Tables and figures

Table 1. Cordierite and Beryl-type silicates from group VIIICO6 [91N1].

Silicate	Ideal composition
Cordierite	$Mg_2Al_4Si_5O_{18}$
Indialite	$Mg_2Al_4Si_5O_{18}$
Sekaninaite	$(Fe,Mg)_2Al_4Si_5O_{18}$
Beryl	$Be_3Al_2Si_6O_{18}$
Bazzite	$Be_3(Sc,Fe)_2Si_6O_{18}$

Table 2. Atomic sites and temperature factors.

a) Indialite[4)], having hexagonal structure, space group P6/mcc, and low cordierite[4)] with orthorhombic structure, space group Cccm [77M1].

Hexagonal				Orthorhombic			
Site	x_h	y_h	z_h	Site	x_o	y_o	z_o
T_1	1/2	1/2	1/4	$T_1$1	1/4	1/4	1/4
				$T_1$6	0	1/2	1/4
T_2	0.3727	0.2668	0	$T_2$1	0.1864	0.0805	0
				$T_2$6	0.0530	0.3200	0
				$T_2$3	–0.1334	0.2393	0
O_1	0.4851	0.3494	0.1445	$O_1$1	0.2426	0.1069	0.1445
				$O_1$6	0.0679	0.4172	0.1445
				$O_1$3	–0.1747	0.3104	0.1445
O_2	0.2305	0.3093	0	$O_2$1	0.1153	0.1941	0
				$O_2$6	–0.0394	0.2699	0
				$O_2$3	–0.1547	0.0759	0
M	1/3	2/3	1/4	M	0.1667	1/2	1/4

Coordinate transformations from hexagonal (H) to C-centered orthorhombic basis for the atoms in indialite related by identity (1), six turn (6) and third turn (3) are 1: $x_0 = x_h/2$, $y_0 = y_h - x_h/2$, $z_0 = z_h$; 6: $x_0 = x_h/2 - y_h/2$, $y_0 = x_h/2 + y_h/2$, $z_0 = z_h$; 3: $x_0 = -y_h/2$, $y_0 = x_h - y_h/2$, $z_0 = z_h$.
[4)] See Table 3.

b) Beryl[36)], $Al_2Be_3Si_6O_{18} \cdot 0.1H_2O$, having hexagonal-type structure, space group P6/mcc [72M1].

Atom	x	y	z	$\beta_{ij} \cdot 10^3$					
				β_{11}	β_{22}	β_{33}	β_{12}	β_{13}	β_{23}
Si	0.38749(2)	0.11584(2)	0	3.43(5)	2.97(5)	3.17(5)	1.62(4)		
Be	1/2	0	1/4	5.9(1)					
Al	2/3	1/3	1/4	3.74(6)		3.86(9)			
O1	0.31001(7)	0.23661(7)	0	10.1(1)	7.1(1)	11.7(2)	6.6(1)		
O2	0.49884(4)	0.14551(4)	0.14529(3)	7.10(8)	5.30(8)	5.25(7)	2.97(7)	2.29(7)	0.51(6)
O3	0	0	1/4	38.0[a)]					

[a)] Population parameter for O3 is 0.0991(1) which corresponds to $\cong 0.1H_2O$;
[36)] See Table 3.

Table 3. Crystal structure and lattice parameters at RT.

