X-RAY SINGLE CRYSTAL STUDIES OF OLIVINES IN YAMATO-74354 AND -74371 METEORITES

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***Abstract*:** The olivines from Yamato-74354 (L5–6) and -74371 (H5) meteorites have been studied by X-ray diffraction method.

The crystal structures of olivines have been refined using X-ray intensity data. The site preference of metal cations for M1 and M2 sites in both olivine structures has been determined. The cation distributions of Mg^{2+} and Fe^{2+} in M1 and M2 sites for these olivines show a slight tendency to disorder. For Yamato-74354 and -74371 olivines, the distribution coefficient K_D is 1.09 and 0.92, respectively. This tendency resembles the tendency of cation distribution in metamorphic olivines.

1. Introduction

The olivine structure is based on hexagonal close packing of oxygen atoms with Mg^{2+} and Fe^{2+} cations occupying half of the distorted octahedral voids (M1 and M2), and Si atoms occupying one-eighth of the tetrahedral sites. It has been found from X-ray structure analysis that the volume of M1 site is slightly smaller than that of M2 site, and ionic radious of Fe^{2+} is larger than that of Mg^{2+} ion. For this reason, a site preference of olivine that Fe^{2+} ion is preferably ordered in M2 site had been presumed as well as cation distribution of pyroxene (GHOSE, 1962). BIRLE *et al.* (1968), however, have reported the disordering of Mg^{2+} and Fe^{2+} cations in the octahedral sites from the refinement of four terrestrial olivines. With the development of X-ray single crystal diffraction technique, it was found that Fe^{2+} cation was slightly ordered in M1 site for some olivines from igneous rocks (FINGER, 1971; FINGER and VIRGO, 1971; BROWN and PREWITT, 1973). The Mössbauer study for some olivines has supported the result of X-ray study (VIRGO and HAFNER, 1972). The metamorphic olivines, however, have shown the site preference of Fe^{2+} cation in M2 site (WENK and RAYMOND, 1973). These results are tabulated in Table 1. The site preference of cations in olivine has not been fully interpreted as yet. KUMAZAWA and TOKONAMI (1979) reported that the olivine of the interior of the earth may exhibit a reverse cation distribution against the olivine from near surface of the earth.

This study was undertaken in order to obtain the crystals structure parameters of olivines from Yamato-74354 and -74371 meteorites using single crystal X-ray

Table 1. Intercrystalline cation distribution for Mg and Fe in octahedral coordination.

Olivine	K_D	Chem. Comp.	Occurrence
10020[1]	1.06(5)	$Fo_{75}Fa_{25}$	Lunar rock (igneous)
C15-64[1]	1.13(4)	$Fo_{50}Fa_{50}$	A volcanic neck
B1[2]	1.37(4)	$Fo_{73}Fa_{27}$	Chilled margin
OG2B[3]	1.02(4)	$Fo_{70}Fa_{30}$	Metamorphosed black shale ultramafic pod
12018[3]	1.14(4)	$Fo_{82}Fa_{18}$	Lunar basalt
Yosemite 103-481[4]	0.66(20)	Mg-rich	Yosemite
Bergell Alps[4]	0.969(24)	$Fo_{90}Fa_{10}$	Bergell Alps
Modoc[5]	1.00	$Fo_{78}Fa_{22}$	Chondrite
S14[5]	1.06	$Fo_{80}Fa_{20}$	Volcanic bomb

1. Finger (1971).
2. Finger and Virgo (1971).
3. Brown and Prewitt (1973).
4. Wenk and Raymond (1973).
5. Virgo and Hafner (1972)*.
* Mössbauer method.
$K_D=[Mg/Fe]_{M2}/[Mg/Fe]_{M1}$.

intensity data, and to determine the distribution coefficient of metal cations in olivine structure.

2. Experiment and Refinement

The crystals in this study were picked out from Yamato-74354 and -74371 meteorites.

The Yamato-74354 olivine was ground into a sphere of 0.1 mm in diameter and μR is 0.14 for Mo $K\alpha$ radiation ($\lambda=0.7107$ Å). The Y-74371 olivine was not polished up for the small size of crystal ($0.1\times0.08\times0.08$ mm). These olivines were first examined by oscillation and Weissenberg photography. The systematic absence of reflections agreed with that for *Pnma* as reported previously. The intensities of reflections for both olivines with $2\theta=0°-80°$ were collected in the $\omega-2\theta$ mode on a Philips PW1100 automatic four-circle diffractometer with graphite-monochromatized Mo $K\alpha$ radiation. Three standard reflections were monitored at regular intervals and showed no systematic variation. The cell parameters were determined by the least squares from the setting angles of 15 reflections. For Yamato-74354 and -74371 olivines, 1003 and 826 reflections were collected, respectively; with the criterion $I>2\sigma(I)$ for an observed reflection and omitting systematic absences, 466 unique reflections for Yamato-74354 olivine and 585 for -74371 olivine remained which were employed in the analysis. Lorentz-polarization corrections were applied to both olivines, and the absorption correction was made to only Yamato-74354 olivine. No extinction correction was applied for both samples, since secondary extinction

Table 2. Crystal data and experimental detail for Yamato-74354 and -74371 olivines.

	Yamato-74354	Yamato-74371
System	Orthorhombic	Orthorhombic
Space group	Pnma	Pnma
a(Å)	10.268(2)	10.244(3)
b	6.010(1)	6.002(2)
c	4.770(1)	4.777(5)
V(Å^3)	294.4(2)	294.1(5)
Z	4	4
Size of cyrstal (mm)	r=0.05 (sphere)	0.1×0.08×0.08
Radiation	Mo Kα (λ=0.7107A)	Mo Kα
Monochrometer	Graphite	Graphite
Absorption correction	Yes	No
μR	0.14	—
Numer of reflections	466	585
Final R (unweighted)	0.041	0.028
K_D	1.09(5)	0.92(4)

$R=\sum|(Fo|-|Fc|)/\sum|Fo|$

$K_D=[Mg/Fe]_{M2}/[Mg/Fe]_{M1}$

The numbers in parentheses represent calculated standard deviations, for 10.268(2) read 10.268±0.002.

Table 3. Chemical compositions of Yamato-74354 and -74371 olivines.*

Average (wt %)**	Yamato-74354 olivine	Yamato-74371 olivine
SiO_2	38.45(25)	39.57(23)
FeO	22.65(28)	17.35(25)
TiO_2	0.0	0.0
MnO	0.48(3)	0.46(3)
NiO	0.02(1)	0.01(1)
MgO	38.90(24)	43.38(30)
CaO	0.04(1)	0.02(1)
Na_2O	0.0	0.0
K_2O	0.0	0.0
Cr_2O_3	0.03(1)	0.01(1)
Al_2O_3	0.07(2)	0.06(2)
Total	100.73(57)	100.86(19)
Mg/(Mg+Fe)	0.754(2)	0.817(3)

* Microprobe analyses by A. GOTO.

** Average compositions of 5 grains for Yamato-74354 and -74371 olivines, respectively. Errors in parentheses are standard deviations; for 38.45(25) read 38.45±0.25.

appeared not to affect the strong intensities.

