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ภาคผนวก

09-0080 — Wavelength= 1.54056

CaPO3(OH)

Calcium Hydroxide Phosphate

Monetite, syn

Rad.: CuKa1 λ: 1.5405 Filter: d-sp: Guinier 114.6

Cut off: 50.0 Int.: I/Icor.:

Ref: de Wolff, P., Technisch Physische Dienst, Delft, The Netherlands, ICDD Grant-in-Aid, (1957)

Sys.: Triclinic S.G.: P1 (2)

a: 6.906 b: 8.577 c: 6.634 A: 0.8052 C: 0.7735

α: 93.99 β: 91.50 γ: 127.6 Z: 4 mp:

Ref: MacLennan, Beevers, Acta Crystallogr., 8, 579 (1955)

Dx: 2.921 Dm: 2.900 SS/FOM $_{30}$=26(.026, 45)

εα: 1.60 ηωβ: 1.61 εγ: 1.63 Sign: 2V: 60(15)°

Ref: Bale, Bonner, Hodge, Ind. Eng. Chem., Anal. Ed., 17, 491 (1945)

Color: Light yellowish white

Dana's System of Mineralogy, 7th Ed., II 660. Dehydrated Ca H P O4 ½2 H2 O. Weilite is the As analogue. C.D. Cell: a=6.906, b=6.998, c=6.634, α=96.38, β=91.50, γ=76.17, a/b=0.9868, c/b=0.9479, S.G.=P-1(2). PSC: aP28. To replace 1-653. Mwt: 136.06. Volume[CD]: 309.40.

2θ	Int	h	k	l
13.125*	14	0	1	0
16.311*	4	1	$\bar{0}$	0
17.760*	4	0	$\bar{1}$	1
19.801*	2	0	1	1
20.258*	4	$\bar{1}$	0	1
20.785*	4	1	2	0
22.038*	4	1	$\bar{0}$	1
24.032*	4	$\bar{1}$	2	1
25.576*	14	1	2	1
26.426*	70	0	$\bar{2}$	0
26.586*	75	$\bar{2}$	2	0
26.749*	16	2	1	0
26.997*	10	0	$\bar{1}$	2
28.493*	20	1	$\bar{1}$	1
28.775*	6	0	$\bar{2}$	2
29.899*	2	$\bar{2}$	2	1
30.188*	100	1	1	2
30.409*	35	1	$\bar{0}$	2
30.677*	4	2	$\bar{1}$	1
31.015*	8	0	2	1
31.170*	4	1	1	1
31.440*	2	0	$\bar{1}$	2
32.375*	10	$\bar{1}$	3	0
32.484*	20	2	3	0
32.889*	35	1	$\bar{0}$	2
34.728*	4	$\bar{2}$	3	1
35.422*	4	1	$\bar{2}$	2
35.906*	16	0	$\bar{2}$	2
36.055*	2	1	1	2
36.758*	2	$\bar{2}$	0	1
37.264*	2	2	1	2
38.251*	4	2	$\bar{2}$	2
39.045*	10	1	$\bar{2}$	0
39.365*	2	2	1	$\bar{2}$
40.021*	16	0	3	0
40.189*	6	0	2	2
40.339*	10	1	$\bar{1}$	2
40.681*	4	1	3	2
41.010*	12	$\bar{0}$	0	3
41.206*	4	3	$\bar{2}$	1
41.784*	12	0	1	3
42.214*	6	2	$\bar{4}$	0
42.674*	8	3	3	1
42.930*	4	1	$\bar{2}$	1
43.275*	6	$\bar{1}$	$\bar{2}$	3
43.692*	4	$\bar{2}$	3	2
44.553*	6	1	3	2
44.996*	2	$\bar{1}$	$\bar{2}$	3
45.401*	6	$\bar{1}$	2	2
45.642*	6	3	4	0
46.308*	2	$\bar{2}$	$\bar{1}$	1
46.890*	2	$\bar{1}$	1	3
47.436*	16	$\bar{3}$	2	2
48.238*	2	$\bar{3}$	$\bar{4}$	1
48.678*	6	2	$\bar{1}$	2
49.211*	20	$\bar{2}$	2	2
49.640*	4	3	1	2
50.703*	6	$\bar{1}$	2	2
50.915*	4	3	0	1
51.532*	2	0	3	2
52.068*	6	1	1	3
52.616*	4	1	3	0
53.044*	20	3	$\bar{1}$	2
53.784*	2	$\bar{2}$	1	2
54.196*	6	$\bar{2}$	5	0
54.440*	6	2	$\bar{3}$	3
54.616*	6	0	$\bar{4}$	1
55.042*	4	$\bar{4}$	2	0
55.585*	6	3	$\bar{0}$	2
55.916*	6	0	$\bar{1}$	4
56.781*	2	$\bar{1}$	0	4
57.205*	6	2	5	1