Silicate	Space group	Lattice parameters [Å]			Refs.
		a	*b*	*c*	
α-cordierite[1)]	P6/mcc	9.7815(2)		9.3537(3)	94S1
α-cordierite[2)]	P6/mcc	9.7850(1)		9.3495(1)	94S1
K-substituted synthetic α-cordierite[3)]	P6/mcc	9.764(4)		9.360(3)	84K1
Indialite[4)]	P6/mcc	9.800(3)		9.345(3)	77M1
β-cordierite[5)]	Cccm	17.044(4)	9.716(3)	9.334(2)	80W1
β-cordierite[6)]	Cccm	17.089(3)	9.737(1)	9.344(1)	80W1
β-cordierite[7)]	Cccm	17.088(3)	9.726(1)	9.335(1)	80W1
β-cordierite[8)]	Cccm	17.114(3)	9.761(1)	9.333(1)	80W1
β-cordierite[9)]	Cccm	17.098(4)	9.741(3)	9.319(3)	80W1
β-cordierite[10)]	Cccm	17.140(3)	9.769(2)	9.321(2)	80W1
β-cordierite[11)]	Cccm	17.083(4)	9.738(3)	9.335(2)	66G1
β-cordierite[12)] (T = 300 K)	Cccm	17.054(1)	9.759(2)	9.324(1)	86A1
β-cordierite[13)]	Cccm	17.065(2)	9.797(2)	9.293(2)	86A2
β-cordierite[14)]	Cccm	17.060(2)	9.759(1)	9.322(2)	86A2
β-cordierite[15)]	Cccm	17.056(3)	9.783(2)	9.335(2)	86A2
β-cordierite[16)]	Cccm	17.0568(8)	9.7154(4)	9.3472(4)	01M1
β-cordierite[17a)]	Cccm	17.086(10)	9.737(6)	9.356(6)	77C1
β-cordierite[17b)]	Cccm	17.079(3)	9.730(2)	9.356(2)	77C1
β-cordierite[18)]	Cccm	17.055(5)	9.724(5)	9.350(1)	73P1
β-cordierite[17)]	Cccm	17.088(3)	9.734(2)	9.359(1)	79H1
β-cordierite[19)]	Cccm	17.230(5)	9.835(3)	9.314(3)	79H1
β-cordierite[20)]	Cccm	17.071(2)	9.715(1)	9.344(1)	86K1
β-cordierite[21)]	Cccm	17.058(6)	9.724(3)	9.336(3)	86K1
β-cordierite[22)]	Cccm	17.040(8)	9.702(2)	9.320(2)	86K1
β-cordierite[23)]	Cccm	17.013(3)	9.680(1)	9.3035(7)	86K1
β-cordierite[24)]	Cccm	16.990(4)	9.680(2)	9.293(2)	86K1
β-cordierite[25)]	Cccm	16.975(7)	9.647(4)	9.274(3)	86K1
β-cordierite[26)]	Cccm	17.064(3)	9.721(2)	9.340(3)	82M1
β-cordierite[27)]	Cccm	17.125(1)	9.753(1)	9.326(1)	82M1
β-cordierite[28)]	Cccm	17.047(1)	9.7315(8)	9.3463(6)	94S1
β-cordierite[29)]	Cccm	17.0299(3)	9.7424(2)	9.3481(1)	94S1
β-cordierite[30)]	Cccm	17.0409(3)	9.7382(2)	9.3485(1)	94S1
Cordierite[31)]	Ccmm	17.072(1)	9.727(1)	9.351(1)	00G1
Cordierite[32)]	Ccmm	17.069(1)	9.725(1)	9.347(1)	00G1
Cordierite[33)]	Ccmm	17.101(1)	9.736(1)	9.331(1)	00G1
$Mn_2Al_4Si_5O_{18}$	Cccm	17.128(1)	9.764(1)	9.147(1)	99K1
$Co_2Al_4Si_5O_{18}$	P6/mcc	9.841(2)		9.372(2)	99K1
$Co_2Al_4Si_5O_{18}$	P6/mcc	9.825(4)		9.346(2)	97W1
Sekaninaite[35)]	Cccm	17.186	9.827	9.298	75S1
$Be_3(Al_{0.986}Cr_{0.014})_2Si_6O_{18} \cdot 0.36H_2O$	P6/mmc	9.286(9)		9.1934	86H2
Beryl[36)]	P6/mcc	9.2088(5)		9.1896(7)	72M1
Beryl[37)]	P6/mcc	9.208(3)		9.188(3)	86H1
Bazzite[38)]	P6/mcc	9.521(5)		9.165(5)	66C2
Bazzite[39)]	P6/mcc	9.51(1)		9.11(1)	56P1

Table 3 (cont.)

