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LAMPIRAN

LAMPIRAN 1

HASIL ANALISIS *X-RAY DIFFRACTION* (XRD)

1. Sampel Awal

Match! Phase Analysis Report

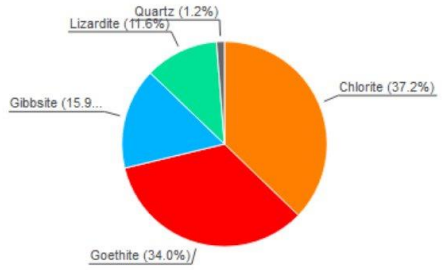
Sample: Shinta-SampelAwal

Sample Data

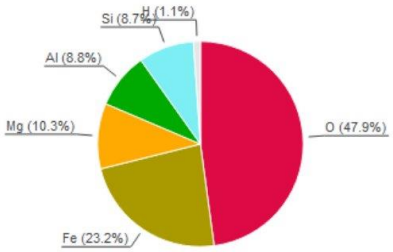
File name	Shinta-SampelAwal.txt
File path	E:/BISMILLAH TA SHINTA/SKRIPSI/Shinta-SampelAwal
Data collected	Sep 29, 2023 11:57:32
Data range	5.000° - 70.000°
Original data range	5.000° - 70.000°
Number of points	3251
Step size	0.020
Rietveld refinement converged	No
Alpha2 subtracted	No
Background subtr.	No
Data smoothed	Yes
Radiation	X-rays
Wavelength	1.541874 Å

Analysis Results

Phase composition (Weight %)



Elemental composition (Weight %)



Index	*Amount (%)*	*Name*	*Formula sum*
A	37.2	Chlorite	Al0.865 Fe0.255 H4 Mg2.292 O9 Si1.588
B	34.0	Goethite	Fe H O2
C	15.9	Gibbsite	Al O3
D	11.6	Lizardite	H4 Mg3 O9 Si2
E	1.2	Quartz	O2 Si
	1.3	*Unidentified peak area*	

Element	*Amount (weight %)*
O	*47.9%(*)*
Fe	23.2%
Mg	10.3%
Al	8.8%
Si	8.7%
H	*1.1%(*)*
**LE (sum)*	*49.0%*

Amounts calculated by RIR (Reference Intensity Ratio) method

Details of identified phases

A: Chlorite (37.2 %)*

Formula sum	Al0.865 Fe0.255 H4 Mg2.292 O9 Si1.588
Entry number	96-901-0164
Figure-of-Merit (FoM)	0.576327*
Total number of peaks	600
Peaks in range	312
Peaks matched	98
Intensity scale factor	0.21*
Space group	C 1 2/m 1
Crystal system	monoclinic
Unit cell	a= 5.3363 Å b= 9.2400 Å c= 14.3700 Å β= 96.930 °
I/Ic	0.69
Calc. density	2.700 g/cm³
Reference	Zanazzi P. F., Montagnoli M., Nazzareni S., Comodi P., "Structural effects of pressure on monoclinic chlorite: a single-crystal study", American Mineralogist **92**, 655-661 (2007)

B: Goethite (34.0 %)*

Formula sum	Fe H O2
Entry number	96-900-2160
Figure-of-Merit (FoM)	0.749632*
Total number of peaks	364
Peaks in range	74
Peaks matched	45
Intensity scale factor	0.65*
Space group	P n m a
Crystal system	orthorhombic
Unit cell	a= 9.9189 Å b= 3.0148 Å c= 4.5835 Å
I/Ic	2.38
Calc. density	4.306 g/cm³
Reference	Gualtieri A., Venturelli P., "In situ study of the goethite-hematite phase transformation by real timesynchrotron powder diffractionSample at T = 156 C", American Mineralogist **84**, 895-904 (1999)

C: Gibbsite (15.9 %)