09-0077 Wavelength= 1.54056

CaPO3(OH)n2H2O

Calcium Phosphate Hydroxide Hydrate

Brushite, syn

Rad.: CuKa1λ: 1.5405 Filter: d-sp: Debye-Sheerrer

Cut off: Int.: I/Icor.:

Ref: de Wolff, P., Technisch Physische Dienst, Delft, The Netherlands, ICDD Grant-in-Aid

Sys.: Monoclinic S.G.: Cc (9)

a: 6.363 b: 15.19 c: 5 815 A: 0.4189 C: 0.3828

α: β: 118.5 γ: Z: 4 mp:

Ref: Ibid.

Dx: 2.314 Dm: 2.306 SS/FOM$_{3C}$=68(.0119 37)

εα: 1.539 ηωβ: 1.545 εγ: 1.551 Sign:+ 2V: 87°

Ref: Bale, Bonner, Hodge, Ind. Eng. Chem., Anal. Ed., 17, 491 (1945)

Color: Colorless, light yellow

Dana's System of Mineralogy, 7th Ed., II 704. Beevers, Acta Crystallogr., 11 273-277 (1958) reports: a=5.812, b=15.80, c=6.239, β=116.25, S.G.=`I2/a`; a=6.359, b=15.180, c=5.182, β=118.31, S.G.=`C2/c` in the setting used here. Gypsum group, pharmacolite subgroup. C.D. Cell: a=6.244, b=15.190, c=5.815, β=116.42, a/b=0.4111, c/b=0.3828, S.G.=Ia(9). PSC: mC52. Plus additional reflections. Mwt: 172.09. Volume[CD]: 493.93.

2θ	Int	h	k	l	2θ	Int	h	k	l
11.680	100	0	2	0	49.070*	<1	1	3	2
17.978*	2	1	1	1	50.107*	20	2	4	1
20.934	100	0	2	1	50.703*	10	0	6	2
23.390*	8	0	4	0	51.283*	4	0	8	1
23.707*	<1	1	3	0	52.292*	2	3	3	0
24.502*	2	1	3	1					
29.257*	75	0	4	1					
30.505*	50	2	2	1					
31.305*	10	1	1	2					
31.971*	2	2	0	0					
33.536*	4	1	5	0					
33.823*	4	1	3	1					
34.155*	50	2	2	0					
34.425*	30	2	0	2					
35.107*	4	0	0	2					
35.422*	2	0	6	0					
35.597*	4	1	3	2					
36.899*	14	2	4	1					
37.104*	16	0	2	2					
39.709*	4	0	6	1					
40.003*	2	2	4	0					
41.543*	20	1	5	1					
42.029*	16	2	4	2					
42.611*	2	0	4	2					
43.037*	6	1	5	2					
43.384*	10	3	1	1					
44.785*	4	1	7	0					
45.281*	10	1	7	1					
45.886*	6	1	1	2					
46.711*	2	3	3	1					
47.860*	2	0	8	0					
48.157*	4	1	1	3					
48.430*	14	2	6	0					
48.985*	8	2	2	3					

