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CALCULATED POWDER PATTERNS. PART II. SIX POTASSIUM FELDSPARS AND BARIUM FELDSPAR[1]

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Abstract

Integrated (I_{INT}) and peak (I_{PK}) intensities are calculated from single-crystal structure analyses for maximum microcline (granitic and authigenic), intermediate microcline, orthoclase, adularia, high sanidine and celsian. Graphical representation of the intensities distributed over Cauchy profiles results in plots which are very similar to comparable experimental X-ray diffraction traces over the whole 2θ range. Apparent differences in peak heights in the calculated and experimental patterns can be related to preferred orientations of crystals in standard mounts because of cleavage production during grinding.

Introduction

Among the rock-forming minerals, the ubiquitous feldspars are most important as indicators of the thermal history of a rock. Accurate determination of the chemical composition, cell size and crystal structure of the feldspar is of some use in categorizing the mineral as to its temperature of formation.

Both single-crystal patterns and powder patterns can be used to obtain the necessary information. Powder patterns are more readily obtainable but suffer from problems of preferred orientation, coincidence and overlap of reflections, and the difficulty of obtaining a single-phase sample. Preferred orientation can be minimized by careful sample preparation. Overlap can be compensated for by creating a complete set of standard powder patterns which can then be used to define the sensitive regions and distinguishing criteria for particular species. This set of standards may be either experimental or calculated from known crystal structure determinations. As accurate structure determinations of the calculated standard increases because it yields an "ideal" pattern free of the defects inherent in the experimental ones.

Part I (Borg and Smith, 1968) of this series presented the calculated X-ray powder patterns for five members of the plagioclases. This paper contains comparable data for potassium and barium feldspars. These patterns are shown to compare very well with experimental patterns and serve as a guide to the indexing and interpretation of the experimental patterns.

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Source of Data for Calculations

Computations are based on data from seven published structure analyses all based on three-dimensional intensity data having R factors in range from 0.054 to 0.138. The six potassium feldspars for which powder patterns have been calculated include maximum microcline (igneous) (Brown and Bailey, 1964), maximum microcline (authigenic) (Finney and Bailey, 1964), intermediate microcline (Bailey and Taylor, 1955), orthoclase (Colville and Ribbe, 1968), sanidine (heat-treated orthoclase) (Ribbe, 1963), and adularia (Colville and Ribbe, 1968). The barium feldspar (celsian) structure was determined by Newnham and Megaw (1960). All of the potassium feldspars closely approach the composition of the end member $KAlSi_3O_8$ (Table 1).

Minor Na, Ca and Ba were generally ignored in the structure refinements, and small amounts of co-existing Na-feldspar in the microperthites did not interfere with the structure analyses (Bailey and Taylor, 1955; p. 622). Accordingly, their effects were also omitted in the computations presented here. As far as possible, the exact site occupancies (or weighted scattering factors) and temperature factors were used in the computations, as were reported in the structure investigations. The temperature factors thus compensate for the small contribution of minor constituents. If the state of ionization of the atomic scattering factors used was not given, a fully ionized state was assumed. When available, anisotropic temperature factors were used for the large cations (K, Ba) and isotropic for the remaining ions. The Si/Al distribution summarized in Table 1 derives from a consideration of the size of the tetrahedra. In some cases, they differ slightly from those given in the original publications because the relationship between T-O distance and Al content has been subject to review (Smith and Bailey, 1963; Ribbe and Gibbs, 1967; Stewart and Ribbe, 1967). There is some indication that approximations of Al-content are only accurate to ± 8 percent, and Appleman and Clark (1965) question the evidence for partial disorder in maximum microcline.

Calculations for both orthoclase and adularia are based on $C2/m$ symmetry although the presence of weak, diffuse reflections $h+k=$ odd indicate a lower symmetry ($P2_1/a$) for the unit cell (Laves and Goldsmith, 1961; Colville and Ribbe, 1968). These reflections, which were ignored in the original structural study, probably have no expression in experimental powder patterns. Similarly, the triclinic domains described most recently by McConnell (1965), Gubser and Laves (1967), and Colville and Ribbe (1968) have not been taken into account because the average structures are monoclinic.

Powder Pattern Calculations

The powder patterns listed in Tables 2–8 and shown in Figures 1–6 were calculated using the POWD2 and XCHART programs described by Smith (1967). An evaluation of the use of these programs to simulate complicated patterns has been given by Smith (1968), and its specific application to feldspar patterns was discussed by Borg and Smith (1968). For completeness of the present paper, a summary of the more important characteristics follows:

Integrated intensities and their associated d-values are calculated directly from the crystal structure. This integrated intensity is assumed to be distributed over a Cauchy-shaped diffraction maximum. The width of the peak at half-maximum is a function of the diffraction angle, 2θ, and the values used were based on empirically determined relationships

TABLE 1. DESCRIPTION OF FELDSPARS

Variety	Max. Microcline (granitic)	Max. Microcline (authigenic)	Intermediate Microcline	Adularia	Orthoclase	High Sanidine (heated orthoclase)	Celsian
Composition (Mol %)	~$Or_{98}Ab_2$ (within a perthite, $Or_{74}Ab_{25}An_1$)	Or_{100}	~Or_{100} (within a microperthite, $Or_{85}Ab_{13}An_{1.4}$)	$Or_{89}Ab_9$ Cs_2	$Or_{90}Ab_8$ An_1	$Or_{90}Ab_8$ An_1	$Ba_{0.81}K_{0.18}$ $Al_{1.90}Si_{2.11}O_8$
Source	Pellotsalo, Russia Helsinki #SM4709	Pontiskalk limestone, Switzerland	Kodarma, Bihar India (Spencer U)	St. Gotthard, Switzerland (Spencer B)	Mogok, Upper Burma (Spencer C)	Mogok, Upper Burma (Spencer C)	Broken Hill, N.S.W.
a (Å)	8.560	8.5726	8.5784	8.554	8.561	8.5642	8.627
b	12.964	12.9618	12.9600	12.970	12.996	13.0300	13.045
c	7.215	7.2188	7.2112	7.207	7.192	7.1749	14.408
α	90° 39′	90° 34′	89° 42′				
β	115° 50′	115° 55′	115° 58′	116° 0.4′	116° 0.6′	115° 59′	115° 13′
γ	87° 42′	87° 45′	90° 52.5′				
Space group	$C\bar{1}$	$C\bar{1}$	$C\bar{1}$	$C2/m(P2_1/a)$	$C2/m(P2_1/a)$	$C2/m$	$I2/c$
Site occupancy (% Si)							
T_1 (o)	6[a]	10[a]	31[a]	61	65	75[a]	$B_1(0)79$[b]
T_1(m)	97	97	73	61	65	75	$B_1(z)23$
T_2(o)	99	93	97	89	85	75	$B_2(0)27$
T_2(m)	98	100	99	89	85	75	$B_2(z)82$
R	0.104	0.085	0.138	0.055	0.054	0.099	0.069
Reference	Brown & Bailey (1964)	Finney & Bailey (1964)	Bailey & Taylor (1955)	Colville & Ribbe (1968)	Colville & Ribbe (1968) Jones & Taylor (1961)	Ribbe (1963); Cole, et al. (1949)	Newnham & Megaw (1960)
ASF	0.0454	0.0452	0.0539	0.0575	0.0574	0.0561	0.161

[a] Brown & Bailey (1964) based on 1.00 Al.
[b] Taylor (1962, p. 15).

TABLE 2. CALCULATED POWDER DATA FOR MAXIMUM MICROCLINE (GRANITIC)—CuKα.

