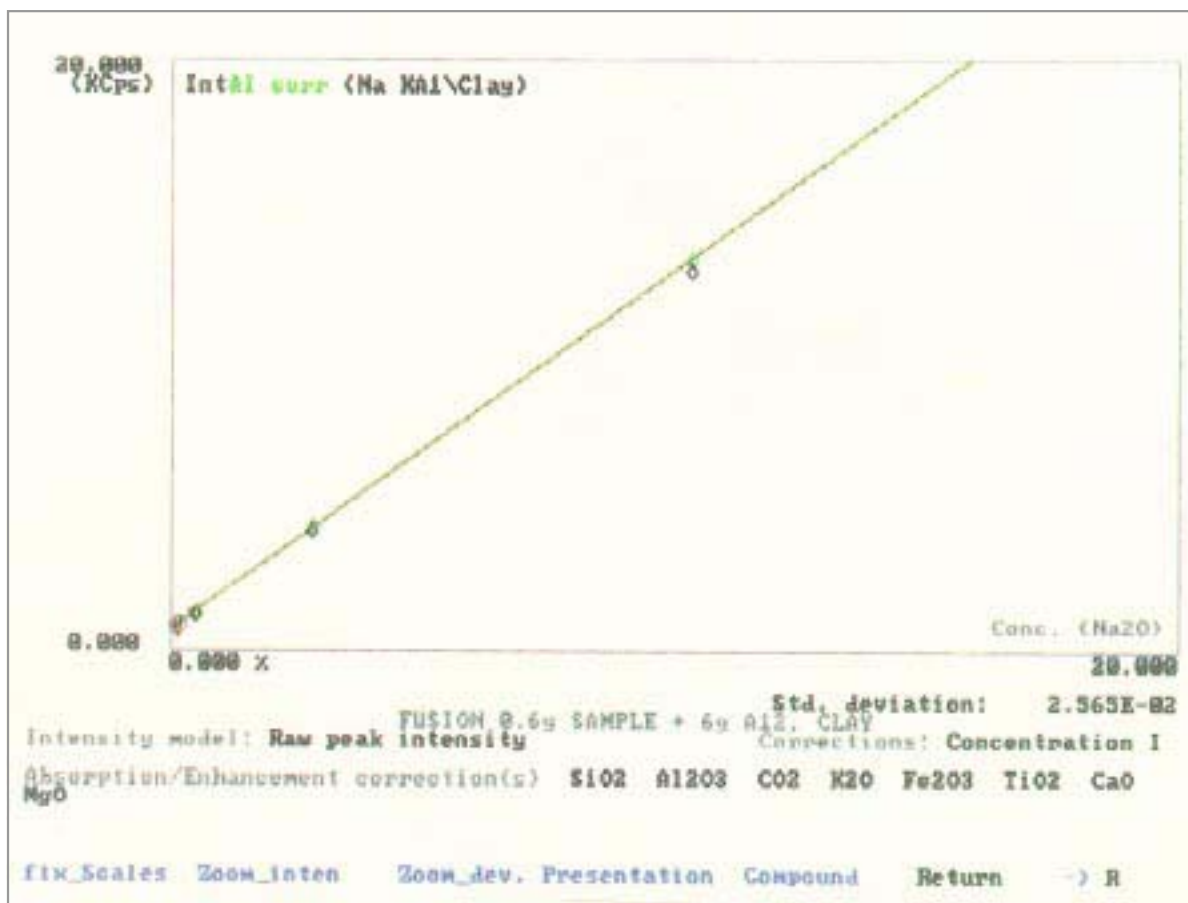
Program file: CLAY-F.QAN
 Compound: MgO

Std. deviation: 2.684E-02

Net intensity model: Raw peak intensity
 Dead time correction is On
 Line overlap correction Factor
 Al2O3 3.41885E-04

Concentration correction model: Concentration I Regression weighting: Absolute
 Intensity at 100 % : 75.205 KCps - Slope : 1.3316 % / KCps
 Intensity at 0.0 % : +0.110 KCps - Offset:-0.14585 %
 Absorption / Secondary emission corrections
 SiO2 1.70024E-02 (fixed)
 Al2O3 9.30734E-03 (fixed)
 CO2 -1.00000E-02 (fixed)
 K2O 3.45382E-02 (fixed)
 Na2O 0.15946 (fixed)
 Fe2O3 0.16998 (fixed)
 TiO2 8.03265E-02 (fixed)
 CaO 3.00000E-03 (fixed)

--- Standard	Status	Measured KCps	Chemical %	Computed %	Deviation %	Rel.
1 BCS309		0.3004	0.170	0.171	0.001	0.86
2 BCS348		0.3730	0.305	0.311	0.006	2.06
3 BCS776-1		0.5165	0.480	0.512	0.032	6.64
4 BCS315		0.5581	0.570	0.551	-0.019	-3.32
5 BCS315A		0.5536	0.570	0.545	-0.025	-4.41
6 BCS375		0.1637	0.050	0.049	-0.001	-1.49
7 BCS376		0.1594	0.030	0.044	0.014	46.82
8 NBS76A		0.5522	0.520	0.546	0.026	5.05
9 FF5		0.5117	0.430	0.451	0.021	4.82
10 FF7		0.3005	0.200	0.224	0.025	11.32