The refinement of each data set was initiated using the full matrix least squares program LINUS (COPPENS and HAMILTON, 1970), with positional parameters of lunar olivine 12070 refined by WENK and RAYMOND (1973). Neutral atomic scattering factors (International Tables for X-ray Crystallography, Vol. 3, 201) were used for each atom. Mn and Ca atoms are disregarded in these refinements, since their contents are both too small. The initial composition in refinement was assumed as $Fo_{75}Fa_{25}$, and the cations (Mg^{2+} and Fe^{2+}) were suitably distributed as follows; (0.35 Mg+0.15 Fe) for M1 site and (0.40 Mg+0.10 Fe) for M2 site. Throughout all refinements, the composition of Mg and Fe of each olivine was not constrained. Consequently, the composition of Mg^{2+} and Fe^{2+} cations varies from the initial

Table 4. Final atomic positional parameters for Yamato-74354 and -74371 olivines.

Atom		Yamato-74354 olivine	Yamato-74371 olivine
M1	Mg	0.378	0.417
	Fe	0.122(3)	0.083(2)
	X	0.0	0.0
	Y	0.0	0.0
	Z	0.0	0.0
M2	Mg	0.386	0.411
	Fe	0.114(4)	0.089(2)
	X	0.27819(12)	0.27804(7)
	Y	1/4	1/4
	Z	0.98827(23)	0.98885(13)
Si	X	0.09513(13)	0.09480(7)
	Y	1/4	1/4
	Z	0.42761(25)	0.42694(13)
O1	X	0.09150(32)	0.09159(16)
	Y	1/4	1/4
	Z	0.76720(63)	0.76646(35)
O2	X	0.44837(31)	0.44837(16)
	Y	1/4	1/4
	Z	0.21821(67)	0.22009(35)
O3	X	0.16352(20)	0.16347(10)
	Y	0.03438(35)	0.03412(20)
	Z	0.28052(44)	0.27959(24)

Errors in parentheses are standard deviations; for 0.27819(12) read 0.27819±0.00012.
Total occupancy fixed at 0.5, but chemical composition for Mg and Fe allowed to vary during the refinements for M1 and M2 atoms.
Throughout this paper, O1, O2 and O3 stand for oxygen atoms and Si stands for silicon atom.

value by the refinement. Though the chemical composition calculated from this refinement does not always coincide with that of chemical analysis, the discrepancy between them may be 10%–20% at most. For example, the chemical composition of Yamato-74354 olivine from microprobe analysis is $Fo_{75}Fa_{25}$ and that calculated from the refinement is $Fo_{76}Fa_{24}$. The crystal data and experimental details are summarised in Table 2. Microprobe analyses were made on 5 grains for Yamato-74354 and -74371 olivines, respectively. The result of analyses is given in Table 3.

The final conventional (unweighted) R values of Yamato-74354 and -74371 olivines were 0.041 and 0.028, respectively. The final parameters are listed in Tables 4 and 5. Interatomic distances were calculated from the refined positional parameters using RSDA-4 program (SAKURAI, 1967) and the results are shown in Tables 6 and 7. The observed and calculated structure amplitudes are compared in Table 10.

Table 5. Anisotropic temperature factor coefficients for Yamato-74354 and -74371 olivines.

Yamoto-74354 olivine

Atom	β_{11}	β_{22}	β_{33}	β_{12}	β_{13}	β_{23}
M1	0.0014(1)	0.0026(3)	0.0032(4)	−0.0005(1)	0.0001(1)	−0.0005(2)
M2	0.0009(1)	0.0024(3)	0.0042(5)	0	−0.0001(2)	0
Si	0.0009(1)	0.0021(3)	0.0033(4)	0	0.0001(2)	0
O1	0.0017(3)	0.0039(7)	0.0030(10)	0	−0.0006(5)	0
O2	0.0011(3)	0.0048(7)	0.0062(11)	0	0.0003(5)	0
O3	0.0016(2)	0.0032(5)	0.0060(7)	0.0004(2)	0.0002(3)	0.0002(5)

Yamato-74371 olivine

Atom	β_{11}	β_{22}	β_{33}	β_{12}	β_{13}	β_{23}
M1	0.0013(1)	0.0025(2)	0.0045(3)	−0.0003(1)	0.0001(1)	−0.0005(1)
M2	0.0009(1)	0.0031(2)	0.0065(3)	0	0.0001(1)	0
Si	0.0010(1)	0.0027(1)	0.0043(2)	0	−0.0001(1)	0
O1	0.0018(1)	0.0038(3)	0.0045(5)	0	0.0004(2)	0
O2	0.0011(1)	0.0045(3)	0.0069(6)	0	0.0002(2)	0
O3	0.0016(1)	0.0042(2)	0.0067(4)	0.0005(1)	0.0003(1)	−0.0001(3)

The numbers in parentheses represent calculated standard deviations, for 0.0014(1) read 0.0014±0.0001.

Temperature factor form; $\exp\text{-}(h^2\beta_{11}+k^2\beta_{22}+l^2\beta_{33}+kl\beta_{23}+lh\beta_{31}+hk\beta_{12})$.

3. Result and Discussion

The lattice constants of three other different olivines from Yamato-74354, besides those of two olivines (74354–1 and 74371–1) used in structure refinements, were

Table 6. Bond distances (A) for the M1 and M2 octahedra and the tetrahedron in Yamato-74354 olivine.

Octahedron (1)		Octahedron (2)	
M–O1 [2]	2.091(2)	M–O1 [1]	2.188(3)
M–O2 [2]	2.085(2)	M–O2 [1]	2.063(2)
M–O3 [2]	2.157(2)	M–O3 [1]	2.064(2)
		M–O3 [2]	2.238(2)
Mean [6]	2.111	Mean [6]	2.138
O1–O2 [2]	3.042(1)	O1–O3 [2]	3.042(3)
O1–O3 [2]	3.135(3)	O2–O3 [2]	2.933(3)
O2–O3 [2]	3.382(3)	O2–O3 [2]	3.213(4)
O1–O2 [2]	2.861(4)*	O3–O3 [2]	3.002(3)
O1–O3 [2]	2.867(3)**	O3–O3 [1]	3.418(3)
O2–O3 [2]	2.561(3)***	O1–O3 [2]	2.867(3)**
		O3–O3 [1]	2.592(3)***
Mean [12]	2.975	Mean [12]	3.010
Tetrahedron		Tetrahedron	
Si–O1 [1]	1.620(3)	O1–O2 [1]	2.742(4)
Si–O2 [1]	1.660(3)	O1–O3 [2]	2.760(3)
Si–O3 [2]	1.632(2)	O2–O3 [2]	2.561(3)
		O3–O3 [1]	2.592(3)
Mean [4]	1.634	Mean [6]	2.664

* Shared between two octahedra of type (1).
** Shared between two octahedra of different types.
*** Shared between octahedron and tetrahedron.
The numbers in parentheses represent calculated standard deviations, for 2.091(2) read 2.091 ± 0.002.

obtained by the same method described in the previous chapter, and d_{301} values were calculated from the equation $d_{301}=[(3^2/a^2)+(1/c^2)]^{-1/2}$. The lattice constants and the d_{301} values of these five olivines are shown in Table 8. It is to be noted that four d_{301} values of Yamato-74354 olivines are consistent with each other within the limits of error. This implies that the composition of olivines is almost homogeneous in Yamato-74354 meteorite. Actually, all olivines checked in Yamato-74354 and -74371 meteorites by EPMA, show almost the same chemical composition in the same meteorite and they are homogeneous and do not have zonal structures.