1) $Mg_2Al_4Si_5O_{18}$ crystallized from glass at 1050 °C for 18 h;
2) $Mg_2Al_4Si_5O_{18}$ synthesized in 2 at % bismuth oxide flux at 1000°C for 12 h;
3) $K_{0.17}Mg_2Al_{4.17}Si_{4.83}O_{18}$;
4) $Mg_{1.40}Fe_{0.66}Al_{4.11}Si_{4.89}O_{18}$;
5) $Mg_{1.86}Fe_{0.14}Al_{4.03}Si_{4.98}O_{18} \cdot nH_2O$.
6) $Mg_{1.79}Fe_{0.19}Al_{4.02}Si_{5.00}O_{18} \cdot nH_2O$;
7) $Mg_{1.72}Fe_{0.27}Al_{4.00}Si_{5.00}O_{18} \cdot nH_2O$;
8) $Mg_{1.36}Fe_{0.64}Al_{4.03}Si_{4.98}O_{18} \cdot nH_2O$;
9) $Mg_{1.19}Fe_{0.73}Al_{4.03}Si_{5.01}O_{18} \cdot nH_2O$;
10) $Mg_{1.11}Fe_{0.80}Al_{4.01}Si_{5.03}O_{18} \cdot nH_2O$; the H_2O content from samples [5)]…[10)] was not determined (small amount);
11) $(Li_{0.12}Na_{0.10}Ca_{0.03}K_{0.02})(Mg_{1.53}Fe_{0.45}Mn_{0.02})(Si_{4.93}Al_{4.04})O_{18.07}(H_2O)_{0.48}$;
12) $Na_{0.27}{}^{[6]}(Li_{0.10}Mg_{1.32}Fe_{0.59}Mn_{0.02})^{[4]}(Be_{0.17}Al_{3.74}Si_{5.05})O_{18} \cdot 0.73H_2O \cdot 0.02CO_2$;
13) $Na_{0.03}(Mg_{1.2}Fe_{0.75}Mn_{0.05})Al_4Si_5O_{18} \cdot 0.4H_2O$;
14) $Na_{0.23\text{-}0.32}Li_{0.02\text{-}0.04}Mg_{1.40\text{-}1.49}Fe_{0.50\text{-}0.60}Mn_{0.01\text{-}0.02}Al_{3.76\text{-}3.91}Be_{0.15\text{-}0.20}Si_{4.94\text{-}4.97}O_{18}$;
15) Natural sample from south-central Maine;
16) $Na_{0.039}Ca_{0.02}Mg_{2.092}Fe_{0.019}Al_{3.961}Si_{4.963}O_{18}$;
17) $(Na_{0.05}K_{0.02}Ca_{0.02})(Mn_{0.01}Mg_{1.91}Fe_{0.08})(Si_{5.01}Al_{3.95})O_{18} \cdot 0.56H_2O$; [a)] neutron data, [b)] X-ray data;
18) Same composition as [17)];
19) $(Na_{0.15}Ca_{0.05})(Mn_{0.08}Mg_{0.25}Fe^{2+}{}_{1.65})(Si_{4.91}Al_{4.05}) \cdot 0.61H_2O$;
20) $Na_{0.13}Mg_{2.057}Al_{4.062}Fe_{0.002}Si_{4.92}O_{12}$ water transmitting media; $p = 0.1$ MPa;
21) as [20)] $p = 0.3$ GPa;
22) as [20)] $p = 0.9$ GPa;
23) as [20)] $p = 1.2$ GPa;
24) as [20)] $p = 2.3$ GPa;
25) Composition as [20)] $p = 2.2$ GPa and fluorcarbon as transmitting media;
26) Synthetic anhydrous Mg-cordierite;
27) Hydrous Mg,Fe natural cordierite, Soto-Argentina; composition as [13)];
28) $Mg_2Al_4Si_5O_{18}$ crystallized from glass at 1200 °C for 350 h;
29) $Mg_2Al_4Si_5O_{18}$ synthesized in 5 at % bismuth oxide flux at 1000 °C for 12 h;
30) $Mg_2Al_4Si_5O_{18}$ synthesized in 10 at % bismuth oxide flux at 1000 °C for 12 h;
31) $Mg_{1.90}Fe^{2+}{}_{0.17}Na_{0.07}Si_{4.98}Al_{3.94}Fe^{2+}{}_{0.02}O_{18}$;
32) $Mg_{1.90}Fe^{2+}{}_{0.19}Na_{0.07}Al_{3.97}Fe^{2+}{}_{0.02}Si_{4.95}O_{18}$;
33) $Mg_{1.62}Fe^{2+}{}_{0.41}Mn^{2+}{}_{0.01}Na_{0.03}Al_{3.98}Si_{4.99}O_{18}$;
34) $Mg_{0.36}Fe^{2+}{}_{1.53}Mn^{2+}{}_{0.07}Na_{0.12}Al_{4.10}Si_{4.91}O_{18}$;
35) $(Na_{0.14}Ca_{0.05})(Fe^{2+}{}_{1.63}\ Mg_{0.28}Mn_{0.09})(Al_{1.94}Fe^{3+}{}_{0.08}Si_{0.93})Al_2Si_4O_{18} \cdot 0.67H_2O$;
36) Natural sample $Al_2Be_3Si_6O_{18} \cdot 0.1H_2O$ with 0.1 wt % Fe and traces (≤ 0.001) of K and Ca;
37) $Be_3Al_2Si_6O_{18}$with 1.3 % occupancy of Cr at the Al octahedral site. The water content < 0.3 mol H_2O/formula unit;
38) $Be_{3.06}[(Sc_{1.26}Fe_{0.17}Al_{0.03})(Fe^{2+}{}_{0.31}Mn_{0.13}Mg_{0.12})](Na_{0.55}K_{0.03}Cs_{0.01})[Si_{5.93}Be_{0.07}O_{18}] \cdot 0.87H_2O$;
39) Natural sample, composition not mentioned;
40) $Na_{0.04}Be_{2.18}Al_2Si_6O_{18} \cdot 0.3H_2O$;
41) Beryl with 0.3 wt % Cr, 0.05 wt % Fe and trace amount of Mg, Ca and Ti;
42) The same composition as [37)];
43) Beryl, composition [wt %]: BeO –12.66; Al_2O_3 – 18.24; SiO_2 – 65.18; Fe_2O_3 – 0.006; FeO – 0.08; TiO_2 – 0.01; Li_2O – 0.69; Na_2O – 0.79; K_2O – 0.05; Rb_2O – 0.021; Cs_2O – 0.16; H_2O^+ – 1.68; H_2O^- – 0.02;
44) Beryl, composition [wt %]: BeO –13.60; Al_2O_3 – 18.20; SiO_2 – 65.92; Fe_2O_3 – 0.167; FeO – 0.11; TiO_2 – 0.020; Li_2O – 0.03; Na_2O – 0.13; K_2O – 0.013; Rb_2O – 0.001; Cs_2O – 0.75; H_2O^+ – 1.36; H_2O^- – 0.02;
45) Natural beryl, sea green;
46) Blue-green natural β-cordierite single crystal from Madagascar, contaning H_2O;
47) $Mg_2Al_4Si_5O_{18}$ synthetic;
48) Composition not mentioned, expected $Be_3Al_2Si_6O_{18}$;
49) Synthetic sample, Cr^{3+} doped $Be_3Al_2Si_6O_{18}$;