2θ (hkℓ)	2θ (PK)	d	hkℓ	I(INT)	I(PK)	2θ (hkℓ)	2θ (PK)	d	hkℓ	I(INT)	I(PK)
13.13	13.14	6.736	110	6	5	49.90	49.92	1.826	$\bar{2}\bar{6}2$	2	2
13.62	13.66	6.494	001	3	5	49.92		1.825	$\bar{4}20$	2	
13.66		6.477	020	4		50.49		1.806	043	5	
14.94	14.95	5.923	$1\bar{1}1$	6	4	50.55		1.804	062	6	
15.26	15.28	5.800	$\bar{1}11$	4	3	50.56	50.56	1.804	$\bar{4}\bar{4}1$	4	19
19.26	19.28	4.603	021	4	3	50.57		1.803	$\bar{2}04$	29	
21.07	21.08	4.213	$\bar{2}01$	76	51	50.75		1.797	$\bar{4}\bar{4}2$	2	0
22.29	22.30	3.984	111	17	12	50.88	50.90	1.793	$0\bar{4}3$	8	9
22.64	22.66	3.924	$1\bar{1}1$	8	6	50.93		1.791	$0\bar{6}2$	8	
23.09	23.20	3.849	200	7	0	51.03		1.788	$\bar{3}50$	2	
23.20		3.831	130	44	30	51.18		1.783	$\bar{2}62$	4	0
24.00	24.02	3.704	$\bar{1}30$	46	30	51.63	51.64	1.769	242	3	2
24.35	24.36	3.652	$\bar{1}31$	15	11	52.63	52.68	1.738	$\bar{4}41$	4	3
24.74	24.76	3.595	$\bar{2}21$	13	9	52.74		1.734	$\bar{1}\bar{1}4$	2	
24.95	24.94	3.566	$\bar{1}31$	6	6	52.97		1.727	$\bar{2}42$	2	0
25.55	25.56	3.484	$\bar{1}\bar{1}2$	40	29	54.07	54.08	1.694	$\bar{3}53$	3	2
25.64		3.471	$\bar{2}21$	2		55.39	55.40	1.658	351	5	3
25.68	25.66	3.466	$\bar{1}12$	29	26	55.54	55.56	1.653	$\bar{1}\bar{7}2$	3	4
26.44	26.44	3.368	220	67	41	55.59		1.652	$\bar{3}53$	5	
27.11	27.12	3.286	$\bar{2}02$	73	48	56.03	56.02	1.640	$\bar{1}72$	2	1
27.39		3.253	$\bar{2}20$	62		56.81	56.80	1.619	080	3	2
27.45	27.46	3.247	002	100	100	56.95	56.94	1.616	$\bar{5}13$	2	2
27.52		3.238	040	42		57.46	57.48	1.602	$\bar{4}\bar{2}4$	4	4
29.43	29.44	3.033	131	33	19	57.48		1.602	$\bar{3}51$	5	
30.15	30.24	2.961	$\bar{2}\bar{2}2$	6	26	58.24	58.26	1.583	$\bar{4}24$	4	2
30.23		2.954	$\bar{1}31$	15		58.45	58.44	1.578	024	4	3
30.68		2.912	022	8		58.68	58.68	1.572	$0\bar{2}4$	5	3
30.73	30.74	2.907	041	19	17	58.83	58.82	1.568	$0\bar{8}1$	2	2
30.80		2.900	$\bar{2}22$	3		59.39	59.40	1.555	$\bar{2}\bar{2}3$	2	1
30.87		2.894	$0\bar{2}2$	6	0	59.67	59.68	1.548	$\bar{5}\bar{3}3$	6	3
30.93	30.92	2.889	$0\bar{4}1$	13	13	59.94	59.94	1.542	$\bar{4}\bar{8}1$	6	3
32.15	32.16	2.782	$\bar{1}\bar{3}2$	11	7	61.16	61.16	1.514	280	16	7
32.43	32.48	2.758	$\bar{3}11$	2	10	61.27		1.512	$\bar{5}33$	4	
32.47		2.755	$\bar{1}32$	16		62.71	62.72	1.480	$\bar{4}61$	5	3
34.24		2.616	$\bar{3}\bar{1}2$	9		63.11	63.12	1.472	$\bar{2}80$	13	7
34.24	34.26	2.616	$\bar{2}41$	21	17	63.13		1.472	$\bar{5}14$	4	
34.28		2.614	221	1		63.28	63.28	1.469	530	2	6
34.72	34.74	2.581	$\bar{3}12$	13	8	63.78	63.96	1.458	114	5	7
34.88	34.82	2.570	112	8	8	63.88		1.456	$\bar{1}73$	2	
35.12	35.14	2.553	$2\bar{2}1$	3	5	63.92		1.455	243	7	
35.15		2.551	$1\bar{1}2$	3		63.98		1.454	$\bar{4}\bar{6}3$	2	
35.36	35.38	2.536	310	5	5	65.05	65.22	1.432	$\bar{5}30$	2	4
35.46	35.58	2.528	240	2	15	65.21		1.429	$2\bar{4}3$	5	
35.58		2.521	$\bar{2}41$	26		65.49	65.48	1.424	$\bar{6}02$	10	5
35.91	35.92	2.499	$\bar{3}10$	6	4	66.32	66.32	1.408	402	9	5
36.93	36.96	2.432	$\bar{1}\bar{5}1$	7	6	66.50	66.50	1.405	$\bar{1}90$	2	4
36.94		2.431	$\bar{2}40$	3		67.05	67.06	1.395	$\bar{4}05$	4	3
37.07	37.06	2.423	$\bar{3}\bar{3}1$	11	8	67.25	67.24	1.391	$\bar{2}\bar{6}4$	3	2
37.62	37.62	2.389	$\bar{1}51$	4	2	68.47	68.48	1.369	$\bar{4}25$	3	2
38.53	38.60	2.334	$\bar{3}31$	6	7	69.04	69.04	1.359	$\bar{6}\bar{2}1$	3	2
38.56		2.333	$1\bar{1}3$	4		70.09	70.10	1.341	$\bar{1}\bar{9}2$	3	1
38.61		2.330	$\bar{1}13$	6		70.65	70.64	1.332	$\bar{1}92$	4	3
39.21	39.22	2.296	$\bar{3}\bar{3}2$	3	2	71.01	71.00	1.326	$\bar{6}04$	4	2
40.49	40.52	2.226	$\bar{3}32$	2	2	71.53	71.58	1.318	$\bar{1}35$	3	3
40.52		2.224	151	2		71.59		1.317	$\bar{1}\bar{3}5$	5	
41.53	41.80	2.172	$\bar{1}\bar{5}1$	3	0	72.15	72.16	1.308	$\bar{4}\bar{8}2$	5	4
41.79		2.160	241	12	21	72.29	72.32	1.306	204	4	4
41.81		2.159	060	31		72.40		1.304	$\bar{5}15$	2	
42.75	42.78	2.113	$\bar{4}01$	5	3	73.11	73.14	1.293	282	7	4
42.90	42.88	2.106	$\bar{4}02$	7	5	73.52		1.287	$\bar{6}\bar{4}1$	2	0
43.21	43.20	2.092	$2\bar{4}1$	5	3	73.74	73.76	1.284	$\bar{3}\bar{9}2$	2	3
43.48	43.58	2.079	311	2	3	73.78		1.283	600	3	
43.56		2.076	202	3		74.57	74.58	1.271	$\bar{4}45$	3	2
43.98	44.06	2.057	$3\bar{1}1$	2	2	74.91	75.00	1.267	$\bar{5}35$	3	3
44.06		2.053	061	3		75.02		1.265	$\bar{3}\bar{5}5$	3	
44.28	44.28	2.044	$0\bar{8}1$	5	3	75.31	75.32	1.261	$\bar{2}\bar{8}2$	8	6
44.69	44.70	2.026	$\bar{4}\bar{2}2$	6	3	75.32		1.261	$\bar{4}82$	9	
45.49	45.50	1.992	222	9	5	80.18	80.26	1.196	$\bar{3}16$	3	2
45.76	45.76	1.981	$\bar{4}22$	13	7	80.30		1.195	$\bar{2}\bar{1}02$	2	
45.93	45.88	1.974	$\bar{3}\bar{3}3$	3	5	81.13	81.12	1.184	$\bar{7}\bar{3}3$	2	1
46.23	46.24	1.962	$2\bar{2}2$	7	4	82.48	82.50	1.168	$\bar{3}\bar{8}4$	3	1
46.38	46.36	1.956	$\bar{3}\bar{5}1$	3	4	84.02	84.04	1.151	084	3	2
47.18	47.18	1.925	400	16	8	84.46	84.46	1.146	$\bar{5}16$	2	2
47.58	47.58	1.910	$\bar{4}03$	9	5	84.82	84.82	1.142	$0\bar{8}4$	3	2
48.04	48.04	1.892	$\bar{2}61$	2	1	85.14	85.16	1.139	$\bar{4}84$	3	2
48.78	48.78	1.866	113	6	4	85.25		1.138	443	3	
48.92	48.94	1.860	350	3	5	86.97	86.96	1.119	$\bar{7}\bar{5}3$	2	1
48.99	48.98	1.858	152	2	5	87.28	87.26	1.116	$\bar{4}\bar{4}3$	3	1
49.00		1.857	$1\bar{1}3$	4		90.36		1.086	$\bar{7}53$	2	0
49.15	49.12	1.852	$\bar{2}60$	3	4	90.79	90.80	1.082	$1\bar{5}5$	3	2

TABLE 3. CALCULATED POWDER DATA FOR MAXIMUM MICROCLINE (AUTHIGENIC)—CuKα.