09-0347

Wavelength= 1.54184

Ca(H2PO4)2·H2O

Calcium Hydrogen Phosphate Hydrate

Rad.: CuKα1 λ: 1.5405 Filter: d-sp: Guinier 114.6

Cut off: 50.0 Int.: Film I/Icor.:

Ref: de Wolff, P., Technisch Physische Dienst, Delft, The Netherlands, ICDD Grant-in-Aid

Sys.: Triclinic S.G.:

a: 6.250 b: 11.892 c: 5.629 A: 0.5256 C: 0.4733

α: 96.67 β: 114.2 γ: 92.95 Z: 2 mp:

Ref: Ibid.

Dx: 2.222 Dm: 2.220 SS/FOM30=44(.0152, 45)

εα: 1.501 ηωβ: 1.518 εγ: 1.528 Sign: 2V:

Ref: Bale, Bonnier, Hodge, Ind. Eng. Chem., Anal. Ed., 17, 491 (1945)

Commercial sample, recrystallized. To replace 1-471. Mwt: 252.07. Volume[CD]: 376.75.

2θ	Int	h	k	l	2θ	Int	h	k	l
7.556	75	0	1	0	33.799	4	$\bar{1}$	1	2
15.145	10	0	2	0	33.957	2	$\bar{1}$	$\bar{2}$	2
15.657	16	1	0	0	34.702	12	$\bar{1}$	$\bar{4}$	1
16.601	2	$\bar{1}$	1	0	35.052	20	0	$\bar{1}$	2
17.956	10	0	$\bar{1}$	1	35.380	2	0	0	2
18.104	20	1	1	0	36.328	8	$\bar{2}$	0	2
19.086	4	$\bar{1}$	$\bar{1}$	1	36.650	16	2	2	0
20.089	16	0	1	1	37.120	8	$\bar{1}$	2	2
20.559	10	$\bar{1}$	2	0	37.376	10	0	1	2
21.359	14	0	$\bar{2}$	1	37.603	10	$\bar{2}$	$\bar{3}$	1
22.921	100	$\bar{1}$	$\bar{2}$	1	38.352	4	0	5	0
24.118	90	$\bar{1}$	2	1	38.764	4	$\bar{2}$	$\bar{2}$	2
24.871	14	0	2	1	39.238	4	1	3	1
26.211	6	$\bar{1}$	3	0	39.780	2	0	$\bar{5}$	1
26.609	16	0	$\bar{3}$	1	40.261	4	$\bar{2}$	2	2
27.970	16	1	$\bar{1}$	1	40.813	4	0	2	2
28.060	14	1	0	1	41.861	8	$\bar{2}$	4	1
28.333	10	$\bar{1}$	$\bar{3}$	1	42.086	8	$\bar{1}$	$\bar{4}$	2
28.990	8	$\bar{2}$	0	1	42.564	6	2	0	1
29.822	25	$\bar{1}$	3	1	43.139	4	2	$\bar{2}$	1
30.277	30	1	1	1	43.488	10	0	$\bar{4}$	2
30.456	10	0	4	0	44.270	4	1	$\bar{5}$	1
31.581	12	2	0	0	44.848	10	1	0	2
32.104	10	$\bar{1}$	$\bar{1}$	2	45.441	20	$\bar{3}$	2	1
32.830	10	0	$\bar{4}$	1	46.373	8	$\bar{3}$	0	2
33.333	14	2	1	0	46.778	12	$\bar{2}$	$\bar{4}$	2
33.474	6	1	$\bar{3}$	1	46.983	10	$\bar{3}$	$\bar{1}$	2
33.577	25	$\bar{2}$	2	0	47.216	8	1	$\bar{3}$	2