Table 4. Linear compressibilities, parallel ($\beta_{\|}$) and perpendicular ($\beta_{\perp}$) to ***c***-axis, bulk modules (K) and their derivative (K') and elastic constants (c_{ij}).

Sample	K [Mbar]	K'	$\beta \cdot 10^4$ [(kbar)$^{-1}$]	c_{ij} [Mbar]						Refs.
				c_{11}	c_{33}	c_{12}	c_{13}	c_{44}	c_{66}	
Beryl[42)]	1.70(5)	4	$\beta_{\perp}$=1.72(4) $\beta_{\|}$ = 2.10(9)							86H1
Beryl[43)]	1.76			3.042(3)	2.776(4)	1.238(8)	1.145(3)	0.653(1)	0.902(5)	73Y1
Beryl[44)]	1.81			3.085(3)	2.834(3)	1.289(4)	1.185(5)	0.661(1)	0.898(2)	73Y1
Beryl[45)]	1.43			2.873	2.418	0.991	0.729	0.702	0.941	48S1

[42)]…[45)] See Table 3.

Table 5. Magnetic properties [99K1].

Sample	Temperature range	Θ [K]	p_{eff} [μ_B/ion]
Co-cordierite $Co_2Al_4Si_5O_{18}$	T < 10 K	≅ – 2.10	3.87(4)
Mn-cordierite $Mn_2Al_4Si_5O_{18}$	5 K < T <100 K	– 4.3(1)	5.47(6)

Table 6. Data obtained by ^{57}Fe NGR method.

Sample	T [K]	Site	δ[1)] [mms^{-1}]	ΔQ [mms^{-1}]	$DH1$ [mms^{-1}]	DH [mms^{-1}]	$DH2$ [mms^{-1}]	Relative area [%]	Refs.
Deep blue beryl[4)] (first type of fit)	4.2	Fe^{2+} oct.	1.28	2.74	0.32			84	02V1
		Fe^{2+} tetr.	0.91	1.73		0.40[2)]		6	
		Fe^{3+} oct.	0.42	0.68		0.40[2)]		10	
	14		1.28	2.75	0.35			87	
			0.91[2)]	1.70[2)]		0.40[2)]		6	
			0.46[2)]	0.70[2)]		0.40[2)]		7	
	30		1.27	2.77	0.65		0.40	87	
			0.91[2)]	1.70[2)]		0.40[2)]		7	
			0.46[2)]	0.70[2)]		0.40[2)]		6	
	80		1.28	2.66	1.57		0.51	93	
			0.91[2)]	1.70[2)]		0.40[2)]		6	
			1.46[2)]	0.70[2)]		0.40[2)]		2	
	295		1.14	2.66	0.83		0.37	88	
			0.98	1.32		0.40[2)]		6	
			0.36[2)]	0.60[2)]		0.40[2)]		6	
	500[3)]		1.01	2.78	0.44			39	
			1.02	2.18		0.44		36	
			1.14	1.75		0.44		10	