2θ(hkℓ)	2θ(PK)	d	hkℓ	I(INT)	I(PK)	2θ(hkℓ)	2θ(PK)	d	hkℓ	I(INT)	I(PK)
13.13	13.14	6.738	110	6	3	49.00	49.02	1.857	152	2	5
13.59	13.66	6.511	110	1	6	49.02		1.857	1$\bar{1}$3	4	
13.63		6.493	001	3		49.13		1.853	$\bar{2}$60	3	
13.66		6.476	020	4		49.87	49.90	1.827	$\bar{4}$20	2	2
14.94	14.94	5.927	1$\bar{1}$1	5	4	50.49	50.54	1.806	043	5	21
15.24	15.26	5.808	111	4	3	50.53		1.805	$\bar{4}$41	4	
19.26	19.28	4.604	021	4	3	50.54		1.804	$\bar{2}$04	29	
21.03	21.04	4.220	$\bar{2}$01	74	54	50.54		1.804	062	5	
22.30	22.30	3.983	111	17	12	50.71		1.799	$\bar{4}$42	2	0
22.65	22.66	3.923	1$\bar{1}$1	7	6	50.90	50.92	1.793	043	7	6
23.07	23.20	3.852	200	7	0	50.95		1.791	062	7	
23.20		3.830	130	44	32	50.99		1.789	$\bar{3}$50	2	
24.00	24.00	3.705	$\bar{1}$30	44	31	51.14		1.784	$\bar{2}$62	4	0
24.35	24.36	3.652	$\bar{1}$31	14	11	51.64	51.64	1.769	242	3	2
24.73	24.74	3.597	$\bar{2}$21	12	9	52.56	52.58	1.740	$\bar{4}$41	4	3
24.93	24.92	3.569	$\bar{1}$31	7	6	52.73	52.72	1.734	$\bar{1}$$\bar{1}$4	2	3
25.54	25.56	3.485	$\bar{1}$$\bar{1}$2	37	30	52.98	52.98	1.727	$\bar{2}$42	2	2
25.60	25.66	3.477	$\bar{2}$21	2	30	54.06	54.06	1.695	$\bar{3}$53	3	2
25.66		3.468	$\bar{1}$12	31		55.40	55.54	1.657	351	5	5
26.43	26.44	3.369	220	67	45	55.52		1.654	353	5	
27.08	27.08	3.290	$\bar{2}$02	72	51	55.56		1.653	$\bar{1}$72	3	
27.37	27.46	3.256	$\bar{2}$20	62	100	56.01	56.00	1.640	$\bar{1}$72	2	1
27.45		3.246	002	100		56.82	56.82	1.619	080	3	3
27.52		3.238	040	38		57.40	57.44	1.604	$\bar{4}$24	4	4
29.43	29.44	3.032	131	32	20	57.46		1.602	351	5	
30.13	30.24	2.963	$\bar{2}$22	6	29	58.15	58.16	1.585	$\bar{4}$24	4	2
30.23		2.954	$\bar{1}$31	41		58.46	58.46	1.577	024	4	3
30.68	30.74	2.912	022	7	18	58.70	58.70	1.571	0$\bar{2}$4	5	3
30.73		2.907	041	19		59.60	59.60	1.550	$\bar{5}$33	6	3
30.76		2.904	$\bar{2}$22	3		59.93	59.92	1.542	$\bar{4}$61	6	3
30.89	30.92	2.893	0$\bar{2}$2	7	14	61.15	61.18	1.514	$\bar{5}$33	4	8
30.93		2.888	0$\bar{4}$1	13		61.18		1.514	280	16	
32.15	32.16	2.781	$\bar{1}$32	11	7	62.65	62.66	1.482	$\bar{4}$61	5	3
32.38	32.46	2.763	311	1	10	63.01	63.10	1.474	$\bar{5}$14	4	7
32.45		2.756	$\bar{1}$32	16		63.09		1.472	280	12	
34.19	34.24	2.620	$\bar{3}$12	10	17	63.23	63.24	1.469	530	2	5
34.24		2.616	$\bar{2}$41	20		63.80	63.86	1.458	114	4	7
34.28		2.614	221	11		63.86		1.456	$\bar{1}$73	2	
34.66	34.66	2.586	312	11	7	63.94		1.455	243	7	
34.89	34.90	2.569	112	8	6	63.96		1.454	$\bar{4}$63	2	
35.12	35.16	2.553	2$\bar{2}$1	3	5	64.99	65.02	1.434	$\bar{5}$30	2	2
35.16		2.550	1$\bar{1}$2	4		65.23	65.24	1.429	$\bar{2}$43	5	4
35.33	35.34	2.538	310	5	5	65.38	65.38	1.426	$\bar{8}$02	9	5
35.49	35.54	2.527	240	2	15	66.31	66.32	1.408	402	9	5
35.54		2.524	$\bar{2}$41	25		66.50	66.50	1.405	$\bar{1}$90	2	4
35.88	35.88	2.501	$\bar{3}$10	5	4	66.98	66.98	1.396	$\bar{4}$05	4	2
36.92	37.04	2.433	$\bar{2}$40	3	9	67.26	67.16	1.391	$\bar{2}$64	2	2
36.94		2.431	$\bar{1}$51	7		68.41	68.40	1.370	$\bar{4}$25	3	2
37.05		2.424	$\bar{3}$31	11		68.96	68.96	1.361	$\bar{6}$21	2	2
37.60	37.60	2.390	$\bar{1}$51	4	3	70.12	70.12	1.341	$\bar{1}$52	3	2
38.48	38.56	2.338	$\bar{3}$31	5	7	70.63	70.64	1.332	$\bar{1}$82	4	2
38.55		2.333	$\bar{1}$13	4		70.88	70.86	1.328	$\bar{6}$04	4	2
38.60		2.331	$\bar{1}$13	6		71.52	71.60	1.318	$\bar{1}$35	3	3
39.18	39.18	2.297	$\bar{3}$32	3	2	71.60		1.317	$\bar{1}$35	4	
40.42	40.52	2.230	$\bar{3}$32	2	2	72.14	72.16	1.308	$\bar{4}$82	5	4
40.53		2.224	151	2		72.28	72.30	1.306	$\bar{5}$15	2	4
41.54		2.172	1$\bar{5}$1	3	0	72.31		1.306	204	4	
41.70	41.82	2.164	003	1	22	72.99	73.14	1.295	0100	2	4
41.79		2.160	241	12		73.13		1.293	282	8	
41.81		2.159	060	30		73.46		1.288	$\bar{6}$41	2	0
42.70	42.72	2.116	$\bar{4}$01	5	4	73.72	73.72	1.284	600	3	3
42.82	42.82	2.110	$\bar{4}$02	6	5	73.75		1.284	$\bar{3}$52	2	
43.20	43.20	2.092	$\bar{2}$41	5	3	74.47	74.50	1.273	$\bar{4}$45	2	2
43.47	43.58	2.080	311	2	3	74.83	74.82	1.268	$\bar{5}$35	3	2
43.57		2.075	202	3		75.01	75.02	1.265	$\bar{3}$55	3	2
43.97	44.06	2.057	3$\bar{1}$1	2	2	75.24	75.26	1.262	$\bar{4}$82	8	5
44.06		2.053	061	3		75.32		1.261	$\bar{2}$82	7	
44.29	44.30	2.043	0$\bar{6}$1	5	3	80.13	80.14	1.197	$\bar{3}$16	3	2
44.63	44.64	2.028	$\bar{4}$22	6	4	80.27	80.24	1.195	$\bar{2}$102	2	2
45.51	45.52	1.992	222	9	5	81.01	81.02	1.186	$\bar{7}$33	2	1
45.68	45.68	1.984	$\bar{4}$22	12	8	82.47	82.46	1.169	$\bar{4}$84	3	2
45.90		1.976	$\bar{3}$33	3	0	84.02	84.02	1.151	084	3	2
46.24	46.24	1.962	$\bar{2}$$\bar{2}$2	7	4	84.34	84.30	1.147	$\bar{5}$16	2	2
46.37	46.36	1.957	$\bar{3}$51	3	4	84.86	85.06	1.142	0$\bar{8}$4	3	2
47.14	47.14	1.926	400	15	8	85.04		1.140	$\bar{4}$84	3	
47.50	47.50	1.913	$\bar{4}$03	9	6	85.27	85.24	1.137	443	3	2
48.01	48.02	1.893	$\bar{2}$61	2	1	86.87	86.86	1.120	$\bar{7}$53	2	1
48.35	48.36	1.881	$\bar{3}$51	2	1	87.29	87.28	1.116	$\bar{4}$$\bar{4}$3	2	1
48.78	48.78	1.865	113	6	4	90.18	90.22	1.088	$\bar{7}$53	2	1
48.92	48.92	1.860	350	3	5	90.83	90.82	1.081	1$\bar{5}$5	3	2

Table 4. Calculated Powder Data for Intermediate Microcline—Cu$K\alpha$

2θ(hkℓ)	2θ(PK)	d	hkℓ	I(INT)	I(PK)	2θ(hkℓ)	2θ(PK)	d	hkℓ	I(INT)	I(PK)
13.26	13.28	6.669	$\bar{1}10$	5	4	43.60	43.62	2.074	202	3	4
13.43	13.44	6.585	110	2	2	43.63		2.073	$3\bar{1}1$	2	
13.65	13.66	6.483	001	2	6	43.80	43.72	2.065	311	3	3
13.65		6.479	020	4		44.14	44.16	2.050	$06\bar{1}$	3	4
15.02	15.04	5.893	$\bar{1}11$	5	5	44.18		2.048	061	4	
15.15	15.16	5.842	$\bar{1}\bar{1}1$	5	5	44.90	44.90	2.017	$\bar{4}22$	7	4
19.34	19.36	4.587	$02\bar{1}$	3	3	45.31	45.32	2.000	$\bar{4}\bar{2}2$	10	5
21.01	21.02	4.225	$\bar{2}01$	74	58	45.78	45.78	1.980	$2\bar{2}2$	8	5
22.43	22.44	3.961	$1\bar{1}1$	13	11	46.03	46.02	1.970	222	7	5
22.55		3.940	111	9		46.17	46.16	1.964	$\bar{3}33$	3	4
23.05	23.06	3.856	200	8	7	46.60	46.60	1.947	$\bar{3}\bar{3}3$	2	2
23.44	23.44	3.792	$\bar{1}30$	46	36	46.94	47.10	1.934	$\bar{3}51$	2	0
23.73	23.74	3.746	130	47	37	47.10		1.928	400	12	7
24.51	24.52	3.629	$\bar{1}31$	14	12	47.46	47.48	1.914	$\bar{4}03$	7	5
24.75	24.76	3.593	$\bar{1}\bar{3}1$	9	8	48.93	49.00	1.860	$1\bar{1}3$	4	4
24.97	24.98	3.563	$\bar{2}21$	10	9	49.00		1.857	113	4	
25.31	25.34	3.515	$\bar{2}\bar{2}1$	5	7	49.38	49.52	1.844	$1\bar{5}2$	2	3
25.59	25.66	3.477	$\bar{1}12$	41	47	49.54	49.52	1.838	$\bar{3}50$	2	3
25.66		3.468	$\bar{1}\bar{1}2$	34		50.24		1.814	$\bar{2}62$	2	0
26.71	26.72	3.335	$\bar{2}20$	70	53	50.31	50.62	1.812	350	2	0
27.06	27.08	3.293	220	67	100	50.60		1.802	$\bar{2}04$	23	15
27.08		3.290	$\bar{2}02$	73		50.70		1.799	$04\bar{3}$	5	
27.49	27.50	3.242	002	100	96	50.71		1.799	$0\bar{6}2$	4	
27.51		3.240	040	35		50.77	50.74	1.797	$\bar{2}62$	2	17
29.70	29.72	3.005	$\bar{1}\bar{3}1$	37	26	50.78		1.796	043	6	
29.97	29.98	2.979	131	40	29	50.79		1.796	062	5	
30.31	30.32	2.946	$\bar{2}22$	5	5	51.10	51.10	1.786	$\bar{4}41$	4	3
30.58		2.921	$\bar{2}\bar{2}2$	3	0	51.88	51.88	1.761	$\bar{4}\bar{4}1$	3	2
30.80		2.901	$0\bar{2}2$	6		52.11	52.02	1.754	$2\bar{4}2$	2	2
30.81	30.84	2.900	$0\bar{4}1$	17	27	54.47	54.46	1.683	$\bar{3}53$	3	2
30.84		2.897	022	5		55.09	55.10	1.666	$\bar{3}\bar{5}3$	4	2
30.85		2.896	041	15		55.65	55.66	1.650	$\bar{1}72$	3	2
32.24	32.24	2.774	$\bar{1}32$	14	11	55.90	55.90	1.643	$\bar{1}\bar{7}2$	2	2
32.40	32.40	2.761	$\bar{1}\bar{3}2$	16	12	56.04	56.04	1.639	$3\bar{5}1$	4	3
34.30	34.32	2.612	$\bar{3}12$	12	9	56.78	56.78	1.620	351	4	4
34.49		2.598	$3\bar{1}2$	12		56.79		1.620	080	3	
34.55	34.60	2.593	$2\bar{2}1$	2	19	57.61	57.62	1.599	$\bar{4}24$	4	2
34.61		2.589	$\bar{2}41$	22		57.93	57.94	1.590	$4\bar{2}4$	3	2
34.85		2.572	221	3	0	58.64	58.68	1.573	$02\bar{4}$	3	3
35.02		2.560	$1\bar{1}2$	7		58.69		1.572	024	4	
35.11	35.12	2.554	112	5	21	60.00	60.00	1.540	$\bar{5}33$	4	2
35.12		2.553	$\bar{2}41$	24		60.63	60.68	1.526	$5\bar{3}3$	4	4
35.47	35.48	2.528	$\bar{3}10$	5	5	60.71		1.524	$\bar{4}61$	4	
35.68	35.68	2.514	310	6	5	61.74	61.74	1.501	$\bar{2}80$	10	6
35.92		2.498	$\bar{2}40$	1	0	61.75		1.501	$\bar{4}61$	4	
36.45	36.46	2.463	240	1	1	62.45	62.46	1.486	280	9	4
37.11	37.12	2.420	$\bar{1}51$	7	5	62.84	62.82	1.478	$5\bar{1}4$	2	2
37.40	37.44	2.403	$\bar{1}\bar{5}1$	5	7	63.98	64.00	1.454	$1\bar{1}4$	2	3
37.45		2.399	331	8		64.43	64.42	1.445	$2\bar{4}3$	4	4
38.00	38.00	2.366	$\bar{3}\bar{3}1$	6	4	64.85	64.84	1.437	243	4	2
38.61	38.63	2.330	$\bar{1}13$	5	6	65.28	65.28	1.428	$\bar{6}02$	6	3
38.64		2.328	$\bar{1}\bar{1}3$	6		66.32	66.32	1.408	402	6	3
39.52	39.52	2.278	$\bar{3}32$	3	2	70.21	70.20	1.339	$\bar{1}92$	2	1
40.02	40.02	2.251	$\bar{3}\bar{3}2$	3	2	70.48	70.48	1.335	$\bar{1}\bar{9}2$	2	2
40.48	40.52	2.227	132	1	2	70.81	70.80	1.330	$\bar{6}04$	2	1
40.54		2.223	$\bar{3}30$	1		71.64	71.68	1.316	$\bar{1}35$	2	2
40.86	40.86	2.207	$\bar{1}51$	3	2	71.69		1.315	$\bar{1}\bar{3}5$	2	
41.08	41.20	2.195	330	1	3	72.41	72.40	1.304	204	2	1
41.20		2.189	151	3		73.02	73.00	1.295	$\bar{4}82$	3	2
41.79	41.80	2.160	060	28	16	73.85	73.86	1.282	$2\bar{8}2$	3	2
42.25	42.26	2.137	$2\bar{4}1$	8	5	74.24	74.22	1.276	$4\bar{8}2$	4	3
42.64		2.119	$\bar{4}01$	6		74.59	74.58	1.271	282	4	3
42.74	42.76	2.114	241	5	9						
42.77		2.112	$\bar{4}02$	6							

TABLE 5. CALCULATED POWDER DATA FOR ADULARIA—CuKα.