For Yamato-74354–1 and -74371–1, the Mg and Fe compositions were calculated by two different manners;

1st manner: Derivation from the site occupancies of the refinement without chemical constraint.

Table 7. Bond distances (B) for the M1 and M2 octahedra and the tetrahedron in Yamato-74371 olivine.

Octahedron (1)	Octahedron (2)
M-O1 [2] 2.092(1)	M-O1 [1] 2.186(2)
M-O2 [2] 2.078(2)	M-O2 [1] 2.065(2)
M-O3 [2] 2.152(1)	M-O3 [2] 2.233(2)
	M-O3 [2] 2.066(1)
Mean [6] 2.107	Mean [6] 2.138
O1-O2 [2] 3.037(1)	O1-O3 [2] 3.035(2)
O1-O3 [2] 3.128(2)	O2-O3 [2] 2.941(2)
O2-O3 [2] 3.371(3)	O2-O3 [2] 3.206(2)
O1-O2 [2] 2.858(3)*	O3-O3 [2] 3.003(2)
O1-O3 [2] 2.869(3)**	O3-O3 [1] 3.441(2)
O2-O3 [2] 2.556(2)***	O1-O3 [2] 2.869(3)**
	O3-O3 [1] 2.591(1)***
Mean [12] 2.970	Mean [12] 3.008
Tetrahedron	**Tetrahedron**
Si-O1 [1] 1.622(2)	O1-O2 [1] 2.749(3)
Si-O2 [1] 1.656(2)	O1-O3 [2] 2.762(3)
Si-O3 [2] 1.633(1)	O2-O3 [2] 2.556(2)
	O3-O3 [1] 2.591(2)
Mean [4] 1.637	Mean [6] 2.665

* Shared between two octahedra of type (1).
** Shared between two octahedra of different types.
*** Shared between octahedron and tetrahedron.
The numbers in parentheses represent calculated standard deviations, for 2.092(1) read 2.092±0.001.

Table 8. Lattice constants and d_{301} values of Yamato-74354 and -74371 olivines.

Sample No.	*a*	*b*	*c*	d_{301}
74354-1	10.268(2)	6.010(1)	4.770(1)	2.781(1)
74354-2	10.267(4)	6.004(1)	4.771(1)	2.781(1)
74354-3	10.267(2)	6.007(1)	4.770(1)	2.781(1)
74354-4	10.265(2)	6.008(1)	4.771(1)	2.781(1)
74371-1	10.244(3)	6.002(2)	4.777(5)	2.778(2)

Sample No. 74354 (L5-6), No. 74371 (H5).
The numbers in parentheses represent calculated standard deviations, for 10.267(4) read 10.267±0.004.

Table 9. Mg–Fe composition of Yamato-74354 and -74371 olivines derived from X-ray intensity data.

Meteorite No.	Yamato-74354 (L5-6)	Yamato-74371 (H5)
Chem. Comp. $(d_{301})^1$	$Fo_{77}Fa_{23}$	$Fo_{82}Fa_{18}$
Chem. Comp. $(K_D)^2$	$Fo_{76}Fa_{24}$	$Fo_{83}Fa_{17}$
Chem. Comp.	$Fo_{75.4(2)}{}^3$	$Fo_{81.7(3)}{}^3$
	$Fo_{75-78}Fa_{25-22}{}^4$	$Fo_{80}Fa_{20}(d_{301}=2.7793)^5$

1. These compositions were derived using the YODER and SAHAMA's equation. The d_{301} value was calculated from lattice constants for each olivine (see text).
2. These compositions were calculated from the values of multiplicity in the least squares refinements without chemical constraint of Mg and Fe.
3. Microprobe analysis (see Table 3).
4. NAGAHARA (1978).
5. KIMURA *et al.* (1978).

2nd manner: Derivation from the lattice constants using the relation between Fo–Fa mol per cent and d_{301} value, Fo(mol %)=4233.91–1495.59 d_{301}, by YODER and SAHAMA (1957).
These results are tabulated in Table 9 with microprobe analyses of olivines from the same meteorites and those reported previously (NAGAHARA, 1978; KIMURA *et al.*, 1978). As shown in Table 9, the chemical compositions for Mg and Fe atoms derived by different methods almost agree with each other.

The distribution coefficient K_D was calculated from the site occupancies in both olivines. The values of K_D for Yamato-74354 and -74371 olivines are 1.09 and 0.92, respectively. Consequently, the cation distributions of both olivines show a slight tendency to disorder. The tendency of cation distribution in this study resembles that in metamorphic olivine. Generally, the volcanic olivines show a certain preference of metal cations. It has also been reported that the site preference of cations in olivine appears to increase with increasing temperature.

The reason why Yamato-74354 and -74371 olivines showed almost a disordering Fe^{2+} and Mg^{2+} cations is not clear at the present stage. The disordering of metal cations in Yamato-74354 and -74371 olivines, however, may represent any geological metamorphism or alteration.

Acknowledgments

We are grateful to the National Institute of Polar Research, Japan, for offering the meteorite samples investigated, and to Dr. K. YANAI for providing the thin sections of meteorite. We thank Mr. A. GOTO of Kanazawa University for microprobe analysis of meteorite sample. The computations were performed at data processing center of Kanazawa University.

Table 10a. Observed and calculated structure factors for Yamato-74354 olivine. The five columns for each datum represent H, K, L, F_{obs}, F_{calc}.