(cont.)

Table 6 (cont.)

Sample	*T* [K]	Site	δ[1] [mms^{-1}]	ΔQ [mms^{-1}]	*DH*1 [mms^{-1}]	*DH* [mms^{-1}]	*DH*2 [mms^{-1}]	Relative area [%]	Refs.
Deep blue beryl[4]	4.2		1.29	2.82				43	02V1
(second type of fit)			1.29	2.61				39	
			1.10	1.43				7	
			0.37	1.1				11	
	295		1.08	2.79				45	
			1.15	2.62				41	
			0.98	1.32				6	
			0.36[2]	0.60[2]				8	
Bluish green beryl[4]	80		1.16	2.81	0.74		0.64	43	02V1
			0.94	1.60		0.40[2]		24	
			0.46[2]	0.46		0.40[2]		33	
	295		1.12	2.68	0.96		0.61	49	
			0.98	1.33		0.40[2]		18	
			0.36[2]	0.61		0.40[2]		33	
Greenish blue beryl[4]	14		1.30	2.74	0.27			51	02V1
			1.03	1.58	0.43			49	
	80		1.36	2.55	1.27		0.53	70	
			0.96	1.58		0.40[2]		30	
	295		1.20	2.54	1.22		0.40	73	
			0.90	1.48		0.40[2]		27	
Light blue beryl[4]	14		1.26	2.76	0.23		0.25	69	02V1
			0.97	1.65		0.40[2]		31	
	80		1.24	2.77	0.69		0.39	67	
			1.01	1.49		0.40[2]		33	
	295		1.16	2.67	0.77		0.33	73	
			0.93	1.45		0.40[2]		27	
	500		1.02	2.49	0.49			84	
			0.85	1.50		0.40[2]		16	
Cordierite[33]	RT	1	1.34	2.63		0.13		100	00G1
Cordierite[34]	RT	1	1.34	2.56		0.14		100	00G1
Cordierite[32]	RT	1	1.00	2.32		0.13		12.3	00G1
		2	1.34	2.64		0.12		87.7	
Cordierite[31]	RT	1	1.01	2.31		0.13		12.2	00G1
		2	1.34	2.65		0.13		87.8	

[1] Relative to α-Fe;
[2] Fixed values;
[3] There is an additional doublet due to Fe^{3+} accounting for 15 % of the spectral area;
[4] Composition not mentioned (natural samples from Brasil);
[31]…[34] for compositions see Table 3.

Table 7. Data obtained by NMR studies.

Sample	T [K]	Nucleus	Site	Environment	δ [ppm]	$\frac{e^2qQ}{h}$ [MHz]	η		Refs.
β-cordierite[46)]	RT	^{27}Al	Al1 Al2			10.6 5.6	0.38 0.34	***X*** ∥ ***c***, ***Z*** and ***Y***, 30° away from ***a*** and ***b*** ***Y*** ∥ ***c***, ***Z*** and ***X***, 20° away from ***a*** and ***b***	72T1
β-cordierite[47)]	293	^{29}Si	$T_1$6 $T_2$1 or $T_2$3	Si(4Al) Si(3Al)	–79[a)] –100[a)]				85P1
Beryl[48)]	RT RT	^{9}Be ^{27}Al				0.504(4) 3.093(15)	0.090(5) 0.000(5)		56B1
Emerald[49)]	120…420 K	^{27}Al				3.123(5)	0.0076(64)		00K1
Beryl Beryl CsNa	RT	^{29}Si			–100.2 –101.0				85J1

[a)] Chemical shifts are given relative to tetramethyl-silane;
[46)]…[49)] See Table 3.

For **Table 8** see next page

Table 9. Refractive indices.