Formula sum	Al O3
Entry number	96-901-5977
Figure-of-Merit (FoM)	0.000000
Total number of peaks	996
Peaks in range	348
Peaks matched	119
Intensity scale factor	0.23
Space group	P 1 21/n 1
Crystal system	monoclinic
Unit cell	a= 8.6410 Å b= 5.0700 Å c= 9.7200 Å β= 85.430 °
I/Ic	1.79
Calc. density	2.347 g/cm³
Reference	Megaw H., "The crystal structure of Hydrargillite Al (O H)3_cod_database_code 1011081", Zeitschrift fur Kristallographie **87**, 185-204 (1934)

D: Lizardite (11.6 %)*

Formula sum	H4 Mg3 O9 Si2
Entry number	96-900-0849
Figure-of-Merit (FoM)	0.467227*
Total number of peaks	224
Peaks in range	56
Peaks matched	18
Intensity scale factor	0.13*
Space group	P 3 1 m
Crystal system	trigonal (hexagonal axes)
Unit cell	a= 5.3320 Å c= 7.2330 Å
I/Ic	1.35
Calc. density	2.584 g/cm³
Reference	Mellini M., "The crystal structure of lizardite 1T: hydrogen bonds and polytypism", American Mineralogist **67**, 587-598 (1982)

E: Quartz (1.2 %)

Formula sum	O2 Si
Entry number	96-900-0776
Figure-of-Merit (FoM)	0.000000
Total number of peaks	140
Peaks in range	36
Peaks matched	11
Intensity scale factor	0.03
Space group	P 32 2 1 S
Crystal system	trigonal (hexagonal axes)
Unit cell	a= 4.9160 Å c= 5.4054 Å
I/Ic	2.95
Calc. density	2.646 g/cm³
Reference	Levien L., Prewitt C. T., Weidner D. J., "Structure and elastic properties of quartz at pressureP = 1 atm", American Mineralogist **65**, 920-930 (1980)

(*)2theta values have been shifted internally for the calculation of the amounts, the intensity scaling factors as well as the figure-of-merit (FoM), due to the active search-match option 'Automatic zero point adaption'.

Candidates

Name	***Formula***	***Entry No.***	***FoM***
Neon	Ne	96-901-1723	0.6112
	Nb Zr	96-153-7846	0.5676
Li0.77 (Ni0.7 Fe0.15 Co0.15)1.03 O2	Co0.1545 Fe0.1545 Li0.77 Ni0.721 O2	96-152-6305	0.5476
Li Co0.333 Ni0.333 Mn0.333 O2	Co0.333 Li Mn0.333 Ni0.333 O2	96-400-2444	0.5456
(Li0.99 Ni0.01) ((Ni0.70 Co0.15 Al0.15) O2)	Al0.15 Co0.15 Li0.99 Ni0.71 O2	96-153-3586	0.5448
Lithium Cobalt Oxide	Co Li1.43 O2	96-155-0400	0.5388
(Li0.82 Ni0.026) Ni0.994 O2	Li0.82 Ni1.02 O2	96-152-6281	0.5373
Li (Cr0.167 Li0.277 Mn0.556) O2	Cr0.167 Li1.277 Mn0.556 O2	96-153-2835	0.5251
Li (Cr0.25 Li0.25 Mn0.5) O2	Cr0.25 Li1.25 Mn0.5 O2	96-153-2836	0.5250
(Li0.88 Mg0.02) (Ni0.92 Mg0.08) O2	Li0.88 Mg0.1 Ni0.92 O2	96-152-6285	0.5075
(Li0.98 Ni0.02) (Li0.05 Ni0.75 Co0.1 Mn0.1) O2	Co0.1 Li1.03 Mn0.1 Ni0.77 O2	96-152-0790	0.5026
	Li0.65 Ni1.08 O2	96-153-5513	0.5013