H	K	L	|Fo|	Fc	H	K	L	|Fo|	Fc	H	K	L	|Fo|	Fc
2	0	0	59.61	59.97	5	4	1	53.81	55.56	1	3	2	46.90	-46.48
4	0	0	34.85	34.72	4	4	1	48.00	46.40	0	4	2	37.28	36.06
8	0	0	37.36	34.77	2	4	1	15.36	-16.77	1	4	2	41.30	42.33
10	0	0	76.15	75.74	0	5	1	51.79	-53.51	3	4	2	31.25	32.10
10	1	0	73.02	72.65	1	5	1	26.77	-24.86	4	4	2	95.96	95.62
8	1	0	20.39	20.04	5	5	1	31.58	-31.60	6	4	2	7.88	0.26
6	1	0	131.57	131.09	6	5	1	17.36	-19.80	8	4	2	67.58	67.76
4	1	0	84.40	-82.69	7	5	1	13.92	-14.25	9	4	2	27.15	-26.47
2	1	0	86.50	-85.51	10	5	1	20.16	20.29	10	4	2	72.15	73.15
0	2	0	90.16	-89.50	10	6	1	9.75	7.71	10	5	2	19.18	20.27
2	2	0	53.55	55.90	9	6	1	76.94	79.09	8	5	2	10.87	-10.72
4	2	0	43.94	46.81	3	6	1	16.45	16.83	7	5	2	7.68	-9.97
6	2	0	231.73	241.17	1	6	1	88.69	89.01	6	5	2	31.26	30.00
8	2	0	51.30	50.63	0	7	1	12.34	-12.55	5	5	2	39.83	-38.01
10	2	0	21.28	-22.83	1	7	1	25.02	24.26	4	5	2	73.16	-72.56
10	3	0	46.04	-45.02	4	7	1	13.17	11.65	3	5	2	11.50	-12.21
8	3	0	40.84	-43.80	5	7	1	14.35	16.80	2	5	2	20.91	22.15
6	3	0	101.51	-102.67	6	7	1	29.82	-27.73	1	5	2	45.24	47.12
4	3	0	113.68	113.22	7	7	1	27.84	20.20	0	6	2	8.02	-5.31
2	3	0	8.86	9.26	9	7	1	18.66	20.92	1	6	2	21.11	-22.67
0	4	0	277.89	292.34	7	8	1	64.65	64.77	2	6	2	90.67	92.29
2	4	0	41.07	42.34	6	8	1	8.25	9.47	3	6	2	24.67	-24.84
4	4	0	43.57	41.68	5	8	1	32.47	32.24	4	6	2	28.33	26.83
6	4	0	19.67	-18.45	2	8	1	8.40	4.85	5	6	2	7.79	-6.56
8	4	0	31.72	33.12	0	9	1	26.14	-27.19	6	6	2	51.10	52.23
10	4	0	66.37	67.03	3	9	1	43.25	44.14	7	6	2	30.28	32.13
10	5	0	54.76	65.95	4	9	1	13.89	11.72	8	6	2	17.60	16.98
2	5	0	64.56	-67.38	1	0	2	75.20	71.96	9	6	2	21.97	22.65
0	6	0	65.95	-68.97	2	0	2	10.64	12.83	10	6	2	10.67	8.06
2	6	0	49.84	51.36	3	0	2	38.85	40.17	10	7	2	36.46	-35.84
4	6	0	40.03	43.02	4	0	2	148.48	152.28	9	7	2	13.95	-12.98
8	6	0	35.11	36.25	5	0	2	15.85	-14.78	8	7	2	43.28	43.23
6	7	0	54.50	-53.58	7	0	2	37.82	-36.62	6	7	2	22.63	-24.24
2	8	0	28.36	28.66	8	0	2	94.61	94.30	5	7	2	35.31	36.22
4	8	0	28.33	28.15	9	0	2	32.27	-32.07	4	7	2	20.36	20.45
10	0	1	18.23	16.55	0	1	2	40.95	39.90	3	7	2	6.53	-7.26
8	0	1	21.28	-21.25	9	1	2	9.78	7.66	1	7	2	24.79	-24.05
7	0	1	148.22	149.31	8	1	2	42.22	-41.83	0	8	2	61.71	63.23
6	0	1	34.14	32.67	7	1	2	19.99	-19.89	3	8	2	22.14	18.52
5	0	1	70.46	69.38	6	1	2	42.48	41.56	4	8	2	39.69	40.03
4	0	1	124.98	117.57	5	1	2	59.24	-59.57	6	8	2	12.22	13.32
3	0	1	167.63	168.46	4	1	2	90.53	-89.54	8	8	2	32.50	34.47
1	0	1	7.30	2.21	2	1	2	17.46	14.69	2	9	2	10.21	12.60
1	1	1	40.86	-55.80	1	1	2	72.44	70.17	1	9	2	25.31	24.90
3	1	1	134.93	132.45	0	2	2	31.40	-31.52	10	0	3	6.13	-5.87
4	1	1	10.09	0.47	1	2	2	20.62	-20.68	9	0	3	30.14	-30.82
6	1	1	7.71	-6.55	2	2	2	198.11	196.76	8	0	3	97.16	88.04
8	1	1	18.15	18.31	4	2	2	61.28	60.96	7	0	3	119.91	112.84
9	1	1	33.04	-31.49	5	2	2	21.05	-20.37	5	0	3	42.01	42.66
10	1	1	16.48	15.58	6	2	2	56.28	54.28	4	0	3	98.06	-99.53
10	2	1	27.43	26.36	7	2	2	56.74	57.30	3	0	3	84.03	85.42
8	2	1	48.86	-50.20	8	2	2	33.30	34.30	2	0	3	57.26	-58.32
7	2	1	29.51	-27.89	9	2	2	32.67	33.91	1	0	3	13.20	74.22
4	2	1	10.24	8.72	10	2	2	21.94	22.07	0	1	3	39.48	-38.77
3	2	1	47.54	45.49	10	3	2	50.10	-49.05	1	1	3	58.61	-55.66
2	2	1	104.19	-95.01	9	3	2	16.39	-15.79	2	1	3	33.62	-32.89
1	2	1	160.70	158.83	8	3	2	57.69	58.34	4	1	3	66.23	66.95
0	3	1	19.84	-18.12	7	3	2	22.95	24.43	5	1	3	14.95	-15.43
2	3	1	48.17	46.23	6	3	2	38.59	-39.45	6	1	3	57.63	58.99
3	3	1	110.52	-108.91	5	3	2	56.83	58.50	7	1	3	6.61	7.87
5	3	1	34.45	34.61	4	3	2	47.16	46.45	9	2	3	80.18	80.80
6	3	1	31.86	-32.63	3	3	2	11.24	-10.81	8	2	3	37.50	-38.17
					2	3	2	29.53	28.71	7	2	3	13.46	11.38

Table 10a (continued).