2θ	Int	h	k	l
48.390	2	$\bar{3}$	3	1
48.638	4	0	$\bar{5}$	2
48.888	2	$\bar{1}$	$\bar{1}$	3
49.141	2	2	$\bar{4}$	1
49.397	4	$\bar{2}$	$\bar{5}$	1
49.800	6	$\bar{1}$	$\bar{2}$	3
50.961	12	$\bar{3}$	$\bar{3}$	1
51.329	4	$\bar{3}$	3	0
51.892	8	1	5	1
52.436	8	$\bar{3}$	4	1
53.191	4	$\bar{2}$	$\bar{3}$	3
53.832	10	2	$\bar{5}$	1

09-0432 Wavelength= 1.54056

$Ca_5(PO_4)_3(OH)$

Calcium Phosphate Hydroxide

Hydroxylapatite, syn

Rad.: CuKa1 λ: 1.5405 Filter: d-sp: Debye-Sheerrer

Cut off: Int.: I/Icor.:

Ref: de Wolff, P., Technisch Physische Dienst, Delft, The Netherlands, ICDD Grant-in-Aid

Sys.: Hexagonal S.G.: $P6_3/m$ (176)

a: 9.418 b: c: 6.884 A: C: 0.7309

α: β: γ: Z: 2 mp:

Ref: Ibid.

Dx: 3.155 Dm: 3.080 SS/FOM$_{30}$=54(.0158, 35)

εα: ηωβ: 1.651 εγ: 1.644 Sign: 2V:

Ref: Dana's System of Mineralogy, 7th Ed., II, 879

Color: Green, bluish green, yellow-green, grayish green, violet. Sample obtained following the procedure indicated by Hodge et al., Ind. Eng. Chem. Anal. Ed., 10 156 (1938). CAS #: 1306-06-5. I/I1 are peak values from a pattern which shows slight broadening of prism reflections. Validated by calculated data 24-33. Apatite group, apatite subgroup. PSC: hP44. To replace 34-10. Mwt: 502.32. Volume[CD]: 528.80.

2θ	Int	h	k	l	2θ	Int	h	k	l
10.820*	12	1	0	0	58.073*	4	5	0	1
16.841*	6	1	0	1	59.938*	6	4	2	0
18.785*	4	1	1	0	60.457*	6	3	3	1
21.819*	10	2	0	0	61.660*	10	2	1	4
22.902*	10	1	1	1	63.011*	12	5	0	2
25.354*	2	2	0	1	63.443*	4	5	1	0
25.879*	40	0	0	2	64.078*	13	3	0	4
28.126*	12	1	0	2	64.078*	13	3	2	3
28.966*	18	2	1	0	65.031*	9	5	1	1
31.773*	100	2	1	1	66.386*	4	4	2	2
32.196*	60	1	1	2	66.386*	4	4	1	3
32.902*	60	3	0	0	69.699*	3	5	1	2
34.048*	25	2	0	2	71.651*	5	4	3	1
35.480*	6	3	0	1	71.651*	5	4	0	4
39.204*	8	2	1	2	72.286*	4	5	2	0
39.818*	20	3	1	0	72.286*	4	2	0	5
40.452*	2	2	2	1	73.995*	7	4	2	3
42.029*	10	3	1	1	75.022*	3	3	2	4
42.318*	4	3	0	2	75.022*	3	6	0	2,
43.804*	8	1	1	3	75.583*	9	2	1	5
44.369*	2	4	0	0	76.154*	1	4	3	2
45.305*	6	2	0	3	77.175*	11	5	1	3
46.711*	30	2	2	2	78.227*	9	5	2	2
48.103*	16	3	1	2					
48.623*	6	3	2	0					
49.468*	40	2	1	3					
50.493*	20	3	2	1					
51.283*	12	4	1	0					
52.100*	16	4	0	2					
53.143*	20	0	0	4					
54.440*	4	1	0	4					
55.879*	10	3	2	2					
57.128*	8	3	1	3					

09-0169 — Wavelength= 1.54056

Ca3(PO4)2

Calcium Phosphate

Whitlockite, syn

Rad.: CuKa1 λ: 1.5405 Filter: Mono d-sp: Guinier I 14.6

Cut off: 50.0 Int.: Film I/Icor.:

Ref: de Wolff, P., Technisch Physische Dienst, Delft, The Netherlands, ICDD Grant-in-Aid, (1957)

Sys.: Rhombohedral S.G.: $R\bar{3}c$ (167)

a: 10.429 b: c: 37.38 A: C: 3.5842

α: β: γ: Z: 21 mp:

Ref: Ibid.