Spinel	Al2.401 Mg0.398 O4	96-900-5769	0.4197
Spinel	Al2 Mg O4	96-900-5768	0.4173
Spinel	Al1.88 Fe0.225 Mg0.887 Mn0.005 Ni2 O4 Zn0.001	96-900-5346	0.3825
Spinel (Li, Ti)	Li1.03 O4 Ti2	96-100-8792	0.0000
Spinel (Li, Ti)	Li0.89 O4 Ti2	96-100-8793	0.0000
Spinel (Li, Ti)	Li0.75 O4 Ti2	96-100-8794	0.0000
Iron diiron(III) oxide (Magnetite)	Fe3 O4	96-101-1033	0.0000
Aluminium hydroxide (Gibbsite)	Al H3 O3	96-101-1082	0.0000
Iron diiron(III) oxide (Magnetite)	Fe3 O4	96-101-1085	0.0000
Silicon oxide $-alpha (Quartz low)	O2 Si	96-101-1098	0.0000
Trimagnesium dihydroxide phyllo-tetrasilicate (Talc 2M)	H2 Mg3 O12 Si4	96-101-1153	0.0000
Silicon oxide (Quartz low)	O2 Si	96-101-1160	0.0000
Silicon oxide $-alpha (Quartz low)	O2 Si	96-101-1173	0.0000
Silicon oxide - $-alpha (Quartz low)	O2 Si	96-101-1177	0.0000
Silicon oxide - \b (Quartz high)	O2 Si	96-101-1201	0.0000
Silicon oxide (Quartz high)	O2 Si	96-110-0020	0.0000
Montmorillonite	Al2 Ca O12 Si4	96-110-1055	0.0000
Aluminium hydroxide (Gibbsite)	Al H3 O3	96-120-0017	0.0000
Lithium Manganese Oxide (0.78/1.88/4) (Unnamed_Spinel)	Li0.78 Mn1.88 O4	96-151-4008	0.0000
Lithium Manganese Oxide (1/2/4) (Unnamed_Spinel)	Li Mn2 O4	96-151-4042	0.0000
Lithium Manganese Oxide (1/2/4) (Unnamed_Spinel)	Li Mn2 O4	96-151-4043	0.0000
Lithium Manganese Oxide (1/2/4) (Unnamed_Spinel)	Li Mn2 O4	96-151-4051	0.0000
Magnetite	Fe3 O4	96-153-9748	0.0000
Zn2TiO4 ordered spinel	O4 Ti Zn2	96-154-4335	0.0000
LiFe5O8 ordered spinel	Fe5 Li O8	96-154-4336	0.0000
LiZnNbO4 ordered spinel	Li Nb O4 Zn	96-154-4337	0.0000
Al(OH)3 gibbsite (gibbsite)	Al H3 O3	96-154-4376	0.0000
Zn2TiO4 cubic spinel	O4 Ti Zn2	96-154-4563	0.0000
Zn1.92Ti0.84Ta0.16O4 cubic spinel	O4 Ta0.16 Ti0.84 Zn1.92	96-154-4565	0.0000
Zn1.925Ti0.85Ta0.15O4 cubic spinel	O4 Ta0.15 Ti0.85 Zn1.925	96-154-4566	0.0000
Zn1.93Ti0.86Ta0.14O4 cubic spinel	O4 Ta0.14 Ti0.86 Zn1.93	96-154-4567	0.0000
Zn1.95Ti0.9Ta0.1O4 cubic spinel	O4 Ta0.1 Ti0.9 Zn1.95	96-154-4568	0.0000
Zn1.7Ti0.4Ta0.6O4 tetragonal spinel	O4 Ta0.6 Ti0.4 Zn1.7	96-154-4569	0.0000
Zn1.925Ti0.85Ta0.15O4 tetragonal spinel	O4 Ta0.15 Ti0.85 Zn1.925	96-154-4570	0.0000
Zn1.925Ti0.85Ta0.15O4 cubic spinel	O4 Ta0.15 Ti0.85 Zn1.925	96-154-4576	0.0000
(Co0.4Al0.4)Al2O4 defect spinel	Al2.4 Co0.4 O4	96-154-5122	0.0000
Zn2SiO4 modified spinel (Zn2SiO4 wadsleyite phase)	O4 Si Zn2	96-154-9040	0.0000
Zn2GeO4 cubic spinel	Ge O4 Zn2	96-154-9041	0.0000
Zn2GeO4 tetragonal spinel	Ge O4 Zn2	96-154-9042	0.0000
spinel (Ni0.15Al0.85)(Ni0.425Al0.475Cr0.1)2O4	Al1.8 Cr0.2 Ni O4	96-155-9487	0.0000

and 880 others...