H	K	L	|Fo|	Fc	H	K	L	|Fo|	Fc	H	K	L	|Fo|	Fc
6	2	3	8.08	-5.55	8	0	4	28.61	29.16	1	8	4	23.15	22.79
5	2	3	90.79	90.90	9	0	4	25.31	-24.46	2	8	4	14.38	9.78
4	2	3	33.56	33.42	10	0	4	21.48	21.69	9	0	5	42.73	42.85
2	2	3	125.47	124.33	10	1	4	35.03	36.18	8	0	5	18.38	18.26
1	2	3	94.84	94.72	9	1	4	23.64	22.29	7	0	5	43.42	45.34
0	3	3	67.58	66.85	8	1	4	32.41	-32.62	6	0	5	8.31	5.51
1	3	3	32.58	30.67	6	1	4	47.51	49.07	5	0	5	27.23	-28.86
2	3	3	17.05	16.18	5	1	4	48.89	-49.99	4	0	5	16.56	18.37
3	3	3	73.73	-74.06	4	1	4	18.63	-19.11	3	0	5	72.96	74.66
4	3	3	72.24	-72.54	2	1	4	16.94	15.80	2	0	5	34.45	-34.30
5	3	3	30.11	29.61	1	1	4	16.51	14.88	1	0	5	44.46	44.69
6	3	3	28.61	-29.12	0	2	4	12.19	10.08	0	1	5	13.66	-15.17
7	3	3	20.10	-16.42	1	2	4	64.30	-62.86	1	1	5	59.56	-60.04
9	3	3	8.14	7.46	2	2	4	78.11	76.10	2	1	5	26.08	-25.56
10	3	3	44.57	43.49	3	2	4	39.37	-37.28	3	1	5	11.88	-10.40
9	4	3	20.10	-20.41	5	2	4	7.99	-5.07	4	1	5	26.23	25.15
8	4	3	65.19	64.26	6	2	4	87.97	90.82	5	1	5	44.03	-44.29
7	4	3	84.00	84.91	7	2	4	13.85	11.92	7	1	5	30.20	31.05
5	4	3	29.16	29.23	8	2	4	34.42	35.63	9	1	5	17.20	20.92
4	4	3	64.36	-63.46	9	2	4	19.61	18.24	10	2	5	18.00	15.17
3	4	3	71.72	71.03	10	2	4	23.47	22.33	9	2	5	48.97	49.32
2	4	3	56.19	-55.61	10	3	4	22.46	-22.33	8	2	5	38.39	-39.95
1	4	3	47.16	47.23	8	3	4	17.71	17.65	5	2	5	87.08	37.37
0	5	3	11.42	-12.30	7	3	4	6.21	-7.61	4	2	5	6.73	6.71
1	5	3	45.21	-45.45	6	3	4	40.95	-40.48	3	2	5	57.03	56.15
2	5	3	30.20	-30.98	5	3	4	37.56	38.73	2	2	5	5.98	4.92
3	5	3	56.60	56.50	4	3	4	33.35	32.44	1	2	5	20.79	21.60
4	5	3	37.04	37.67	3	3	4	21.42	22.45	0	3	5	6.79	2.42
6	5	3	57.00	57.10	2	3	4	31.86	-31.19	1	3	5	69.31	69.17
7	5	3	12.88	-1.08	1	3	4	25.51	-24.47	2	3	5	29.85	29.38
8	5	3	12.39	-13.87	0	4	4	113.48	115.15	3	3	5	11.07	10.79
10	5	3	51.33	-52.02	1	4	4	25.31	24.38	4	3	5	15.13	-15.50
10	6	3	7.16	-10.00	3	4	4	31.72	30.36	5	3	5	25.02	26.25
9	6	3	62.46	61.92	4	4	4	63.04	63.79	6	3	5	14.90	-17.24
8	6	3	35.77	-36.27	5	4	4	30.45	30.89	7	3	5	13.86	-15.41
7	6	3	6.27	2.73	6	4	4	27.78	25.79	9	3	5	15.76	-16.45
6	6	3	7.91	-3.77	7	4	4	29.99	-30.83	10	3	5	8.28	9.43
5	6	3	51.53	51.78	8	4	4	25.77	25.86	9	4	5	33.50	31.61
4	6	3	32.06	32.80	9	4	4	18.66	-19.87	8	4	5	17.28	16.45
3	6	3	7.39	9.54	10	4	4	23.35	20.97	7	4	5	42.24	40.58
2	6	3	50.68	60.68	10	5	4	36.38	36.01	5	4	5	20.69	-21.35
1	6	3	51.30	50.98	9	5	4	24.01	26.79	4	4	5	11.39	10.98
0	7	3	47.28	47.95	8	5	4	30.57	-32.71	3	4	5	54.09	53.34
1	7	3	18.29	13.12	6	5	4	37.70	37.48	2	4	5	24.88	-24.24
2	7	3	7.99	7.69	5	5	4	42.07	-41.60	1	4	5	40.23	40.08
3	7	3	41.73	-41.36	1	5	4	8.77	8.14	0	5	5	20.10	-19.73
4	7	3	46.96	-46.49	1	6	4	34.08	-31.63	1	5	5	33.39	-33.29
5	7	3	21.45	22.41	2	6	4	54.18	53.92	2	5	5	13.80	-14.22
6	7	3	13.77	-11.35	3	6	4	24.65	-25.16	4	5	5	24.59	24.29
7	7	3	16.05	-12.59	4	6	4	3.54	5.47	5	5	5	43.94	-43.25
5	8	3	13.57	13.05	5	6	4	12.60	-12.24	7	5	5	33.85	33.46
4	8	3	24.99	-25.68	6	6	4	52.51	51.85	9	5	5	21.54	18.91
3	8	3	47.62	47.30	7	6	4	12.85	15.40	5	6	5	66.40	65.82
2	8	3	43.89	-43.07	8	6	4	27.78	28.11	3	6	5	27.23	28.84
1	8	3	21.86	19.95	9	6	4	11.99	13.54	2	6	5	11.93	9.57
0	0	4	161.68	165.47	7	7	4	9.43	-8.18	1	6	5	19.15	19.14
1	0	4	20.42	20.35	6	7	4	26.14	-24.35	1	7	5	51.59	50.56
2	0	4	7.10	8.19	5	7	4	24.65	22.78	2	7	5	22.57	21.61
3	0	4	35.00	36.40	4	7	4	24.67	25.54	0	0	6	16.85	10.58
4	0	4	73.76	76.07	3	7	4	19.73	20.19	1	0	6	42.04	42.44
5	0	4	46.10	47.02	2	7	4	24.33	-24.24	4	0	6	85.84	90.33
6	0	4	39.08	39.70	1	7	4	16.51	-18.57	5	0	6	16.36	-15.93
7	0	4	41.50	-43.10	0	8	4	57.31	55.82					

Table 10a (continued).

H	K	L	|Fo|	Fc	H	K	L	|Fo|	Fc	H	K	L	|Fo|	Fc
7	0	6	12.62	-11.76	5	4	6	11.22	-8.50	9	2	1	125.27	125.23
8	0	6	35.72	36.02	6	4	6	41.53	40.80	6	2	1	15.99	-17.11
9	0	6	14.93	-13.37	7	4	6	11.01	-14.45	4	3	1	21.68	20.74
10	0	6	8.54	8.76	5	5	6	19.33	-17.22	7	3	1	26.89	28.39
10	1	6	10.32	10.16	2	5	6	44.40	43.38	10	4	1	8.66	6.48
9	1	6	13.52	-13.97	1	5	6	30.94	29.53	9	4	1	17.00	-16.89
8	1	6	56.25	-56.25	6	0	7	9.03	-10.64	6	4	1	19.99	20.70
7	1	6	11.45	-2.47	3	0	7	20.59	21.79	3	5	1	86.13	85.86
5	1	6	30.02	-28.57	1	0	7	60.13	61.50	4	5	1	18.87	19.78
2	1	6	50.73	49.48	0	1	7	8.71	9.25	8	5	1	18.95	17.72
1	1	6	30.14	28.97	1	1	7	33.36	-35.71	8	6	1	17.34	-18.37
0	2	6	42.45	42.32	2	1	7	14.84	-14.03	7	6	1	15.64	-16.58
2	2	6	84.81	84.93	4	1	7	14.75	14.61	6	6	1	12.16	-10.99
4	2	6	13.08	-10.95	5	2	7	68.21	67.44	1	4	1	4.86	6.22
5	2	6	17.97	-18.11	2	2	7	15.33	15.29	8	8	1	9.40	11.11
7	2	6	38.36	38.24	1	2	7	14.00	16.08	3	8	1	49.78	50.77
8	2	6	22.49	23.50	1	3	7	21.14	20.33	5	9	1	12.48	-15.93
9	2	6	16.22	18.01	2	3	7	8.68	12.36	0	0	2	55.99	61.62
8	3	6	61.22	60.20	4	3	7	13.20	-14.74	6	0	2	12.42	-12.16
7	3	6	7.65	11.35	1	9	1	11.96	-10.47	10	0	2	94.87	96.56
6	3	6	9.14	-4.49	6	6	0	115.61	118.66	3	2	2	34.80	-35.18
5	3	6	34.34	33.66	10	6	0	13.77	-8.82	2	4	2	5.92	5.00
4	3	6	8.14	-8.62	10	7	0	21.83	-21.41	7	4	2	32.38	-33.21
3	3	6	20.96	-19.57	8	7	0	33.73	-33.97	7	8	2	23.12	-23.82
2	3	6	39.11	-38.58	0	8	0	113.22	116.71	3	9	2	11.59	-6.92
1	3	6	16.59	-17.15	6	8	0	25.28	-27.91	8	1	3	15.07	-13.42
0	4	6	9.49	10.89	8	8	0	24.47	24.33	9	1	3	11.99	-5.33
1	4	6	30.40	30.16	6	5	0	82.16	84.02	10	2	3	25.62	-23.97
2	4	6	10.38	-8.21	9	0	1	18.29	-17.15	6	8	3	9.14	1.64
4	4	6	75.46	74.88	7	1	1	24.44	-23.40	6	0	6	63.74	45.16

Table 10b. Observed and calculated structure factors for Yamato-74371 olivine. The five columus for each datum represent H, K, L, F_{obs}, F_{calc}.