Silicate	n_α	n_β	n_γ	$2V$		Refs.
β-cordierite[11)]	1.539	1.546	1.549			66G1
β-cordierite[14)]	1.5495	1.5559	1.5581	57.3°		83A1, 86A2
β-cordierite[15)]	1.5556	1.5634(calc.)	1.5656	55.8°		86A2
β-cordierite[17)]	1.536	1.540	1.543	80°		73P1
Sekaninaite[35)]	1.561	1.572	1.576	66°	biaxial negative	75S1
Indialite (synthetic)	1.541(ω)		1.537(ε)			66G1
Bazzite[39)]	1.627(ω)		1.607(ε)			66C2

For footnotes (composition) see Table 3.

Table 8. Data obtained from EPR studies.

Sample	Site	T [K]	$g_\parallel$	$g_\perp$	$D = 3\,B_2^0$ [cm^{-1}]	$E = B_2^2$ [cm^{-1}]	J_z [cm^{-1}]	J_x [cm^{-1}]	J_y [cm^{-1}]	$\langle J \rangle$ [cm^{-1}]	H_d [1)] [cm^{-1}]	r_d [2)] [Å]	r_o [2)] [Å]	Refs.
Cordierite:Fe^{3+}			2.004(2)		B_2^0=14.6(1) kG	8.5(1) kG								66H1
Cordierite:Cu^{2+}			2.35	2.08										92P1
Beryl: Cr^{3+} single ion	Al^{3+}	295	1.9740(3)	1.9792(3)	–0.8956(3)	0								78E1
	1NN	295	1.9741(4)	1.9785(4)	–0.9086(3)	0	2.226(2)	2.277(2)	2.277(2)	2.260(2)	0.017(2)	4.6(2)	4.6	
	1NN	4.2	–	1.9775(5)	–0.9049(12)	0	2.317(6)	2.367(6)	2.367(6)	2.350(6)	0.017(2)	4.6(4)	4.6	
	2NN	295	1.975(1)	1.979(1)	–0.877(1)	–0.014(2)	0.206(3)	0.176(3)	0.208(3)	0.195(3)	0.011(3)	5.4(4)	5.3	
	3NN	295	1.974(1)	–	–0.9(1)	±0.003(3)	–	–	–	0.026(2)	0.006(2)	6.6(6)	7.0	
Beryl: Fe^{3+} single ion	Al^{3+}	20	1.998(2)	2.002(2)	0.01402(2)									60D1
		290	2.001(2)	2.002(2)	0.01740(25)									
Fe^{3+} single ion[3)]	Al^{3+}	290	2.001(2)	2.002(4)	0.0174(3)									82E1
Fe^{3+} pairs[4)]	1NN	295	2.005(2)	2.004(2)	0.0206(3)					2.3(6)				82E1
Beryl: Co^{2+}	Co^{2+} in Al^{3+} site[5)]	4	3.026 $A_\parallel$=3.5 mT	4.758 $A_\perp$=8.6 mT										04S1
	Co^{2+} in Be^{2+} site[6)]	4	g_x=2.231(8) A_x=8 mT, g_y=2.09(8) A_y=9 mT, g_z=3.27(5) A_z=25 mT											
Beryl: Co^{2+} (≅0.1 wt % CoO), γ-irrad.	O^- hole[7)]		g_c=2.014 $^{27}A_c$(Al)= 0.7 mT $^{9}A_c$(Be) = 0.2 mT											89S2
	O^- hole[8)]		g_c=1.9962 $^{27}A_c$(Al)= 39.1 mT											

[1)] H_d is the magnetic dipolar interaction derived on the assumption that the apparent anisotropy in J is due to this effect; [2)] r_d is the ionic separation calculated from H_d, and r_o, the ionic separation calculated from crystal structure; [3)] values $a - F = 0.01358(50)$ cm^{-1} and $F = 0.00177(40)$ cm^{-1} were reported; [4)] values $a - F = 0.0148(6)$ cm^{-1} and $J_{||} - J_\perp = -0.0582(4)$ cm^{-1} were reported; [5)] the directions of $g_\parallel$ and $A_\parallel$ for center coincide with z-axis of AlO_6 polyhedron ($z \parallel c \parallel [0001]$); [6)] the symmetry is consistent with Co^{2+} in Be^{2+} site ; [7)] O^- hole on oxygen of SiO_4 tetrahedron at which $Al^{3+} \rightarrow Si^{4+}$ and [8)] for $Al^{2+} \rightarrow Be^{2+}$