Dx: 3.072 Dm: 3.120 SS/FOM$_{30}$=54(.0147, 38)

εα: 1.626 ηωβ: 1.629 εγ: Sign:- 2V:

Ref: Dana's System of Mineralogy, 7th Ed., II, 684 (1951)

Color: Colorless, white, gray, yellow

Sample obtained by heating a commercial sample. Nearly isostructural with cerite. PSC: hR91. Validated by calculated pattern 42-577. Mwt: 310.18. Volume[CD]: 3520.91.

2θ	Int	h	k	l	2θ	Int	h	k	l
10.847*	12	0	1	2	40.208*	2	0	4	2
13.633*	16	1	0	4	41.088*	14	4	0	4
14.227*	6	0	0	6	41.683*	12	3	0	12
17.004*	20	1	1	0	42.972*	4	1	2	14
18.469*	2	1	1	3	43.560*	8	0	0	18
20.211*	8	2	0	2	43.737*	4	3	2	1
21.393*	4	0	1	8	43.893*	6	2	3	2
21.873*	16	0	2	4	44.530*	10	0	4	8
22.206*	4	1	1	6	44.762*	6	3	2	4
25.802*	25	1	0	10	44.902*	4	3	1	11
26.188*	4	2	1	1	45.305*	8	2	2	12
26.506*	10	1	2	2	46.034*	2	4	1	0
27.420*	8	1	1	9	46.635*	4	4	1	3
27.769*	55	2	1	4	46.968*	20	4	0	10
28.680*	2	1	2	5	47.968*	16	2	3	8
29.655*	16	3	0	0	48.402*	14	4	1	6
31.026	100	0	2	10	49.785*	12	0	1	20
32.448*	20	1	2	8	50.314*	6	3	2	10
33.026*	10	3	0	6	50.733*	6	5	0	2
33.484*	8	1	1	12	51.252*	6	4	1	9
34.371*	65	2	2	0	51.469*	8	0	5	4
34.994*	6	0	1	14	52.616*	4	3	3	0
35.121*	8	2	2	3	52.944*	25	2	0	20
35.597*	12	2	1	10	53.512*	8	3	0	18
35.906*	6	1	3	1	54.405*	8	5	0	8
37.328*	10	1	2	11	55.114*	4	4	1	12
37.850*	6	3	1	5	56.139*	6	2	3	14
39.800*	10	1	0	16	56.591*	6	2	2	18
40.058*	4	1	1	15	57.439*	6	4	2	8

2θ	Int	h	k	l
57.557*	4	5	1	4
59.513*	12	5	1	7
60.370*	4	1	5	8
60.897*	4	2	1	22
61.569*	4	6	0	0
63.443*	6	1	5	11
64.677*	4	0	4	20
65.236*	4	0	5	16
66.016*	4	3	4	8
66.280*	6	5	2	6
67.471*	4	1	5	14

41-1475

Wavelength= 1.54184

CaCO3

Calcium Carbonate

Aragonite

Rad.: CuKa1λ: 1.540598 Filter: Mono d-sp: Diff.

Cut off: Int.: Diffract. I/Icor.: 1.0

Ref: Keller, L., Rask, J., Buseck, P., Arizona State Univ., Tempe, AZ, USA, ICDD Grant-in-Aid, (1989)

Sys.: Orthorhombic S.G.: Pmcn (62)

a: 4.9623(3) b: 7.968(1) c: 5.7439(3) A: 0.6228 C: 0.7209

α: β: γ: Z: 4 mp:

Ref: Ibid.