2θ(hkℓ)	2θ(PK)	d	hkℓ	I(INT)	I(PK)	2θ(hkℓ)	2θ(PK)	d	hkℓ	I(INT)	I(PK)
13.38	13.38	6.613	110	5	6	54.80	54.80	1.674	$\bar{3}53$	6	4
13.64	13.66	6.485	020	4	6	55.74	55.74	1.648	$\bar{1}72$	4	3
13.66		6.477	001	2		56.35	56.50	1.631	$\bar{3}34$	1	5
15.10	15.10	5.863	$\bar{1}11$	7	8	56.50		1.627	351	7	
19.35	19.36	4.583	021	2	3	56.64	56.64	1.624	$\bar{5}13$	1	5
21.06	21.06	4.215	$\bar{2}01$	59	61	56.73		1.621	080	2	
22.53	22.54	3.943	111	18	19	57.83	57.84	1.593	$\bar{4}24$	6	4
23.12	23.12	3.844	200	5	6	58.72	58.72	1.571	024	6	5
23.59	23.60	3.768	130	72	72	59.23	59.24	1.559	223	1	1
24.62	24.64	3.612	$\bar{1}31$	15	15	60.43	60.44	1.531	$\bar{5}33$	8	5
25.18	25.18	3.534	$\bar{2}21$	10	11	60.56	60.58	1.528	063	2	5
25.64	25.64	3.471	$\bar{1}12$	52	50	61.30	61.30	1.511	$\bar{4}61$	8	5
26.94	26.94	3.307	220	100	100	62.08	62.08	1.494	280	22	14
27.11	27.10	3.286	$\bar{2}02$	60	75	62.84	62.84	1.478	$\bar{5}14$	4	3
27.48	27.52	3.243	040	30	100	63.74	63.74	1.459	$\bar{1}73$	3	2
27.52		3.239	002	78		64.10	64.24	1.451	114	4	5
29.86	29.86	2.990	131	57	51	64.24		1.449	530	3	
30.47	30.48	2.932	$\bar{2}22$	8	8	64.73	64.74	1.439	243	9	6
30.81	30.82	2.899	041	25	31	64.86	64.88	1.436	460	2	5
30.83		2.897	022	10		65.10	65.06	1.432	$\bar{4}63$	2	3
32.15		2.782	$\bar{3}11$	1	0	65.32	65.32	1.427	$\bar{3}52$	2	4
32.32	32.32	2.768	$\bar{1}32$	22	19	65.49	65.48	1.424	$\bar{6}02$	7	5
34.46	34.46	2.600	$\bar{3}12$	18	15	65.88	65.88	1.416	190	2	2
34.77	34.88	2.578	221	4	33	66.52	66.52	1.404	402	7	4
34.88		2.570	$\bar{2}41$	37		67.07	67.06	1.394	$\bar{4}05$	3	2
35.12	35.10	2.553	112	8	10	67.63		1.384	$\bar{5}53$	2	
35.68	35.68	2.514	310	8	7	67.64	67.64	1.384	$\bar{2}64$	4	5
36.21	36.22	2.478	240	3	3	67.65		1.384	134	2	
37.23	37.24	2.413	$\bar{1}51$	9	7	68.81	68.82	1.363	$\bar{4}25$	2	1
37.79	37.80	2.378	$\bar{3}31$	12	9	69.75	69.76	1.347	$\bar{6}21$	2	2
38.65	38.66	2.328	$\bar{1}13$	7	6	70.29	70.30	1.338	$\bar{1}92$	6	4
39.82	39.82	2.262	$\bar{3}32$	3	3	70.96	70.96	1.327	$\bar{6}04$	2	2
40.33	40.36	2.234	$\bar{2}23$	1	1	71.71	71.72	1.315	$\bar{1}35$	6	4
40.40		2.231	132	1		72.02	71.92	1.310	$\bar{2}45$	2	3
40.90	41.02	2.204	330	1	4	72.16	72.16	1.308	$\bar{5}15$	2	2
41.03		2.198	151	5		72.43	72.44	1.304	531	2	3
41.75	41.76	2.162	060	25	19	72.54	72.54	1.302	204	3	3
41.80		2.159	003	1		72.86	72.90	1.297	0100	2	3
42.54	42.54	2.123	241	11	9	72.90		1.296	083	2	
42.77	42.78	2.112	$\bar{4}01$	3	5	73.66	73.66	1.285	$\bar{4}82$	11	7
42.88	42.88	2.107	$\bar{4}02$	5	6	73.90	73.88	1.281	600	2	6
43.57		2.076	$\bar{1}33$	1	0	73.93		1.281	$\bar{4}45$	3	
43.70	43.70	2.070	202	2	3	74.24	74.24	1.276	282	11	7
43.84	43.84	2.063	311	3	3	74.84	74.86	1.268	$\bar{6}41$	3	3
44.13	44.14	2.050	061	5	4	74.92		1.266	$\bar{3}92$	2	
45.20	45.20	2.004	$\bar{4}22$	14	10	75.52	75.56	1.258	$\bar{5}35$	3	4
45.99	46.00	1.972	222	12	9	75.56		1.257	355	4	
46.42	46.42	1.954	$\bar{3}33$	3	3	79.35	79.36	1.206	$\bar{2}102$	2	2
47.25	47.26	1.922	400	11	9	80.20	80.22	1.196	$\bar{3}16$	3	2
47.36	47.36	1.918	$\bar{3}51$	3	9	82.12	82.12	1.173	$\bar{7}33$	2	1
47.55	47.54	1.911	$\bar{4}03$	6	6	83.73	83.74	1.154	$\bar{4}84$	4	2
48.26	48.30	1.884	260	3	3	84.27	84.50	1.148	$\bar{5}16$	2	3
48.33		1.882	331	2		84.49		1.146	084	5	
49.03	49.04	1.856	113	7	6	86.52	86.52	1.124	443	3	1
49.42	49.42	1.843	420	2	3	87.73	87.72	1.112	$\bar{1}94$	2	1
49.56	49.56	1.838	152	2	3	88.61	88.64	1.103	$\bar{7}53$	3	2
49.70	49.68	1.833	$\bar{4}23$	1	3	89.47	89.44	1.094	710	2	1
49.99	49.98	1.823	350	4	3	90.46	90.46	1.085	155	3	1
50.49	50.64	1.806	$\bar{2}62$	5	0	93.01	93.02	1.062	$\bar{6}83$	2	1
50.63		1.801	$\bar{2}04$	23	22	93.26	93.28	1.060	$\bar{6}65$	2	1
50.73	50.74	1.798	062	10	24	94.07	94.14	1.053	$\bar{2}104$	2	1
50.76		1.797	043	10		94.20		1.051	590	2	
51.59	51.60	1.770	$\bar{4}41$	7	6	109.43	109.46	0.944	$\bar{5}57$	2	1
51.69		1.767	$\bar{4}42$	3		113.21		0.923	$\bar{3}96$	2	0
52.40	52.40	1.745	242	4	3	114.99	115.02	0.913	$\bar{7}94$	2	1
53.19	53.18	1.721	133	2	1	117.68	117.66	0.900	$\bar{5}96$	2	1
54.06	54.08	1.695	$\bar{5}12$	2	1	118.42	118.06	0.897	2123	2	1

Table 6. Calculated Powder Data for Orthoclase—CuKα.