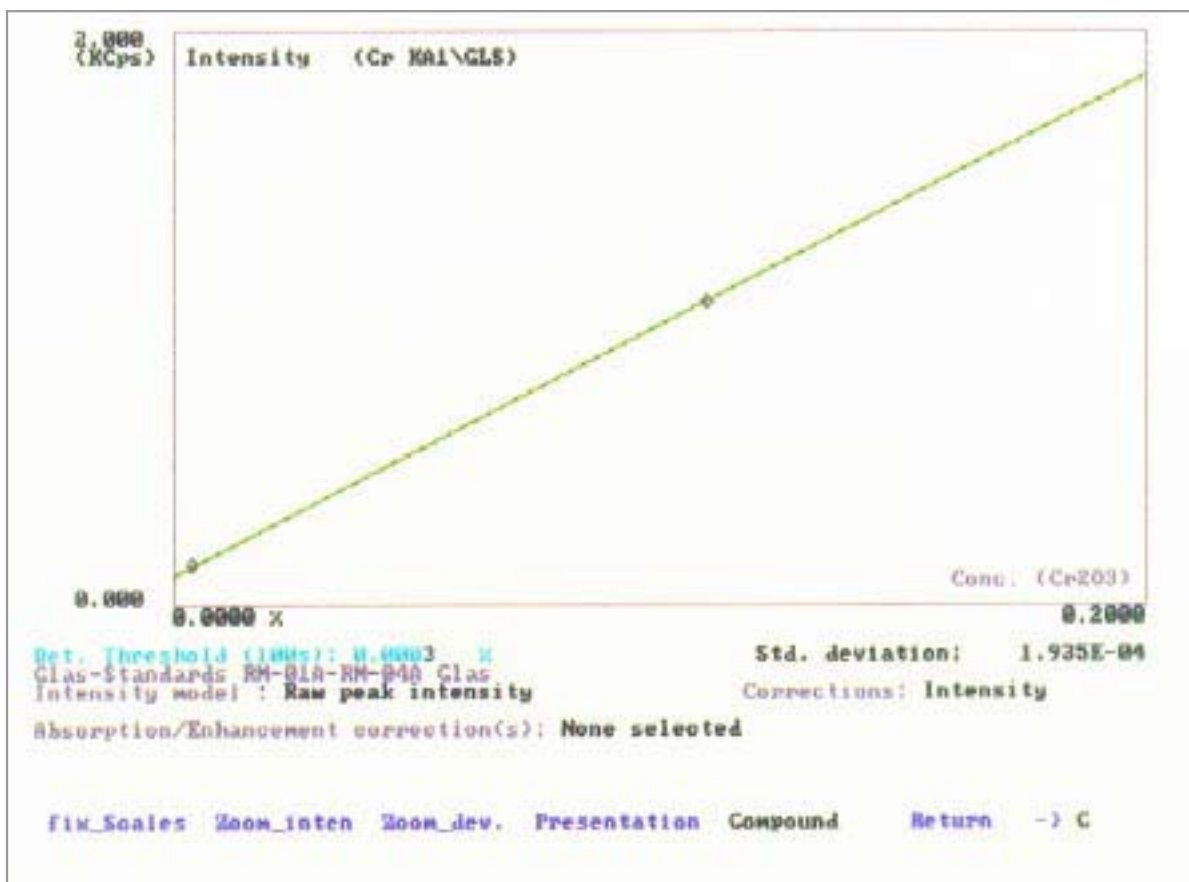
Program file: CLAY-F.QAN
 Compound: Na2O

Std. deviation: 2.565E-02

Net intensity model: Raw peak intensity
 Dead time correction is On

Concentration correction model: Concentration I Regression weighting: Absolute
 Intensity at 100 % : 121.935 KCps - Slope : 0.82447 % / KCps
 Intensity at 0.0 % : +0.645 KCps - Offset:-0.53178 % (fixed)
 Absorption / Secondary emission corrections
 SiO2 3.81620E-02 (fixed)
 Al2O3 2.95538E-02 (fixed)
 CO2 -0.10000 (fixed)
 K2O 6.22625E-02 (fixed)
 Fe2O3 0.20156 (fixed)
 TiO2 0.10984 (fixed)
 CaO 8.18519E-02 (fixed)
 MgO 3.00000E-03 (fixed)

Standard	Status	Measured KCps	Chemical %	Computed %	Deviation %	Rel.
1 BCS309		0.9835	0.340	0.309	-0.031	-9.19
2 BCS348		1.0332	0.344	0.339	-0.005	-1.53
3 BCS776-1		1.1788	0.490	0.478	-0.012	-2.44
4 BCS315		0.7516	0.130	0.113	-0.017	-13.33
5 BCS315A	UN	0.6219	0.130	0.001	-0.129	-98.91
6 BCS375		12.8212	10.400	10.387	-0.013	-0.12
7 BCS376		3.9877	2.830	2.881	0.051	1.81
8 NBS76A		0.7201	0.070	0.085	0.015	21.11
9 FF5		0.8350	0.170	0.182	0.012	7.05
10 FF7	UN	0.7089	0.120	0.076	-0.044	-36.63



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