Search-Match

Settings

Reference database used	COD-Inorg 2023.06.06
Automatic zeropoint adaptation	Yes
Downgrade entries with low scaling factors	Yes
Minimum figure-of-merit (FoM)	0.50
2theta window for peak corr.	0.30 deg.
Minimum rel. int. for peak corr.	0
Parameter/influence 2theta	0.50
Parameter/influence intensities	0.50
Parameter multiple/single phase(s)	0.50

Criteria for entries added by user

Reference:

Entry number: 96-101-1153;96-300-0049;96-900-8041;96-900-8298;96-900-8732;96-901-4436;96-901-7404;96-110-1055;96-900-2780;96-901-0957;96-901-0958;96-901-0959;96-901-0960;96-101-1033;96-101-1085;96-153-9748;96-722-8111;96-900-0927;96-900-0928;96-900-0929;96-900-0930;96-900-0931;96-900-0932;96-900-0933;96-900-0934;96-900-0935;96-900-2317;96-900-2318;96-900-2319;96-900-2320;96-900-2321;96-900-2322;96-900-2323;96-900-2324;96-900-2325;96-900-2326;96-900-2327;96-900-2328;96-900-2329;96-900-2330;96-900-2331;96-900-2332;96-900-2333;96-900-2674;96-900-2675;96-900-4088;96-900-4156;96-900-4157;96-900-5813;96-900-5814;96-900-5815;96-900-5816;96-900-5817;96-900-5837;96-900-5838;96-900-5839;96-900-5840;96-900-5841;96-900-5842;96-900-5843;96-900-6185;96-900-6190;96-900-6195;96-900-6200;96-900-6243;96-900-6248;96-900-6253;96-900-6266;96-900-6921;96-900-6922;96-900-6923;96-900-7645;96-900-7707;96-900-7708;96-900-9769;96-900-9770;96-901-0940;96-901-0941;96-901-0942;96-901-3530;96-901-3531;96-901-3532;96-901-3533;96-901-3534;96-901-3535;96-901-3536;96-901-6802;96-901-6803;96-901-6804;96-901-6805;96-901-6806;96-901-6807;96-901-6808;96-901-6809;96-901-6810;96-901-6811;96-901-6812;96-901-6813;96-901-6814;96-901-6815;96-901-6816;96-901-6817;96-901-6818;96-901-7087;96-901-7088;96-900-0849;96-900-1092;96-900-1093;96-900-1639;96-900-1640;96-900-1779;96-900-1883;96-900-4509;96-900-4510;96-900-4511;96-900-4512;96-900-4513;96-900-4514;96-900-4994;96-900-4995;96-900-7425;96-901-4665;96-901-5164;96-901-5487;96-901-5581;96-901-6051;96-901-6148;96-901-7502;96-101-1098;96-101-1160;96-101-1173;96-101-1177;96-101-1201;96-110-0020;96-500-0036;96-900-0776;96-900-0777;96-900-0778;96-900-0779;96-900-0780;96-900-0781;96-900-5018;96-900-5019;96-900-5020;96-900-5021;96-900-5022;96-900-5023;96-900-5024;96-900-5025;96-900-5026;96-900-5027;96-900-5028;96-900-5029;96-900-5030;96-900-5031;96-900-5032;96-900-5033;96-900-5034;96-900-7379;96-900-8093;96-900-8094;96-900-9667;96-901-0145;96-901-0146;96-901-0147;96-901-1494;96-901-1495;96-901-1496;96-901-1497;96-901-2601;96-901-2602;96-901-2603;96-901-2604;96-901-2605;96-901-2606;96-901-3322;96-901-5023;96-101-1082;96-120-0017;96-154-4376;96-900-3875;96-900-8238;96-901-1748;96-901-5516;96-901-5977;96-100-8792;96-100-8793;96-100-8794;96-151-4008;96-151-4042;96-151-4043;96-151-4051;96-154-