2θ(hkl)	2θ(PK)	d	hkl	I(INT)	I(PK)	2θ(hkl)	2θ(PK)	d	hkl	I(INT)	I(PK)
13.36	13.38	6.621	110	5	6	54.02	54.02	1.696	$\bar{5}12$	2	2
13.62	13.62	6.498	020	5	7	54.78	54.78	1.674	$\bar{3}53$	6	4
13.69		6.464	001	2		55.67	55.68	1.650	$\bar{1}72$	4	3
15.10	15.12	5.861	$\bar{1}11$	6	7	56.42	56.44	1.629	$\bar{3}34$	1	6
19.35	19.36	4.583	021	2	3	56.44		1.629	351	7	
21.05	21.06	4.217	$\bar{2}01$	57	61	56.61	56.60	1.625	080	2	5
22.54	22.54	3.941	111	17	18	56.62		1.624	$\bar{5}13$	1	
23.10	23.12	3.847	200	5	6	57.89	57.90	1.592	$\bar{4}24$	6	4
23.55	23.56	3.775	130	74	75	58.84	58.84	1.568	024	6	5
24.60	24.60	3.616	$\bar{1}31$	15	16	59.30	59.30	1.557	223	2	2
25.15	25.15	3.537	$\bar{2}21$	10	11	60.40	60.40	1.531	$\bar{5}33$	8	6
25.69	25.69	3.465	$\bar{1}12$	52	51	60.56	60.56	1.528	063	2	5
26.91	26.91	3.310	220	100	100	61.21	61.20	1.513	$\bar{4}61$	8	5
27.14	27.14	3.283	$\bar{2}02$	59	67	61.95	61.96	1.497	280	22	13
27.43	27.58	3.249	040	29	0	62.87	62.88	1.477	$\bar{5}14$	3	3
27.58		3.232	002	78	82	63.71	63.72	1.459	$\bar{1}73$	3	2
29.84	29.84	2.991	131	59	53	64.17	64.22	1.450	530	3	5
30.48	30.48	2.930	$\bar{2}22$	7	8	64.23		1.449	114	4	
30.77	30.78	2.903	041	25	25	64.76	64.78	1.438	460	2	7
30.87	30.84	2.894	022	11	24	64.77		1.438	243	9	
32.12		2.784	$\bar{3}11$	1	0	65.05	64.94	1.433	$\bar{4}63$	2	5
32.33	32.34	2.767	$\bar{1}32$	22	20	65.23	65.24	1.429	$\bar{5}52$	2	4
34.46	34.46	2.600	$\bar{3}12$	18	16	65.42	65.42	1.425	$\bar{6}02$	7	6
34.77	34.84	2.578	221	4	34	65.74	65.60	1.419	190	2	3
34.83		2.574	$\bar{2}41$	37		66.53	66.54	1.404	402	7	4
35.17	35.16	2.550	112	8	9	67.18	67.18	1.392	$\bar{4}05$	2	2
35.65	35.66	2.516	310	8	8	67.57	67.68	1.385	$\bar{5}53$	2	4
36.16	36.16	2.482	240	4	3	67.67		1.383	$\bar{2}64$	3	
37.17	37.18	2.417	$\bar{1}51$	9	7	67.75		1.382	134	2	
37.74	37.74	2.381	$\bar{3}31$	12	10	68.92	68.92	1.361	$\bar{4}25$	2	2
38.73	38.74	2.323	$\bar{1}13$	7	6	69.67	69.68	1.348	$\bar{6}21$	3	2
39.80	39.80	2.263	$\bar{3}32$	4	3	70.18	70.18	1.340	$\bar{1}92$	6	4
40.39	40.40	2.231	$\bar{2}23$	1	1	70.96	70.96	1.327	$\bar{6}04$	3	2
40.42		2.230	132	1		71.86	71.86	1.313	$\bar{1}35$	6	4
40.85	40.98	2.207	330	1	4	72.14	72.10	1.308	$\bar{2}45$	2	3
40.98		2.201	151	4		72.24		1.307	$\bar{5}15$	2	
41.66	41.66	2.166	060	25	19	72.38	72.36	1.304	531	2	3
41.89		2.155	003	1	0	72.66	72.66	1.300	204	3	3
42.51	42.52	2.125	241	11	9	72.70		1.300	0.10.0	2	
42.73	42.72	2.114	$\bar{4}01$	4	6	72.86	72.88	1.297	083	2	3
42.85	42.84	2.108	$\bar{4}02$	5	6	73.53	73.54	1.287	$\bar{4}82$	10	7
43.62		2.073	$\bar{1}33$	1	0	73.84	73.74	1.282	600	2	5
43.74	43.84	2.068	202	2	4	74.02	74.16	1.280	$\bar{4}45$	3	7
43.83		2.064	311	3		74.16		1.277	282	10	
44.05	44.06	2.054	061	5	5	74.74	74.76	1.269	$\bar{6}41$	3	3
45.17	45.18	2.006	$\bar{4}22$	13	10	74.78		1.268	$\bar{3}92$	2	
46.02	46.02	1.970	222	12	9	75.60	75.62	1.257	$\bar{5}35$	3	4
46.44	46.44	1.954	$\bar{3}33$	3	3	75.65		1.256	$\bar{3}55$	4	
47.21	47.22	1.923	400	11	10	79.20	79.22	1.208	$\bar{2}.10.2$	2	2
47.29		1.920	$\bar{3}51$	3		80.40	80.42	1.193	$\bar{3}16$	3	3
47.56	47.56	1.910	$\bar{4}03$	6	5	82.04	82.04	1.174	$\bar{7}33$	2	1
48.17	48.18	1.887	260	2	2	83.68	83.68	1.155	$\bar{4}84$	4	2
48.30	48.30	1.883	331	2	3	84.42	84.48	1.146	$\bar{5}16$	2	3
49.12	49.12	1.853	113	7	6	84.49		1.146	084	4	
49.37		1.844	420	2	0	86.55	86.56	1.124	443	3	1
49.54	49.52	1.838	152	2	3	87.70	87.70	1.112	$\bar{1}94$	2	1
49.71	49.70	1.833	$\bar{4}23$	1	2	88.51	88.52	1.104	$\bar{7}53$	3	2
49.91	49.92	1.826	350	3	3	89.38	89.36	1.095	710	2	1
50.43	50.46	1.808	$\bar{2}62$	4	5	90.59	90.60	1.084	155	3	1
50.69	50.76	1.799	062	9	25	92.88	92.90	1.063	$\bar{6}83$	2	1
50.74		1.798	$\bar{2}04$	23		93.25	93.24	1.060	$\bar{6}65$	2	1
50.80		1.796	043	10		94.00	94.00	1.053	$\bar{2}.10.4$	2	2
51.52	51.54	1.772	$\bar{4}41$	7	6	94.02		1.053	590	2	
51.63	51.64	1.769	$\bar{4}42$	3	5	109.63	109.62	0.942	$\bar{5}57$	2	1
52.40	52.40	1.745	242	4	3	114.82	114.80	0.914	$\bar{7}94$	2	1
53.25	53.26	1.719	133	2	1	117.70	117.78	0.900	$\bar{5}96$	2	1

TABLE 7. CALCULATED POWDER DATA FOR HIGH SANIDINE—CuKα.

2θ(hkl)	2θ(PK)	d	hkl	I(INT)	I(PK)	2θ(hkl)	2θ(PK)	d	hkl	I(INT)	I(PK)
13.35	13.36	6.628	110	5	6	50.63	50.64	1.801	062	8	8
13.58	13.58	6.515	020	6	8	50.85	50.86	1.794	043	9	22
13.72		6.449	001	1	0	50.87		1.793	$\bar{2}04$	21	
15.11	15.12	5.857	$\bar{1}11$	6	7	51.46	51.46	1.774	$\bar{4}41$	6	5
19.35	19.36	4.583	021	2	2	51.59	51.58	1.770	$\bar{4}42$	2	5
21.05	21.06	4.217	$\bar{2}01$	57	62	52.40	52.40	1.745	242	4	3
22.56	22.56	3.939	111	17	18	53.31	53.30	1.717	133	1	1
23.09	23.10	3.849	200	5	7	54.00	54.00	1.697	$\bar{5}12$	2	2
23.50	23.50	3.783	130	76	79	54.77	54.78	1.675	$\bar{3}53$	5	4
24.56	24.58	3.621	$\bar{1}31$	15	15	55.58	55.58	1.652	$\bar{1}72$	3	2
25.13	25.14	3.540	$\bar{2}21$	11	12	56.38		1.631	351	7	
25.74	25.74	3.458	$\bar{1}12$	49	49	56.45	56.40	1.629	080	2	5
26.88	26.88	3.314	220	100	100	56.51		1.627	$\bar{3}34$	1	
27.18	27.18	3.278	$\bar{2}02$	59	66	57.97	57.98	1.590	$\bar{4}24$	5	4
27.35	27.35	3.258	040	28	41	58.96	58.96	1.565	024	6	4
27.64	27.64	3.225	002	77	77	59.37	59.36	1.555	223	1	2
29.82	29.82	2.994	131	57	53	60.40	60.40	1.531	$\bar{5}33$	7	5
30.50	30.52	2.928	$\bar{2}22$	7	9	60.55	60.56	1.528	063	2	4
30.72	30.72	2.908	041	24	23	61.10	61.10	1.515	$\bar{4}61$	7	5
30.92	30.90	2.890	022	11	14	61.80	61.80	1.500	280	19	12
32.10		2.786	$\bar{3}11$	1	0	62.94	62.94	1.475	$\bar{5}14$	3	2
32.34	32.34	2.766	$\bar{1}32$	23	21	63.67	63.68	1.460	$\bar{1}73$	3	2
34.47	34.48	2.599	$\bar{3}12$	16	15	64.12	64.12	1.451	530	3	3
34.76	34.78	2.578	221	4	34	64.36	64.36	1.446	114	3	3
34.77		2.578	$\bar{2}41$	35		64.66	64.82	1.440	460	2	6
35.22	35.22	2.546	112	8	8	64.81		1.437	243	7	
35.63	35.64	2.518	310	8	7	65.00	64.98	1.434	$\bar{4}63$	2	5
36.09	36.10	2.487	240	3	3	65.16	65.16	1.430	$\bar{5}52$	2	3
37.09	37.10	2.422	$\bar{1}51$	8	7	65.39	65.40	1.426	$\bar{6}02$	6	5
37.70	37.70	2.384	$\bar{3}31$	12	10	65.55	65.56	1.423	190	2	4
38.82	38.82	2.318	$\bar{1}13$	7	6	66.55	66.56	1.404	402	6	3
39.78	39.78	2.264	$\bar{3}32$	4	3	67.33	67.34	1.389	$\bar{4}05$	2	2
40.44	40.46	2.228	132	1	2	67.53	67.54	1.386	$\bar{5}53$	2	3
40.46		2.228	$\bar{2}23$	1		67.70	67.70	1.383	$\bar{2}64$	3	3
40.81	40.90	2.209	330	2	4	69.06	69.06	1.359	$\bar{4}25$	2	1
40.91		2.204	151	3		69.61	69.62	1.349	$\bar{6}21$	2	2
41.55	41.56	2.172	060	25	20	70.02	70.02	1.343	$\bar{1}92$	5	3
41.99		2.150	003	1	0	71.01	71.02	1.326	$\bar{6}04$	2	1
42.47	42.48	2.127	241	11	9	72.03	72.04	1.310	$\bar{1}35$	4	3
42.70	42.70	2.116	$\bar{4}01$	4	6	72.28	72.30	1.306	$\bar{2}45$	2	4
42.85	42.84	2.109	$\bar{4}02$	5	7	72.35		1.305	531	2	
43.68		2.070	$\bar{1}33$	1	0	72.79	72.78	1.298	204	2	3
43.78	43.84	2.066	202	2	5	73.39	73.40	1.289	$\bar{4}82$	8	6
43.83		2.064	311	3		73.79	73.78	1.283	600	2	2
43.96	43.94	2.058	061	5	6	74.06	74.06	1.279	282	8	6
45.16	45.16	2.006	$\bar{4}22$	13	10	74.12		1.278	$\bar{4}45$	2	
46.05	46.06	1.969	222	11	8	74.62	74.64	1.271	$\bar{3}92$	2	3
46.47	46.48	1.952	$\bar{3}33$	3	3	74.66	74.64	1.270	$\bar{6}41$	2	3
47.19	47.20	1.924	400	10	10	75.70	75.72	1.255	$\bar{5}35$	2	3
47.20		1.924	$\bar{3}51$	3		75.75		1.255	$\bar{3}55$	2	
47.60	47.60	1.909	$\bar{4}03$	6	5	79.01	79.00	1.211	$\bar{2}102$	2	2
48.06	48.06	1.891	260	2	2	80.63	80.60	1.191	$\bar{3}16$	2	2
48.28	48.28	1.883	331	2	2	82.00	82.00	1.174	$\bar{7}33$	2	1
49.20	49.22	1.850	113	7	5	83.62	83.62	1.155	$\bar{4}84$	3	2
49.33	49.32	1.846	420	2	5	84.48	84.48	1.146	084	3	2
49.52		1.839	152	2	0	86.58	86.58	1.123	443	3	1
49.74	49.84	1.832	$\bar{4}23$	1	4	88.44	88.42	1.104	$\bar{7}53$	2	2
49.83		1.828	350	3		90.73	90.76	1.082	155	2	1
50.36	50.36	1.810	$\bar{2}62$	4	4	93.28	93.28	1.059	$\bar{6}65$	2	1

TABLE 8. CALCULATED POWDER DATA FOR CELSIAN—CuKα.