Dx: 2.927 Dm: 2.950 SS/FOM: F_{30} = 217(.0041 , 34)

εα: 1.5300 ηωβ: 1.6810 εγ: 1.6854 Sign:- 2V: 18(calc.)°

Ref: Dana's System of Mineralogy, 7th Ed., II, 182 (1951)

Color: Colorless

Specimen from Sefrou, Morocco. CAS #: 14791-73-2.

Microprobe analyses (wt.%): major Ca, and trace Sr(<<1).

Optical data on specimen from Bilin, Bohemia, Czechoslovakia. Aragonite group, aragonite subgroup. C.D. Cell: a=5.744, b=7.968, c=4.962, a/b=0.7209, c/b=0.6228, S.G.=Pnam(62). Silicon used as an internal stand. PSC: oP20. To replace 5-453 and validated by calculated pattern 24-25. Mwt: 100.09. Volume[CD]: 227.11.

2θ	Int	h	k	l
21.093	3	1	1	0
22.315	1	0	2	0
26.234	100	1	1	1
27.238	50	0	2	1
31.141	6	0	0	2
32.769	9	1	2	1
33.155	60	0	1	2
36.206	40	2	0	0
37.296	14	0	3	1
37.916	45	1	1	2
38.437	25	1	3	0
38.643	25	0	2	2
41.222	12	2	1	1
41.659	2	1	3	1
42.903	20	1	2	2
42.903	20	2	2	0
45.892	55	2	2	1
46.575	1	0	3	2
48.360	25	0	4	1
48.486	25	2	0	2
48.927	2	0	1	3
49.902	4	2	1	2
50.273	20	1	3	2
51.962	3	1	4	1
52.501	25	1	1	3
52.959	12	2	3	1
53.068	16	0	2	3
53.990	2	2	2	2
56.194	3	0	4	2
56.453	1	1	2	3
56.841	2	3	1	0
59.281	4	3	1	1
60.265	2	0	5	1
61.886	4	2	4	1
62.357	1	2	1	3
62.955	2	3	2	1
63.395	4	1	5	1
64.939	1	0	0	4
65.935	1	2	2	3
66.120	3	0	1	4
66.252	4	3	1	2
66.609	3	3	3	0
67.901	<1	0	4	3
68.699	2	2	4	2
68.837	2	3	3	1
69.109	5	1	1	4
69.606	2	0	2	4
69.724	3	3	2	2
70.147	2	1	5	2
70.912	1	1	4	3
70.912	1	0	6	0
72.368	1	2	5	1
72.516	1	1	2	4
75.340	5	3	3	2
76.006	1	1	6	1
76.685	3	2	0	4
76.685	3	3	4	1
76.838	4	4	0	0
77.140	6	3	1	3
78.038	3	0	5	3
78.038	3	1	3	4
78.774	2	2	5	2
79.478	4	2	4	3
79.478	4	0	6	2
80.839	3	1	5	3
81.053	2	2	2	4
82.339	3	1	6	2
82.339	3	2	6	0
82.934	1	0	4	4
82.934	1	3	4	2
83.301	2	4	2	1
85.204	1	4	0	2
85.380	<1	0	1	5
85.819	1	3	3	3
86.283	1	4	1	2
86.455	2	2	3	4
86.455	2	3	5	1
88.088	2	1	7	0
88.088	2	1	1	5
88.632	1	0	2	5
88.632	1	4	3	1
89.504	<1	4	2	2

05-0586 Wavelength= 1.5405

CaCO3

Calcium Carbonate

Calcite, syn

Rad.: CuKaλ: 1.5405 Filter: Ni BetaM d-sp:

Cut off: Int.: Diffract. I/Icor.: 2.00

Ref: Swanson, Fuyat, Natl. Bur. Stand. (U.S.), Circ. 539, II, 51 (1953)

Sys.: Rhombohedral S.G.: $R\bar{3}c$ (167)

a: 4.989 b: c: 17.062 A: C: 3.4199

α: β: γ: Z: 6 mp:

Ref: Ibid.