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Peak List

No.	*2theta [°]*	*d [Å]*	*I/I0 (peak height)*	*Counts (peak area)*	*FWHM*	*Matched*
1	6.45	13.7037	111.48	7.90	0.5333	A
2	10.82	8.1802	56.39	7.03	0.9391	
3	12.45	7.1119	375.61	24.24	0.4858	A,D
4	14.02	6.3182	36.64	1.77	0.3645	C
5	15.45	5.7364	28.60	1.48	0.3885	
6	16.79	5.2805	18.83	1.13	0.4526	
7	18.72	4.7413	408.78	28.96	0.5334	A
8	21.28	4.1757	1000.00	112.47	0.8467	B
9	25.05	3.5551	418.05	23.47	0.4226	A
10	26.64	3.3467	200.90	11.29	0.4230	A,B,C,E
11	31.48	2.8422	79.86	4.35	0.4098	A,C,D
12	33.33	2.6886	311.44	34.83	0.8418	A,B,C,D
13	34.96	2.5664	125.36	21.68	1.3021	A,B,C
14	35.72	2.5136	380.28	33.47	0.6626	B,C,D
15	36.86	2.4389	891.16	89.27	0.7542	A,B,C,E
16	40.35	2.2355	155.06	22.83	1.1082	A,B,C,E
17	41.35	2.1837	148.84	13.41	0.6782	A,B,C,D
18	43.38	2.0860	0.37	0.10	2.0400	A,B,C
19	44.58	2.0326	27.56	3.07	0.8400	A,C
20	45.22	2.0053	42.89	10.64	1.8680	A,B,C
21	47.40	1.9180	33.77	7.99	1.7820	B,C
22	48.52	1.8763	5.83	1.17	1.5076	A,B,C
23	51.00	1.7908	48.48	8.21	1.2757	A,B,C,D,E
24	53.70	1.7069	354.41	62.11	1.3193	A,B,C
25	57.48	1.6033	106.33	9.00	0.6375	A,B,C,E
26	59.24	1.5598	148.97	23.39	1.1821	A,B,C
27	61.76	1.5021	108.12	11.94	0.8315	A,B,C,D
28	63.00	1.4754	105.11	8.32	0.5959	B,C
29	64.18	1.4511	7.58	2.43	2.4131	A,B,C,D,E
30	66.19	1.4120	0.27	0.10	2.7659	A,B,C,D,E
31	66.86	1.3994	42.63	9.64	1.7022	A,C
32	68.80	1.3646	35.38	8.00	1.7022	A,B,C