2θ(hkℓ)	2θ(PK)	d	hkℓ	I(INT)	I(PK)	2θ(hkℓ)	2θ(PK)	d	hkℓ	I(INT)	I(PK)
13.21	13.24	6.698	110	1	3	52.68	52.68	1.736	$\bar{2}28$	3	3
13.56	13.58	6.523	020	44	80	53.62	53.64	1.708	$\bar{5}14$	3	2
13.57		6.517	002	22		54.08	54.08	1.694	314	4	3
15.10	15.10	5.864	$\bar{1}12$	20	23	54.70	54.70	1.677	$\bar{3}56$	10	7
19.24	19.24	4.610	022	34	39	55.47	55.48	1.655	$\bar{1}74$	7	5
22.22	22.22	3.997	112	6	7	55.75	55.74	1.647	352	10	8
22.77	22.78	3.902	200	23	25	56.38	56.40	1.631	080	5	6
23.40	23.40	3.799	130	34	36	56.39		1.630	$\bar{3}38$	2	
24.53	24.54	3.625	$\bar{1}32$	24	26	57.89	57.90	1.591	$\bar{4}28$	7	6
25.04	25.04	3.553	$\bar{2}22$	42	44	57.93		1.591	334	2	
25.64	25.64	3.472	$\bar{1}14$	76	78	58.32	58.34	1.581	028	9	8
26.59	26.60	3.349	220	100	100	58.43	58.44	1.578	226	5	8
27.15	27.16	3.282	$\bar{2}04$	34	37	59.60	59.60	1.550	510	2	2
27.34	27.34	3.259	004	28	32	60.16	60.20	1.537	066	4	9
29.55	29.56	3.021	132	59	55	60.20		1.536	$\bar{5}36$	10	
30.63	30.64	2.917	042	29	29	60.62		1.526	$\bar{3}74$	3	
30.64		2.915	024	3		60.73	60.74	1.524	$\bar{4}62$	9	8
32.24	32.26	2.774	$\bar{1}34$	42	38	60.83		1.521	174	3	
34.26	34.40	2.615	222	6	24	61.59	61.58	1.505	280	16	10
34.39		2.606	$\bar{3}14$	22		62.83	62.84	1.478	$\bar{5}18$	5	3
34.68	34.70	2.584	$\bar{2}42$	43	57	63.24	63.24	1.469	530	4	4
34.71		2.582	114	23		63.44	63.44	1.465	118	2	6
35.14	35.14	2.551	310	12	12	63.44		1.465	$\bar{1}76$	4	
35.85	35.86	2.502	240	3	3	63.91	63.92	1.455	246	9	8
36.27	36.28	2.474	150	1	1	64.07	64.06	1.452	460	4	6
37.05	37.06	2.425	$\bar{1}52$	12	10	64.82	64.82	1.437	604	6	5
37.47	37.48	2.398	$\bar{3}32$	6	6	65.32	65.32	1.427	404	5	4
38.58	38.58	2.332	$\bar{1}16$	14	12	66.71	66.72	1.401	372	3	3
39.69	39.70	2.269	$\bar{3}34$	12	10	67.33	67.36	1.390	$\bar{5}56$	4	4
39.98	39.98	2.253	134	10	9	67.47	67.48	1.387	$\bar{2}68$	5	5
40.36	40.36	2.233	$\bar{2}26$	4	8	67.74	67.66	1.382	512	2	3
40.36		2.233	330	4		68.77	68.78	1.364	$\bar{6}22$	4	3
40.68	40.68	2.216	152	15	13	68.92	68.94	1.361	$\bar{4}2.10$	4	4
41.50	41.50	2.174	060	21	18	69.89	69.90	1.345	$\bar{1}94$	7	4
41.82	41.82	2.158	$\bar{3}16$	5	6	71.16	71.16	1.324	532	4	3
42.03	42.02	2.148	242	9	9	71.41	71.40	1.320	$\bar{1}310$	4	4
42.28	42.28	2.136	$\bar{4}02$	8	8	71.57	71.58	1.317	208	3	4
42.64	42.66	2.118	$\bar{4}04$	7	8	71.88	71.88	1.312	$\bar{2}410$	4	3
42.76	42.76	2.113	$\bar{1}54$	8	11	72.38	72.52	1.305	0100	2	3
43.04	43.10	2.100	204	3	12	72.52		1.302	266	2	
43.10		2.097	312	12		73.18	73.18	1.292	$\bar{4}84$	8	6
43.45	43.46	2.081	$\bar{1}36$	6	6	73.47	73.44	1.288	284	6	6
43.86	43.88	2.062	062	8	9	73.83	73.84	1.282	$\bar{6}42$	4	4
43.89		2.061	026	4		73.98	74.00	1.280	$\bar{4}.4.10$	5	5
44.60	44.60	2.030	$\bar{4}22$	6	5	74.49	74.48	1.273	$\bar{3}94$	2	2
44.95	44.96	2.015	$\bar{4}24$	15	12	77.80	77.80	1.227	552	2	2
45.34	45.34	1.999	224	9	8	79.17	79.18	1.209	$\bar{2}88$	2	3
46.42	46.50	1.955	$\bar{3}36$	9	12	79.95		1.199	$\bar{6}64$	2	0
46.50		1.951	400	9		80.13	80.18	1.197	$\bar{2}610$	2	5
46.93	46.94	1.934	$\bar{2}62$	6	6	80.22		1.196	$\bar{3}.1.12$	3	
46.99		1.932	$\bar{3}52$	2		81.44	81.46	1.181	$\bar{7}36$	2	2
47.51	47.60	1.912	$\bar{4}06$	3	8	83.50	83.50	1.157	$\bar{4}88$	4	2
47.59		1.909	332	9		83.87	83.86	1.153	088	4	3
48.51	48.52	1.875	116	7	5	85.00	85.02	1.140	1.1.12	2	4
48.86	48.86	1.862	$\bar{3}54$	6	6	85.02		1.140	446	4	
49.10	49.10	1.854	154	8	7	87.79	87.82	1.119	710	3	3
49.43	49.44	1.842	350	4	4	87.87		1.110	$\bar{7}56$	3	
50.30	50.44	1.813	$\bar{2}64$	4	0	89.51	89.52	1.094	1510	3	1
50.41		1.809	064	3	14	92.97	93.12	1.062	590	2	3
50.43		1.808	046	11		93.11		1.061	$\bar{5}610$	3	
50.64	50.64	1.801	$\bar{2}08$	18	16	93.62		1.056	$\bar{2}108$	2	0
51.07	51.08	1.787	$\bar{4}42$	12	10	109.54	109.70	0.943	$\bar{5}514$	2	1
52.09	52.10	1.754	$\bar{1}56$	2	2						

measured on a Norelco diffractometer. Two curves relating half-width to 2θ were established from measured traces of well-crystallized Si and 0.03μm Al_2O_3.[1] A proportionality constant was found by measuring the half-width, on experimental feldspar patterns. For computation of I_{PK} in the tables, we have used a value of 0.13° at 40° 2θ on the assumption that it is a good approximation of the half-width in *average* patterns. Half-widths at other values of 2θ were obtained by interpolation or extrapolation from the two experimentally determined curves. The patterns displayed in Figures 1–6 are computed on the basis of the smaller half-width (0.11° at 40° 2θ) and are slightly better resolved especially at high diffraction angles than those based on 0.13°.

An absolute scale factor (ASF) is listed for each feldspar in Table 1. It is a conversion factor by which the tabulated, relative I_{INT} can be placed on an absolute scale, e.g. for use in quantitative analysis. As used in this paper $ASF = I_1/V^2 I_{REL}$ where I_1 is the actual calculated value of the intensity which takes into account multiplicity, $|F|^2$, temperature factors, the Lorentz-polarization correction and the portion of the absorption correction that is angularly dependent; $I_{REL} = I_{INT}$, μ is the linear absorption coefficient; V is cell volume.

Peak height intensities are determined from the simulated traces. Where overlap of adjacent peaks occurs, the reported peak height intensity reflects the sum of all individual contributions at that $2\theta_{PK}$. Both K_{α_1} and $K_{\alpha 2}$ components of the intensity contribute to the simulated trace. With their increased separation with increasing 2θ, the $K_{\alpha 2}$ components overlap K_{α_1} of other *hkl* reflections and commonly produces higher peak maxima than would otherwise be expected. Because of the rapid increase of the half-widths and the density of peaks in the back-reflection region, individual peaks are rarely identifiable.

In preparing the accompanying tables,[2] both integrated and peak height intensities were normalized to a maximum of 100. Then only reflections whose integrated intensities met the following conditions were included: Tables 2–4, for $2\theta < 45°$, $I_{hkl} \geq 1.0$, for $2\theta > 45°$, $I_{hkl} \geq 1.5$ and for $2\theta > 60°$, $I_{hkl} \geq 2.0$. Tables 5–8, for $2\theta < 45°$, $I_{hkl} \geq 0.5$, for $2\theta > 45°$, $I_{hkl} \geq 1.0$, and for $2\theta > 60°$, $I_{hkl} \geq 1.5$. Recorded $2\theta_{PK}$ and I_{PK} values, however, take all contributing reflections into account whether or not they meet the above criteria for inclusion in these tables. The $2\theta_{PK}$ listed in

[1] The curves were based on data measured with 1° divergence and anti-scatter slits over the whole range, and a 0.003-in. receiving slit.