H	K	L	|Fo|	Fc	H	K	L	|Fo|	Fc	H	K	L	|Fo|	Fc
4	0	0	23.39	25.13	2	0	1	51.03	-50.42	8	6	1	19.53	-18.03
6	0	0	3.76	-2.74	1	0	1	2.72	-4.10	7	6	1	16.84	-16.50
8	0	0	29.25	30.29	0	1	1	54.96	-54.21	6	6	1	10.84	-11.03
10	0	0	68.07	71.06	1	1	1	53.13	-50.98	5	6	1	32.71	32.37
12	0	0	61.40	64.66	2	1	1	29.13	-28.14	4	6	1	5.15	-7.39
12	1	0	72.74	-74.52	3	1	1	130.54	128.95	3	6	1	16.62	15.96
10	1	0	69.52	71.10	5	1	1	47.89	-46.21	2	6	1	12.26	-11.82
8	1	0	21.19	22.55	6	1	1	7.32	-6.00	1	6	1	81.94	84.02
6	1	0	126.64	126.71	7	1	1	24.04	-23.20	0	7	1	10.63	-11.22
4	1	0	81.12	-79.98	8	1	1	18.22	18.85	1	7	1	20.73	21.11
2	1	0	91.86	-87.26	9	1	1	33.23	-32.92	2	7	1	25.40	24.46
0	2	0	92.41	-91.94	10	1	1	15.02	15.16	3	7	1	56.95	-56.82
2	2	0	44.61	44.49	11	1	1	3.77	-4.12	4	7	1	11.11	11.62
4	2	0	44.51	43.20	12	2	1	17.15	16.97	5	7	1	14.86	14.39
6	2	0	237.66	234.98	11	2	1	29.34	29.12	6	7	1	26.85	-26.69
8	2	0	48.50	47.65	10	2	1	25.83	25.44	7	7	1	19.82	18.81
10	2	0	24.40	-24.24	9	2	1	119.28	118.40	9	7	1	19.77	20.19
12	2	0	47.05	47.93	8	2	1	48.53	-50.12	10	7	1	5.19	5.46
12	3	0	72.90	72.01	7	2	1	29.34	-29.37	11	7	1	4.42	-0.17
10	3	0	45.35	-44.05	6	2	1	16.65	-17.39	8	8	1	10.23	10.14
8	3	0	45.93	-46.46	5	2	1	65.18	63.11	7	8	1	60.10	59.59
6	3	0	101.10	-99.50	4	2	1	9.40	9.17	6	8	1	10.54	9.84
4	3	0	115.13	109.66	3	2	1	44.76	41.73	5	8	1	32.12	31.20
2	3	0	10.77	10.80	2	2	1	101.97	-95.13	4	8	1	5.29	6.53
0	4	0	279.63	282.23	1	2	1	151.22	150.60	3	8	1	45.97	46.36
2	4	0	44.36	41.49	0	3	1	18.31	-16.83	2	8	1	5.47	5.18
4	4	0	38.91	35.48	1	3	1	50.31	49.38	0	9	1	26.45	-25.96
6	4	0	21.29	-20.98	2	3	1	46.37	45.74	1	9	1	8.99	-8.43
8	4	0	29.59	29.68	3	3	1	108.32	-105.89	3	9	1	41.40	40.12
10	4	0	63.44	62.71	4	3	1	22.12	20.82	4	9	1	9.45	10.38
12	4	0	47.79	46.27	5	3	1	32.43	31.49	5	9	1	14.68	-14.20
12	5	0	53.69	-52.42	6	3	1	32.61	-32.70	0	0	2	42.97	48.33
10	5	0	64.86	63.07	7	3	1	27.43	27.25	1	0	2	71.17	70.02
6	5	0	81.58	79.69	8	3	1	5.55	-4.55	2	0	2	9.88	10.11
4	5	0	30.35	-34.01	9	3	1	31.11	31.21	3	0	2	40.64	41.36
2	5	0	68.16	-67.31	12	3	1	20.24	-19.79	4	0	2	143.35	143.95
0	6	0	68.51	-68.07	12	4	1	7.67	-6.28	5	0	2	14.68	-14.29
2	6	0	46.40	44.93	11	4	1	33.98	33.44	6	0	2	14.98	-15.71
4	6	0	41.12	41.22	10	4	1	8.07	6.71	7	0	2	35.64	-36.83
6	6	0	117.25	113.96	9	4	1	16.33	-16.32	8	0	2	87.81	89.80
8	6	0	35.80	34.79	8	4	1	3.27	-3.33	9	0	2	31.35	-31.93
10	6	0	9.88	-9.29	7	4	1	109.78	107.61	10	0	2	90.04	-92.26
12	6	0	23.28	22.70	6	4	1	20.11	21.08	12	0	2	6.79	6.25
10	7	0	20.92	-20.67	5	4	1	54.83	53.80	12	1	2	29.69	-30.33
8	7	0	36.87	-35.69	4	4	1	45.71	45.62	11	1	2	33.24	33.04
6	7	0	52.52	-50.93	3	4	1	103.25	102.17	10	1	2	38.23	38.03
4	7	0	67.15	64.48	2	4	1	15.26	-16.18	9	1	2	8.86	8.85
0	8	0	111.91	110.28	1	4	1	2.82	2.78	8	1	2	38.28	-39.39
2	8	0	29.49	28.89	0	5	1	50.23	-53.09	7	1	2	18.81	-20.44
4	8	0	24.83	24.25	1	5	1	22.61	-22.07	6	1	2	38.37	37.40
6	8	0	28.20	-27.72	2	5	1	4.61	-2.77	5	1	2	57.40	-58.40
8	8	0	21.83	21.71	3	5	1	82.71	81.94	4	1	2	86.02	-86.87
4	9	0	16.10	-16.11	4	5	1	18.11	18.72	3	1	2	5.53	-5.60
2	9	0	35.92	-34.26	5	5	1	29.25	-29.26	2	1	2	16.07	13.12
12	0	1	6.89	-6.56	6	5	1	18.78	-19.06	1	1	2	70.18	69.11
11	0	1	41.08	41.98	7	5	1	15.33	-14.63	0	2	2	31.81	-32.42
10	0	1	16.74	17.16	8	5	1	19.35	18.00	1	2	2	19.39	-20.26
9	0	1	18.16	-17.50	9	5	1	23.48	-23.07	2	2	2	184.37	186.56
8	0	1	21.23	-21.60	10	5	1	19.12	19.95	3	2	2	35.16	-36.49
7	0	1	141.38	142.38	12	5	1	11.36	-10.15	4	2	2	57.55	57.83
6	0	1	33.43	33.03	12	6	1	11.24	10.40	5	2	2	20.05	-20.02
5	0	1	57.96	66.69	11	6	1	22.40	21.32	6	2	2	49.98	48.26
4	0	1	122.03	116.54	10	6	1	7.70	6.97	7	2	2	54.86	56.38
3	0	1	156.94	157.44	9	6	1	73.91	73.31					

Table 10b (continued).