Integrated Profile Areas

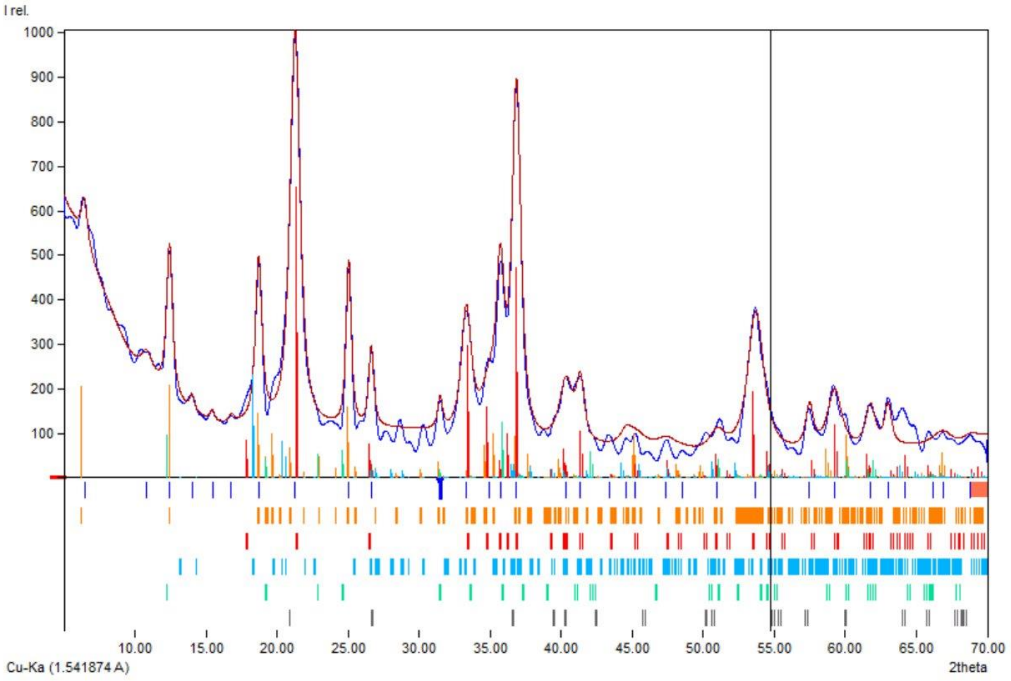
Based on calculated profile

Profile area	*Counts*	*Amount*
Overall diffraction profile	73538	100.00%
Background radiation	45253	61.54%
Diffraction peaks	28286	38.46%
Peak area belonging to selected phases	27346	37.19%
Peak area of phase A (Chlorite)	*8252*	*11.22%*
Peak area of phase B (Goethite)	*13889*	*18.89%*
Peak area of phase C (Gibbsite)	*2865*	*3.90%*
Peak area of phase D (Lizardite)	*2137*	*2.91%*
Peak area of phase E (Quartz)	*203*	*0.28%*
Unidentified peak area	940	1.28%

Peak Residuals

Peak data	*Counts*	*Amount*
Overall peak intensity	606	100.00%
Peak intensity belonging to selected phases	504	83.20%
Unidentified peak intensity	102	16.80%

Diffraction Pattern Graphics



2. Sampel Setelah Pemanggangan Tereduksi dengan Peningkatan Ni Tertinggi pada Suhu Pemanggangan 1000ºC dan Fraksi 100 *Mesh*

Match! Phase Analysis Report

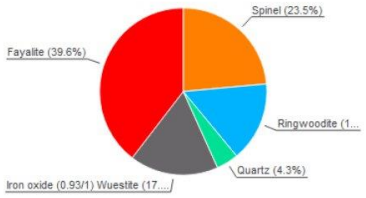
Sample: Shinta-1000C (5-70)

Sample Data

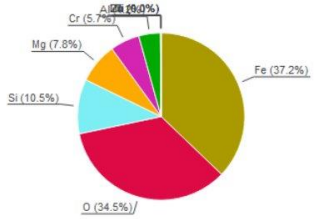
File name	Shinta-1000C.ORG
File path	E:/BISMILLAH TA SHINTA/SKRIPSI/Shinta-1000C
Data collected	Sep 29, 2023 11:57:32
Data range	5.000° - 70.000°
Original data range	5.000° - 70.000°
Number of points	3251
Step size	0.020
Rietveld refinement converged	No
Alpha2 subtracted	No
Background subtr.	No
Data smoothed	Yes
Radiation	X-rays
Wavelength	1.540600 Å

Analysis Results

Phase composition (Weight %)



Elemental composition (Weight %)



Index	*Amount (%)*	*Name*	*Formula sum*
A	23.5	Spinel	Al1.129 Cr0.799 Fe0.307 Mg0.736 Mn0.004 Ni0.005 O4 Si0.002 Ti0.005 Zn0.003
B	15.4	Ringwoodite	Mg2 O4 Si
C	4.3	Quartz	O2 Si
D	17.2	Iron oxide (0.93/1) Wuestite	Fe0.932 O
E	39.6	Fayalite	Fe2 O4 Si
	6.8	*Unidentified peak area*	

Amounts calculated by RIR (Reference Intensity Ratio) method

Element	*Amount (weight %)*
Fe	37.2%
O	*34.5%(*)*
Si	10.5%
Mg	7.8%
Cr	5.7%
Al	4.2%
Ni	0.0%
Ti	0.0%
Mn	0.0%
Zn	0.0%
**LE (sum)*	*34.5%*