[2] To obtain a copy of the unabridged tables, order NAPS Document #00181 from ASIS National Auxiliary Publications Service, c/o CCM Information Sciences, Inc., 22 West 34th Street, New York, New York 10001; remitting $1.00 for microfiche or $3.00 for photocopies, payable to ASIS-NAPS.

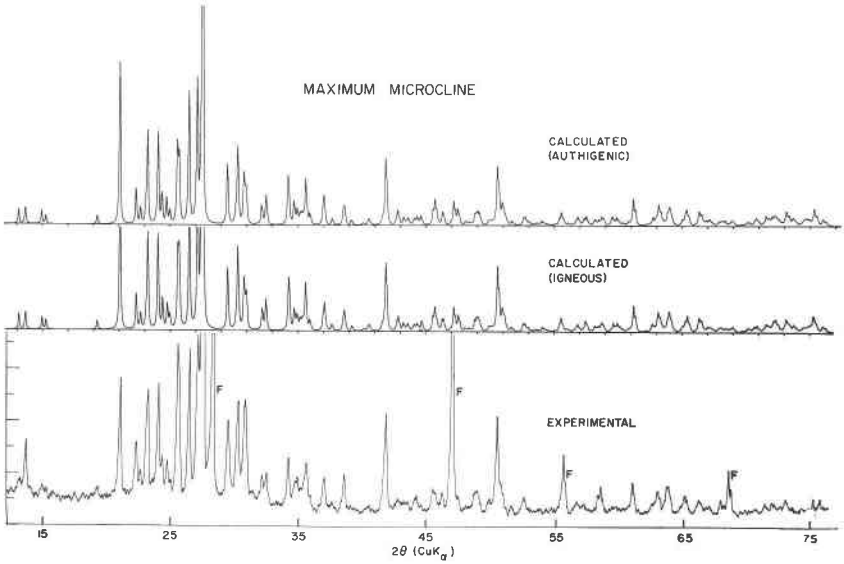

FIG. 1. Calculated and measured patterns for maximum microcline, CuK$_\alpha$. Blue Mtn., Ontario microcline, $a=8.578$, $b=12.961$, $c=7.221$, $\alpha=90°\ 39.9'$, $\beta=115°\ 58.7'$, $\gamma=87°\ 38.2'$. Measured pattern and cell parameters by D. B. Stewart. F = fluorite.

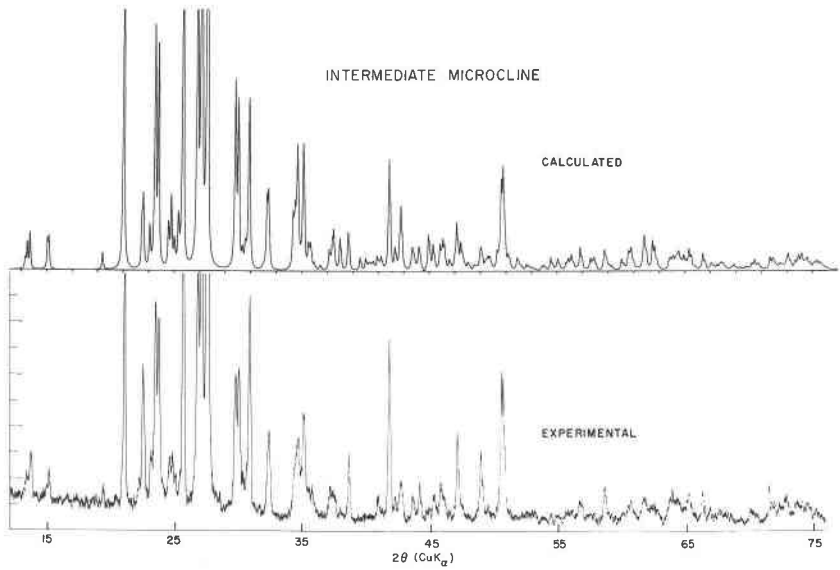

FIG. 2. Calculated and measured patterns for intermediate microcline, CuK$_\alpha$. Spencer U, $a=8.578$, $b=12.957$, $c=7.213$, $\alpha=90°\ 15.1'$, $\beta=116°\ 1.6'$, $\gamma=89°\ 13.5'$-(Wright and Stewart, 1968). Measured patterns by D. B. Stewart.

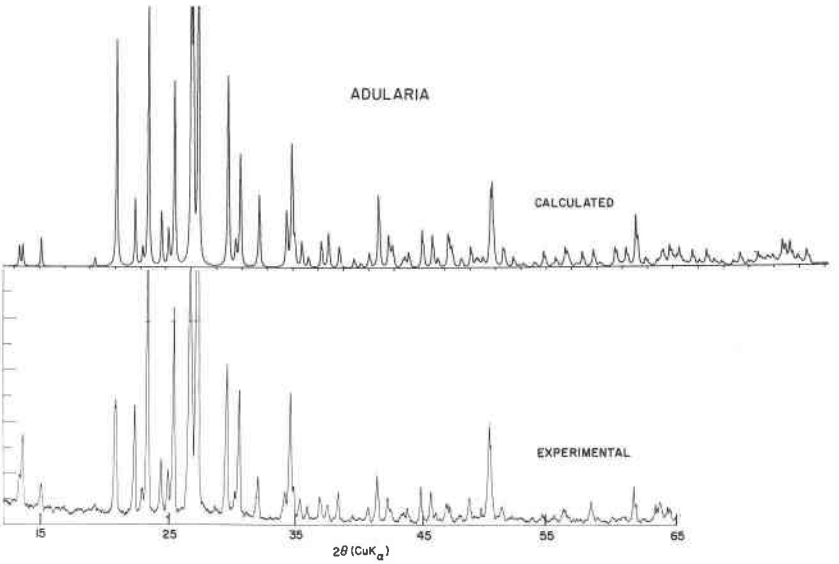

FIG. 3. Calculated and measured patterns for adularia, CuK_α. Spencer B; parameters given in Table 1. Measured pattern by D. B. Stewart.

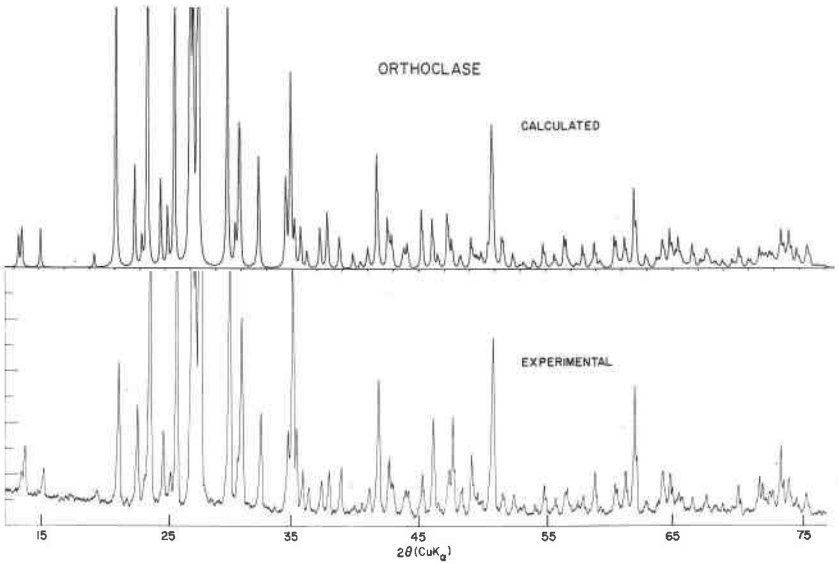

FIG. 4. Calculated and measured patterns for orthoclase, CuK_α. Spencer C equivalent from Bearpaw Mts., Mont. $a=8.561$, $b=12.995$, $c=7.194$, $\beta=115°\ 59.6'$ (Wright and Stewart, 1968). Measured pattern by D. B. Stewart.

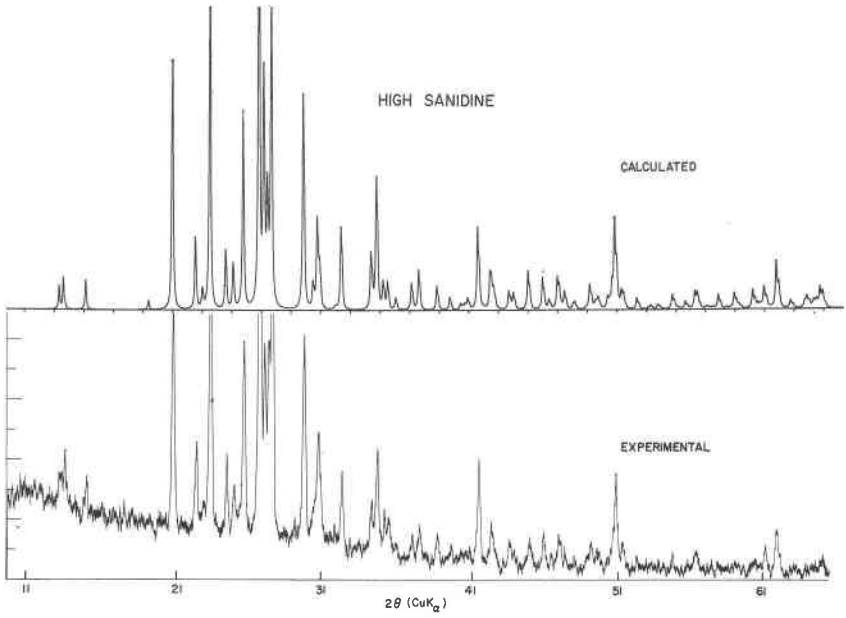

FIG. 5. Calculated and measured patterns for high sanidine, CuK_α. Or_{100} synthesized from glass, 800°C, 2 kbars, 1 week. $a=8.603$, $b=13.021$, $c=7.178$, $\beta=116°\ 0.6'$. Measurements and cell parameters by D. B. Stewart.

the tables is the position of the intensity maximum in the simulated trace *nearest* to the ideal $2\theta_{hkl}$. The I_{PK} listed is found by the computer from the digital representation of the simulated trace. By starting at the ideal $2\theta_{hkl}$ the computer searches for the nearest intensity maximum (I_{PK}) by moving in the direction of increasing intensity. The $2\theta_{PK}$ is the position corresponding to that I_{PK}. Under some conditions the position of I_{PK} may be more than one half-width from the initial $2\theta_{hkl}$. When this occurs,

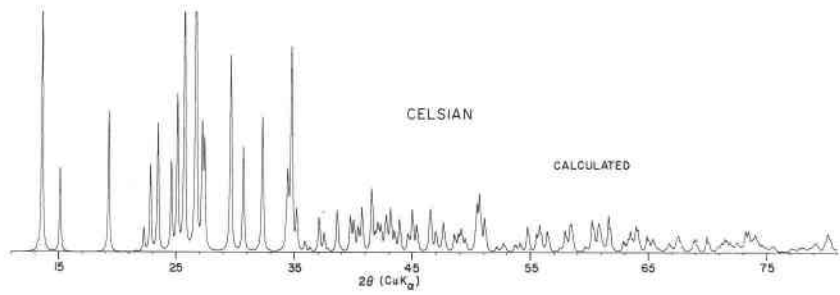

FIG. 6. Calculated pattern for celsian, CuK_α. Parameters as in Table 1.

the *hkl* is considered to be unresolved, and the corresponding I_{PK} is set to 0, e.g. 040 in Table 6. To emphasize that the *hkl* does in fact influence I_{PK} of the nearest peak to some degree, the appropriate $2\theta_{hkl}$'s are bracketed, e.g. 27.43° and 27.58° 2θ in Table 6.