H	K	L	|Fo|	Fc	H	K	L	|Fo|	Fc	H	K	L	|Fo|	Fc
8	2	2	31.57	30.97	1	7	2	22.27	-23.73	9	4	3	19.92	-19.84
9	2	2	33.01	33.11	0	8	2	53.04	55.89	8	4	3	62.30	62.04
10	2	2	20.87	20.66	1	8	2	15.67	15.93	7	4	3	77.00	78.04
11	2	2	19.90	-19.70	3	8	2	17.24	18.28	5	4	3	26.82	27.20
12	2	2	14.48	14.81	4	8	2	35.25	36.28	4	4	3	63.11	-64.35
12	3	2	25.39	25.00	5	8	2	5.77	3.46	3	4	3	64.00	64.75
11	3	2	26.90	-27.11	6	8	2	13.50	12.83	2	4	3	52.81	-54.47
10	3	2	47.73	-47.76	7	8	2	21.89	-22.87	1	4	3	43.34	43.70
9	3	2	15.87	-16.38	8	8	2	31.82	31.87	0	5	3	13.19	-12.77
8	3	2	53.93	55.27	3	9	2	6.28	-6.63	1	5	3	40.24	-41.71
7	3	2	24.10	24.39	2	9	2	11.00	11.04	2	5	3	29.25	-29.31
6	3	2	36.01	-35.88	1	9	2	23.42	23.68	3	5	3	50.90	51.91
5	3	2	55.29	57.01	12	0	3	20.98	-22.58	4	5	3	35.43	36.00
4	3	2	44.17	43.58	11	0	3	49.24	49.68	5	5	3	3.65	-1.63
3	3	2	10.35	-9.29	10	0	3	4.29	-4.64	6	5	3	54.67	56.15
2	3	2	29.18	29.37	9	0	3	28.47	-30.41	8	5	3	13.59	-13.27
1	3	2	45.75	-46.22	8	0	3	83.77	86.11	9	5	3	6.54	-6.32
0	4	2	76.47	75.53	7	0	3	102.54	104.57	10	5	3	51.59	-51.57
1	4	2	39.25	40.93	5	0	3	38.51	39.53	12	5	3	18.47	-17.14
2	4	2	4.95	3.54	4	0	3	98.01	-101.35	11	6	3	13.21	12.79
3	4	2	31.44	32.62	3	0	3	79.97	77.70	10	6	3	10.48	-10.99
4	4	2	88.34	89.43	2	0	3	55.29	-56.94	9	6	3	55.81	56.31
5	4	2	3.02	-3.15	1	0	3	71.38	68.55	8	6	3	33.92	-34.46
6	4	2	4.21	-1.46	0	1	3	39.70	-39.39	7	6	3	4.21	3.30
7	4	2	32.09	-32.97	1	1	3	52.82	-51.94	6	6	3	5.04	-4.01
8	4	2	63.14	63.94	2	1	3	31.76	-31.14	5	6	3	45.43	46.79
9	4	2	25.92	-26.05	3	1	3	80.13	81.65	4	6	3	32.41	33.47
10	4	2	68.14	69.31	4	1	3	63.76	65.12	3	6	3	7.42	8.27
11	4	2	4.65	5.05	5	1	3	10.35	-14.97	2	6	3	57.83	59.04
12	4	2	10.75	11.25	6	1	3	56.80	58.83	1	6	3	44.20	46.48
12	5	2	22.02	-24.16	7	1	3	7.76	7.31	0	7	3	44.78	46.58
11	5	2	27.30	26.69	8	1	3	12.54	-12.59	1	7	3	10.69	11.04
10	5	2	18.44	17.85	9	1	3	9.02	-8.07	2	7	3	5.34	6.43
8	5	2	10.23	-9.63	10	1	3	57.69	-58.60	3	7	3	37.13	-37.72
7	5	2	11.73	-10.69	11	1	3	10.03	-9.39	4	7	3	43.76	-44.51
6	5	2	26.40	25.84	12	1	3	33.74	-34.50	5	7	3	19.11	19.78
5	5	2	36.66	-36.94	12	2	3	12.89	12.37	6	7	3	11.76	-11.43
4	5	2	59.07	-59.93	11	2	3	19.58	20.26	7	7	3	13.21	-12.11
3	5	2	11.03	-12.15	10	2	3	24.65	-25.63	9	7	3	4.55	4.27
2	5	2	21.03	20.59	9	2	3	73.74	74.61	5	8	3	12.20	12.53
1	5	2	44.81	45.91	8	2	3	35.37	-36.45	4	8	3	24.41	-26.09
0	6	2	5.78	-3.87	7	2	3	10.65	10.59	3	8	3	40.22	42.34
1	6	2	20.91	-21.48	6	2	3	7.82	-6.11	2	8	3	40.87	-41.48
2	6	2	83.56	85.88	5	2	3	83.49	83.81	1	8	3	17.73	18.01
3	6	2	23.35	-24.97	4	2	3	33.92	34.61	0	0	4	151.82	155.38
4	6	2	25.38	25.43	3	2	3	5.56	-3.10	1	0	4	18.54	18.33
5	6	2	6.68	-6.52	2	2	3	120.24	123.04	2	0	4	6.77	6.66
6	6	2	46.46	47.61	1	2	3	86.96	87.34	3	0	4	37.26	36.92
7	6	2	31.25	31.29	0	3	3	65.11	67.02	4	0	4	68.35	68.86
8	6	2	14.18	14.60	1	3	3	28.17	28.03	5	0	4	44.85	45.59
9	6	2	22.76	21.91	2	3	3	14.46	14.40	6	0	4	37.12	37.51
10	6	2	8.18	7.36	3	3	3	68.18	-69.14	7	0	4	42.35	-42.00
11	6	2	10.79	-10.21	4	3	3	67.45	-70.79	8	0	4	24.95	24.57
12	6	2	20.54	19.67	5	3	3	28.32	27.61	9	0	4	23.53	-24.63
10	7	2	34.34	-33.89	6	3	3	29.38	-28.94	10	0	4	16.22	16.42
9	7	2	12.50	-12.88	7	3	3	15.54	-15.97	11	0	4	19.65	19.75
8	7	2	39.65	39.84	8	3	3	4.94	4.30	12	0	4	22.94	22.52
7	7	2	17.35	16.78	9	3	3	5.52	6.86	12	1	4	25.04	-24.73
6	7	2	21.80	-21.25	10	3	3	42.71	43.31	11	1	4	37.00	37.17
5	7	2	33.94	34.45	11	3	3	18.56	17.80	10	1	4	33.05	33.54
4	7	2	18.44	18.34	12	3	3	44.55	45.26	9	1	4	21.40	21.24
3	7	2	7.11	-6.29	12	4	3	18.19	-18.25	8	1	4	30.82	-30.46
2	7	2	24.27	24.27	11	4	3	39.36	39.01	6	1	4	44.44	45.50
										5	1	4	47.01	-47.69

Table 10b (continued).