Dx: 2.711 Dm: 2.710 SS/FOM$_{30}$=57(.0159, 33)

εα: 1.487 ηωβ: 1.659 εγ: Sign: 2V:

Ref: Dana's System of Mineralogy, 7th Ed., II, 142

Color: Colorless

Pattern taken at 26 C. Sample from Mallinckrodt Chemical Works. CAS #: 13397-26-7. Spectroscopic analysis: <0.1% Sr; <0.01% Ba; <0.001% Al, B, Cs, Cu, K, Mg, Na, Si, Sn; <0.0001% Ag, Cr, Fe, Li, Mn. Other form: aragonite. Pattern reviewed by Parks, J., McCarthy, G., North Dakota State University, Fargo, North Dakota, USA, ICDD Grant-in-Aid (1992). Agrees well with experimental and calculated patterns. Additional weak reflections [indicated by brackets] were observed. Calcite group, calcite subgroup. PSC: hR10. Mwt: 100.09. Volume[CD]: 367.78.

2θ	Int	h	k	l	2θ	Int	h	k	l
23.021	12	0	1	2	102.943	1	2	3	2
29.404	100	1	0	4	103.889	1	[1	3	10]
31.416	3	0	0	6	104.114	3	1	2	14
35.964	14	1	1	0	105.836	2	3	2	4
39.399	18	1	1	3	106.135	4	0	4	8
43.143	18	2	0	2	107.323	<1	0	2	16
47.121	5	0	2	4	109.550	2	4	1	0
47.487	17	0	1	8	110.473	2	2	2	12
48.510	17	1	1	6					
56.551	4	2	1	1					
57.398	8	1	2	2					
58.071	2	1	0	10					
60.674	5	2	1	4					
60.983	4	2	0	8					
61.341	3	1	1	9					
63.056	2	1	2	5					
64.674	5	3	0	0					
65.594	3	0	0	12					
69.226	1	2	1	7					
70.233	2	0	2	10					
72.864	2	1	2	8					
73.723	1	3	0	6					
76.294	1	2	2	0					
77.171	2	1	1	12					
80.926	<1	3	1	2					
81.541	3	2	1	10					
82.107	<1	0	1	14					
83.761	3	1	3	4					
84.781	1	2	2	6					
86.476	<1	1	2	11					
93.064	1	2	0	14					
94.693	3	4	0	4					
95.003	4	3	1	8					
96.157	2	1	0	16					
97.639	<1	2	1	13					
99.152	2	3	0	12					
102.233	<1	3	2	1					

46-1045

Wavelength= 1.5405981

SiO2

Silicon Oxide

Quartz, syn

Rad.: CuKa1 λ: 1.5405 Filter: Ge Mono d-sp: Diffractometer

Cut off: Int.: Diffract. I/Icor.: 3.41

Ref: Kern, A., Eysel, W., Mineralogisch-Petrograph. Inst., Univ. Heidelberg, Germany, ICDD Grant-in-Aid, (1993)

Sys.: Hexagonal S.G.: $P3_221$ (154)

a: 4.91344(4) b: c: 5.40524(8) A: C: 1.1001

α: β: γ: Z: 3 mp:

Ref: Ibid.

Dx: 2.649 Dm: 2.660 SS/FOM: F_{30}=539(.0018, 31)

εα: ηωβ: 1.544 εγ: 1.553 Sign: + 2V:

Ref: Swanson, Fuyat, Natl. Bur. Stand. (U.S.), Circ. 539, 3, 24 (1954)

Color: White

Integrated intensities. Pattern taken at 23(1) C. Low temperature quartz.θ determination based on profile fit method. O2 Si type. Quartz group. Silicon used as an internal stand. PSC: hP9. To replace 33-1161. Mwt: 60.08. Volume[CD]: 113.01.