In most instances the listed *hkl*'s, i.e. those that pass the I_{INT} test for inclusion, make the largest contribution to the intensity of the associated peak. However in some instances (e.g. 2.12.3 at 118.42° 2θ, Table 5, $\bar{2}64$ at 67.26° 2θ, Table 3, and 600 at 73.84° 2θ in Table 6) its contribution may be negligible with respect to the total contribution of several overlapping weaker reflections. $2\theta_{PK}$'s are located to the nearest 0.02° 2θ. All $2\theta_{hkl}$ values are based on $\lambda = 1.54050$ (CuK_{α_1}).

Table 9 contains a summary of the indices associated with the five strongest I_{INT} and I_{PK} computed for each pattern. The values of the intensities are given in parentheses. The problem of overlap in complex patterns is evident in the data of Table 9. Not only do weak reflections superimpose to produce strong peaks, but as cell dimensions change, the degree of overlap also changes and the patterns show distinct shifts in relative intensities for similar peaks.

TABLE 9. INDICES AND INTENSITIES OF FIVE STRONGEST CALCULATED REFLECTIONS (I_{INT}) AND PEAKS (I_{PK}), $CuK\alpha_1$

	I_{INT}					I_{PK}				
	1	2	3	4	5	1	2	3	4	5
Igneous Maximum Microcline	002 (100)	$\bar{2}01$ (76)	$\bar{2}02$ (73)	220 (67)	$\bar{2}20$ (62)	{$\bar{2}20$ 002 040} (100)	$\bar{2}01$ (51)	$\bar{2}02$ (48)	220 (41)	130 (30)
Authigenic Maximum Microcline	002 (100)	$\bar{2}01$ (74)	$\bar{2}02$ (72)	220 (67)	$\bar{2}20$ (62)	{$\bar{2}20$ 002 040} (100)	$\bar{2}01$ (54)	$\bar{2}02$ (51)	220 (45)	130 (32)
Intermediate Microcline	002 (100)	201 (74)	$\bar{2}02$ (73)	$\bar{2}20$ (70)	220 (67)	{220 $\bar{2}02$} (100)	{002 040} (96)	$\bar{2}01$ (58)	$\bar{2}20$ (53)	{$\bar{1}\bar{1}2$ $\bar{1}12$} (47)
Adularia	220 (100)	002 (78)	130 (72)	$\bar{2}01$ (59)	131 (57)	220 (100)	{040 002} (100)	$\bar{2}02$ (75)	130 (72)	$\bar{2}01$ (61)
Orthoclase	220 (100)	002 (78)	130 (74)	131 (59)	$\bar{2}02$ (59)	220 (100)	002 (82)	130 (75)	$\bar{2}02$ (67)	$\bar{2}01$ (61)
High Sanidine	220 (100)	002 (77)	130 (76)	$\bar{2}02$ (59)	$\bar{2}01$ (57)	220 (100)	130 (79)	002 (77)	$\bar{2}02$ (66)	$\bar{2}01$ (62)
Celsian	220 (100)	$\bar{1}14$ (76)	132 (59)	020 (44)	$\bar{2}42$ (43)	220 (100)	{020 002} (80)	$\bar{1}14$ (78)	{$\bar{2}42$ 114} (57)	132 (55)

Discussion of Results

Calculated powder patterns are displayed in Figures 1–6 together with diffractometer traces of comparable or identical K-feldspars.[1] The agreement between the calculated and experimental patterns is best for synthetic high sandine (Fig. 5); this agreement is analogous to best matches between experimental patterns from synthetic plagioclases and their calculated counter-parts (Borg and Smith, 1968). The purity of the materials and their fine grain size have minimized preferred orientations and eliminated the chief sources of discrepancy. Nonetheless, there is good agreement between all juxtaposed patterns. Preferred orientation related to cleavage would be expected to enhance intensities of $00l$, $0k0$ and $0kl$ peaks and to diminish those of $h00$, and to lesser extent $h0l$ and $hk0$ in the experimental patterns relative to the calculated; however the effect of preferred orientation on intensity of general hkl planes is less predictable. Differences in peak heights tend to follow the general pattern, e.g., 201 and $\bar{2}01$ are consistently low in all experimental traces, and the 001–020 peak is consistently high. In Figure 4, the difference in relative peak heights at $2\theta \simeq 47.3°$ is again related to preferred orientation. In the experimental pattern, $\bar{4}03$ is stronger than 400 whereas the converse is true in the calculated pattern. Other differences such as $1\bar{1}1$ and/or 111 peaks in Figures 2 and 3 ($2\theta \simeq 22.5°$) are not easily explained.

Peak resolution is superior in the calculated patterns and can be improved by plotting on expanded scales. This is comparable in diffractometry to scanning at a slower speed and higher time constants. The calculated traces do not take into account the common diffractometry practice of changing to larger divergence and antiscatter slits at higher 2θ values. For greater resolution in the back reflection regions, the Debye-Scherrer technique may be more useful because of 1) the different relationship between half-width and 2θ and 2) the intensity enhancement due to the lower absorption effect in the back reflections than in the front reflections.

The calculated K-feldspar patterns readily illustrate criteria whereby the various polymorphs can be distinguished and aid indexing of observed peaks prior to data reduction leading to precise cell and obliquity parameters. There is continuous variation between adjacent K-feldspars of Table 1, and the distinction, for example, between a low sanidine and orthoclase can be difficult. Nonetheless, clear qualitative differences in powder patterns of the end members permit them to be recognized at a

[1] All experimental patterns are by D. B. Stewart who used glass slide mounts, CuK_α radiation, pulse-height discrimination, and the following instrumental settings: 45 kV, 20 mA, 2°/min TC = 4 sec, 0.006-in. receiving slits, and 1° divergent and anti-scatter slits.

glance. Patterns of the triclinic K-feldspars are distinguished from the monoclinic by splitting of related reflections such as 130–$\bar{1}$30 and 131 and 1$\bar{3}$1. The splitting increases with obliquity as a result of Al/Si order. The pattern of monoclinic high sanidine differs from those of adularia and orthoclase by the presence of four rather than three distinct peaks corresponding to 220, $\bar{2}$02, 040 and 002 near $2\theta \backsim 27°$. The 002 and 040 reflections in orthoclase are, in fact, separated by 0.15° (Table 10) but they are not clearly resolved in either the experimental or calculated patterns. Because of the effect of Al/Si ordering on cell parameters, the spacing between these two lines is a measure of the degree of Al/Si order in the monoclinic varieties; all other variables such as Na-content being equal. The proposal to use c^*/b^* ratios to assess Al/Si order in both mono-

TABLE 10. SEPARATION OF 002 AND 040 IN MONOCLINIC K-FELDSPARS

hkl	High Sanidine	Orthoclase	Adularia
	2θ (peak)	2θ (peak)	2θ (peak)
220	26.88	26.91	26.94
$\bar{2}$02	27.18	27.14	27.10
040	27.35	27.58	27.52
002	27.64		
$\Delta 2\theta$ 040 – 002	0.29°	0.15°	0.04°
for $CuK_{\alpha 1}$	4 peaks	3 peaks	3 peaks

clinic and triclinic varieties (Jones, 1966) must by necessity, be based on calculated 002 and 040 spacings since they are commonly unresolved in all triclinic and some monoclinic varieties.

Many other parameters, based on unit-cell size and shape have been suggested to estimate Al/Si disorder. Separations of 130 and $\bar{1}$30 or 131 and 1$\bar{3}$1 in triclinic varieties have proven useful in part due to the fact that these reflections are strong, and there is little or no interference from adjacent reflections at any composition. In maximum microcline, 200 overlaps 130 (Orville, 1967, p. 83) but the relative intensities 7:44, together with the probable greater diminution of 200 than 130 with any degree of preferred orientation, minimizes the problem. Other pairs of *hkl* reflections, e.g., $\bar{2}$80 and 280 or 222 and 2$\bar{2}$2, might be proposed as suitable criteria for the determination of Si/Al order on the basis of the data in Tables 2–7. By virtue of their larger separation, they are more sensitive to changes in obliquity although they are generally moderate to weak reflections.

Wright's (1968) "three-peak" method for determining composition and structural state in K-feldspars is based on the positions of $\bar{2}$01, 060

and $\bar{2}04$. From Tables 2–7, it can be seen that $\bar{2}01$ and 060 are, for all practical purposes, not overlapped by other *hkl*'s. On the other hand, $\bar{2}04$ may be overlapped and its 2θ position affected by as many as four unresolvable and weak *kl*0 and *hkl* reflections (maximum microcline), the total of whose intensity in a randomly oriented mount approaches that of $\bar{2}04$ (orthoclase). Clearly, it is desirable to eliminate preferred orientation in a sample before measuring the precise positions of these peaks. Otherwise the likely diminution of the *h*0*l*'s, particularly of $\bar{2}04$, and enhancement of 0*kl*'s may introduce unnecessary difficulties in both their recognition and measurement.[1]

Acknowledgments

We are grateful to Professor P. H. Ribbe for his advice and for making his and A. A. Colville's refinements of orthoclase and adularia available before publication. We are indebted to D. B. Stewart for comments and for use of his unpublished diffractometry data.

Note added in proof—The crystallographic setting used by Bailey and Taylor (1955) is in the old setting for intermediate microcline, and the resulting Miller indices are inconsistent with modern usage. The proper setting $\alpha(\text{new}) = 180° - \alpha(\text{old})$, $\gamma(\text{new}) = 180° - \gamma(\text{old})$, results in an indexing change from *hkl* to $h\bar{k}\bar{l}$, and all indices in Table 4 should be changed accordingly.

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[1] In practice, such difficulties are rarely encountered (D. B. Stewart, personal communication); however, they remain potential problems in the maximum microcline.

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