Details of identified phases

A: Spinel (23.5 %)*

Formula sum	Al1.129 Cr0.799 Fe0.307 Mg0.736 Mn0.004 Ni0.005 O4 Si0.002 Ti0.005 Zn0.003
Entry number	96-900-5621
Figure-of-Merit (FoM)	0.666389*
Total number of peaks	34
Peaks in range	34
Peaks matched	6
Intensity scale factor	0.55*
Space group	F d -3 m
Crystal system	cubic
Unit cell	a= 8.2129 Å
I/Ic	2.93
Calc. density	4.126 g/cm³
Reference	Carraro A., "Crystal chemistry of Cr-spinels from a suite of spinel peridotite mantlexenoliths from the Predazzo Area (Dolomites, Northern Italy)Sample: CRSP4", European Journal of Mineralogy **15**, 681-688 (2003)

B: Ringwoodite (15.4 %)

Formula sum	Mg2 O4 Si
Entry number	96-900-0270
Figure-of-Merit (FoM)	0.000000
Total number of peaks	34
Peaks in range	34
Peaks matched	4
Intensity scale factor	0.26
Space group	F d -3 m
Crystal system	cubic
Unit cell	a= 8.1200 Å
I/Ic	2.13
Calc. density	3.491 g/cm³
Reference	Baur W. H., "Computer-simulated crystal structures of observed and hypothetical Mg2SiO4polymorphs of low and high densitynormal", American Mineralogist **57**, 709-731 (1972)

C: Quartz (4.3 %)

Formula sum	O2 Si
Entry number	96-901-2605
Figure-of-Merit (FoM)	0.000000
Total number of peaks	60
Peaks in range	60
Peaks matched	5

Intensity scale factor	0.09
Space group	P 31 2 1
Crystal system	trigonal (hexagonal axes)
Unit cell	a= 4.5940 Å c= 5.2000 Å
I/Ic	2.68
Calc. density	3.149 g/cm³
Reference	Hazen R. M., Finger L. W., Hemley R. J., Mao H. K., "High-pressure crystal chemistry and amorphization of alpha-quartzSample: P = 9.5 GPa", Solid State Communications **72**, 507-511 (1989)

D: Iron oxide (0.93/1)
Wuestite (17.2 %)

Formula sum	Fe0.932 O
Entry number	96-101-1167
Figure-of-Merit (FoM)	0.000000
Total number of peaks	10
Peaks in range	10
Peaks matched	2
Intensity scale factor	0.76
Space group	F m -3 m
Crystal system	cubic
Unit cell	a= 4.2909 Å
I/Ic	5.54
Meas. density	5.660 g/cm³
Calc. density	5.721 g/cm³
Reference	Jette E R, Foote F, "An x-ray study of the wuestite (Fe O) solid solutions", Journal of Chemical Physics **1**, 29-36 (1933)

E: Fayalite (39.6 %)*

Formula sum	Fe2 O4 Si
Entry number	96-901-1589
Figure-of-Merit (FoM)	0.000000*
Total number of peaks	378
Peaks in range	378
Peaks matched	30
Intensity scale factor	0.54*
Space group	P b n m
Crystal system	orthorhombic
Unit cell	a= 4.8220 Å b= 10.4880 Å c= 6.0940 Å
I/Ic	1.70
Calc. density	4.392 g/cm³
Reference	Kudoh Y., Takeda H., "Single crystal X-ray diffraction study on the bond compressibilityof fayalite, Fe~2~SiO~4~ and rutile, TiO~2~ under high pressureSample: P = 0.001 kbar", Physica B+C **140**, 333-336 (1986)

(*)2theta values have been shifted internally for the calculation of the amounts, the intensity scaling factors as well as the figure-of-merit (FoM), due to the active search-match option 'Automatic zero point adaption'.