2θ	Int	h	k	l	2θ	Int	h	k	l
20.860*	16	1	0	0	92.788*	<1	4	0	0
26.640*	100	1	0	1	94.651*	1	1	0	5
36.544*	9	1	1	0	95.119*	<1	4	0	1
39.465*	8	1	0	2	96.238*	1	2	1	4
40.300*	4	1	1	1	98.751*	1	2	2	3
42.450*	6	2	0	0	102.231	<1	1	1	5
45.793*	4	2	0	1	102.567	<1	3	1	3
50.139*	13	1	1	2	103.877	<1	3	0	4
50.622*	<1	0	0	3	104.203	<1	3	2	0
54.875*	4	2	0	2	106.593	<1	3	2	1
55.325*	2	1	0	3	112.114	<1	4	1	0
57.235*	<1	2	1	0	114.061	<1	3	2	2
59.960*	9	2	1	1	114.467	2	4	0	3
64.036*	2	1	1	3	114.639	2	4	1	1
65.786*	<1	3	0	0	115.885	<1	2	2	4
67.744*	6	2	1	2	117.537	<1	0	0	6
68.144*	7	2	0	3	118.313	<1	2	1	5
68.318*	5	3	0	1	120.124	1	3	1	4
73.468*	2	1	0	4	121.853	<1	1	0	6
75.660*	3	3	0	2	122.605	<1	4	1	2
77.675*	1	2	2	0	127.251	<1	3	0	5
79.884*	2	2	1	3	131.203	<1	1	1	6
80.047*	<1	2	2	1	132.756	<1	5	0	1
81.173*	2	1	1	4	134.293	<1	4	0	4
81.491*	2	3	1	0	136.424	1	2	0	6
83.840*	1	3	1	1	137.895	2	4	1	3
84.957*	<1	2	0	4	140.318	<1	3	3	0
87.439*	<1	3	0	3	143.251	3	5	0	2
90.831*	2	3	1	2	144.119	<1	3	3	1

IR absorption bands

IR bands, Cm^{-1}	Descriptions
471, 470,450	P-O of PO_4 groups
628, 600, 561	P-O of PO_4 groups
964	P-O of PO_4 groups
910, 869	P-OH streching mode of HPO_4 groups
1,280, 1,200	P-OH bending modes, HPO_4 groups
525	O-P-OH bending mode in HPO_4
1,194, 1,108	P-O and P-OH, HPO_4 and PO_4 groups
630	O-H of OH group
1,614	H-O-H, H_2O of crystallization, adsorbed H_2O
3,800-3,000	H-O-H, H_2O of crystallization, adsorbed H_2O
2,516-2,505, 1,801-1,792,1,088, 876, 846, 709, 586	C-O of CO_3^{2-}
1,550-1,520, 1,460-1,450, 880	Type A / high temp CO_3^{2-} located at OH^-
1,534, 1,465, 1,430-1,420, 870-860	Type B / low temp CO_3^{2-} located at PO_4^{3-}
1,100-1,000	quartz

ประวัติผู้เขียนวิทยานิพนธ์

นางสาวดลยา ผลฉาย เกิดวันที่ 8 พฤษภาคม พ.ศ. 2521 ที่จังหวัดลพบุรี สำเร็จการศึกษาปริญญาตรีวิทยาศาสตร์บัณฑิต ภาควิชาวัสดุศาสตร์ คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย เมื่อ พ.ศ. 2541 และเข้าศึกษาต่อในหลักสูตรวิทยาศาสตรมหาบัณฑิต สาขาเทคโนโลยีเซรามิก จุฬาลงกรณ์มหาวิทยาลัย ในปีการศึกษา 2542 และสำเร็จการศึกษาในภาคต้น ปีการศึกษา 2544