H	K	L	|Fo|	Fc	H	K	L	|Fo|	Fc	H	K	L	|Fo|	Fc
4	1	4	15.41	-15.57	5	7	4	20.33	20.77	3	5	5	9.80	-9.28
3	1	4	3.56	-3.77	4	7	4	22.27	22.16	4	5	5	22.02	22.05
2	1	4	16.18	15.38	3	7	4	18.74	18.90	5	5	5	39.47	-39.67
1	1	4	16.28	16.00	2	7	4	23.32	-23.28	7	5	5	31.04	31.46
0	2	4	11.92	9.57	1	7	4	18.07	-17.84	8	5	5	9.29	7.65
1	2	4	58.23	-59.47	0	8	4	48.74	49.91	6	6	5	5.21	-3.09
2	2	4	67.39	67.03	1	8	4	20.55	20.17	5	6	5	58.82	59.54
3	2	4	37.81	-37.83	2	8	4	9.95	10.35	3	6	5	27.15	27.08
4	2	4	4.11	-2.17	12	0	5	5.44	-3.85	2	6	5	8.92	7.60
5	2	4	6.60	-6.49	11	0	5	68.32	67.95	1	6	5	15.45	15.42
6	2	4	83.74	84.90	10	0	5	4.76	1.21	1	7	5	45.04	45.60
7	2	4	10.90	11.15	9	0	5	41.73	41.57	2	7	5	19.79	19.67
8	2	4	31.72	33.05	8	0	5	15.20	15.21	3	7	5	11.40	9.39
10	2	4	20.95	20.92	7	0	5	38.27	39.17	0	0	6	5.22	2.06
11	2	4	4.91	5.00	6	0	5	8.18	7.21	1	0	6	38.52	38.28
12	2	4	50.62	51.17	5	0	5	28.91	-29.75	2	0	6	10.93	-9.44
12	3	4	26.93	25.91	4	0	5	16.95	17.91	3	0	6	7.70	1.42
11	3	4	37.68	-37.61	3	0	5	66.38	67.00	4	0	6	82.32	82.20
10	3	4	19.15	-20.14	2	0	5	32.04	-32.49	5	0	6	17.12	-16.68
9	3	4	6.45	-6.85	1	0	5	41.09	40.86	6	0	6	42.11	41.72
8	3	4	14.51	14.75	0	1	5	17.01	-17.19	7	0	6	10.29	-10.75
7	3	4	5.21	-4.58	1	1	5	56.01	-55.82	8	0	6	34.10	33.35
6	3	4	37.71	-37.57	2	1	5	24.22	-23.58	9	0	6	11.77	-11.78
5	3	4	36.14	36.55	3	1	5	12.51	-12.49	10	0	6	7.36	7.10
4	3	4	28.76	28.98	4	1	5	22.37	22.89	10	1	6	6.74	7.01
3	3	4	21.35	21.52	5	1	5	40.43	-40.70	9	1	6	12.79	-11.91
2	3	4	29.78	-31.01	6	1	5	9.18	8.03	8	1	6	54.79	-54.25
1	3	4	23.49	-24.72	7	1	5	29.41	30.23	7	1	6	5.94	-3.21
0	4	4	103.28	106.55	8	1	5	4.89	6.13	5	1	6	24.80	-24.92
1	4	4	21.55	22.16	9	1	5	19.87	19.73	4	1	6	5.34	4.91
2	4	4	8.62	8.50	11	1	5	12.39	-12.51	2	1	6	46.14	46.60
3	4	4	31.04	30.45	12	1	5	6.77	-7.03	1	1	6	27.58	27.00
4	4	4	55.85	57.81	11	2	5	29.53	-29.04	0	2	6	40.55	40.49
5	4	4	30.27	29.93	10	2	5	14.43	13.62	1	2	6	4.95	-3.52
6	4	4	24.67	23.78	9	2	5	42.14	42.78	2	2	6	76.85	77.33
7	4	4	29.21	-29.68	8	2	5	36.89	-38.14	5	2	6	16.28	-16.45
8	4	4	22.08	22.05	7	2	5	5.03	2.63	6	2	6	7.07	-4.43
9	4	4	19.49	-19.93	6	2	5	10.54	-3.43	7	2	6	36.95	35.66
10	4	4	15.82	16.51	5	2	5	78.34	80.18	8	2	6	19.33	18.99
11	4	4	13.63	13.00	4	2	5	6.68	7.14	9	2	6	16.25	15.59
12	4	4	17.35	15.44	3	2	5	51.84	52.62	8	3	6	56.61	56.27
11	5	4	27.05	26.25	2	2	5	3.45	2.30	7	3	6	11.99	11.36
10	5	4	33.61	32.86	1	2	5	16.77	16.50	5	3	6	29.47	29.76
9	5	4	26.40	25.25	1	3	5	63.14	64.19	4	3	6	10.69	-10.25
8	5	4	29.41	-30.63	2	3	5	27.12	27.50	3	3	6	17.20	-17.60
7	5	4	7.26	-7.59	3	3	5	13.01	12.43	2	3	6	35.50	-35.42
6	5	4	34.00	34.01	4	3	5	14.36	-13.23	1	3	6	16.34	-16.01
5	5	4	38.71	-39.10	5	3	5	23.45	23.38	0	4	6	6.02	3.95
4	5	4	3.46	-0.49	6	3	5	17.73	-17.62	1	4	6	26.97	26.63
3	5	4	8.40	8.53	7	3	5	15.69	-15.47	2	4	6	7.13	-9.13
2	5	4	4.02	0.61	9	3	5	16.12	-16.04	4	4	6	56.23	67.23
1	5	4	10.51	8.67	10	3	5	10.69	9.24	5	4	6	8.24	-9.52
1	6	4	28.58	-29.34	9	4	5	30.33	30.89	6	4	6	38.26	38.09
2	6	4	46.28	47.22	8	4	5	15.54	15.83	7	4	6	11.77	-13.41
3	6	4	24.89	-25.27	7	4	5	35.02	34.88	2	0	0	55.82	56.97
4	6	4	4.67	4.28	6	4	5	5.78	5.72	9	2	4	18.60	18.02
5	6	4	12.30	-11.87	5	4	5	21.71	-21.68	5	5	6	14.55	-14.48
6	6	4	46.96	47.15	4	4	5	9.36	10.39	3	5	6	5.89	-7.62
7	6	4	13.74	13.99	3	4	5	46.64	47.10	2	5	6	40.55	40.68
8	6	4	26.23	26.44	2	4	5	22.27	-22.10	1	5	6	26.16	27.34
9	6	4	11.40	12.79	1	4	5	36.08	36.61	6	0	7	17.86	-10.43
7	7	4	7.05	-6.01	0	5	5	20.60	-21.19	3	0	7	16.98	16.82
6	7	4	21.97	-22.13	1	5	5	29.90	-30.27	2	0	7	7.41	-5.94
5	7	4	20.33	20.77	2	5	5	12.69	-12.59	1	0	7	57.17	56.32

Table 10b (continued).

H	K	L	|Fo|	Fc
0	1	7	8.62	8.58
1	1	7	32.64	-31.71
2	1	7	11.43	-11.01
3	1	7	9.01	5.35
4	1	7	13.41	11.65
5	1	7	5.75	-2.44
5	2	7	61.23	59.84
2	2	7	15.45	13.93
1	2	7	9.95	11.53
1	3	7	17.64	17.07
2	3	7	10.99	9.02
3	3	7	7.38	-5.59
4	3	7	12.81	-12.51

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(Received May 15, 1980; Revised manuscript received August 4, 1980)