Candidates

Name	***Formula***	***Entry No.***	***FoM***
	Fe2 Si	96-901-4529	0.7055
	Fe Sb	96-900-8895	0.7030
Dolomite	C Ca0.5 Mg0.5 O3	96-900-3521	0.6855
Sr3 Sn2 O7	O7 Sn2 Sr3	96-152-1095	0.6829
Dolomite	C Ca0.5 Mg0.5 O3	96-900-3520	0.6819
Dolomite	C Ca0.5 Mg0.5 O3	96-900-3522	0.6800
Zr50 Sc12 O118	O118 Sc12 Zr50	96-153-6706	0.6763
SrSiO3 (SrSiO3 cubic perovskite at 37.8 GPa)	O3 Si Sr	96-155-7931	0.6735
Dolomite	C2 Ca1.14 Mg0.86 O6	96-900-4934	0.6730
Dolomite	C2 Ca Mg O6	96-900-0084	0.6711
	Ni Sn	96-900-8906	0.6669
Dolomite	C2 Ca Mg O6	96-900-1007	0.6665
Dolomite	C2 Ca Mg O6	96-900-1011	0.6665
Ba2 Nb (Nb2.5 V1.5) O9	Ba2 Nb3.5 O9 V1.5	96-153-1604	0.6661
Ag3.5 S I	Ag3.5 I S	96-150-9831	0.6647
Dolomite	C2 Ca Fe0.33 Mg0.67 O6	96-900-4935	0.6641
Dolomite	C2 Ca1.13 Mg0.87 O6	96-900-4932	0.6631
Ankerite	C2 Ca1.007 Fe0.542 Mg0.451 O6	96-900-1247	0.6616
Dolomite	C2 Ca Mg O6	96-900-0106	0.6600
Dolomite	C Ca0.5 Mg0.5 O3	96-900-0888	0.6589
Dolomite	C Ca0.5 Mg0.5 O3	96-900-3524	0.6568
Magnesium Calcium Carbonate (.1/.9/1) (Dolomite)	C2 Ca Mg O6	96-151-7797	0.6555
Calcium magnesium cobalt dicarbonate	C2 Ca Co0.17 Mg0.83 O6	96-224-0440	0.6551
Calcium Magnesium Carbonate (Dolomite)	C2 Ca Mg O6	96-210-5964	0.6539
Dolomite	C2 Ca1.07 Mg0.93 O6	96-900-4933	0.6536
Dolomite	C2 Ca Mg O6	96-900-1006	0.6528
Dolomite	C2 Ca Mg O6	96-900-1010	0.6528
	U	96-153-9737	0.6527
lead hafnate titanate	Hf0.8 O3 Pb Ti0.2	96-210-2004	0.6521
Dolomite	C2 Ca1.08 Mg0.92 O6	96-900-4929	0.6519
Dolomite	C2 Ca Fe0.05 Mg0.94 Mn0.01 O6	96-901-7357	0.6517
Dolomite	C2 Ca1.07 Mg0.93 O6	96-900-4931	0.6512
Calcium magnesium carbonate (Dolomite)	C2 Ca Mg O6	96-120-0015	0.6510
Calcium magnesium carbonate (Dolomite)	C2 Ca Mg O6	96-500-0117	0.6510
Dolomite	C2 Ca Fe0.05 Mg0.94 Mn0.01 O6	96-900-9593	0.6510
Dolomite	C2 Ca Mg O6	96-900-1044	0.6499
Dolomite	C Ca0.5 Mg0.5 O3	96-900-3526	0.6497
Dolomite	C2 Ca0.997 Fe0.234 Mg0.769 O6	96-900-1246	0.6469
	Ba Co0.4 Fe0.4 O2.426 Zr0.2	96-156-7215	0.6434
Silver selenide - $-alpha	Ag2 Se	96-101-1339	0.6430
Cu15 (B2 O5)2 (B O3)6 O2	B10 Cu15 O30	96-210-5419	0.6423
Ba (Sn O3)	Ba O3 Sn	96-153-8371	0.6415
	Au Rb	96-151-0281	0.6397
barium tantalum oxynitride	Ba N0.76 O2.24 Ta	96-451-9034	0.6393
	Fe2 O7 P2	96-400-0292	0.6384
(Ga Pu)	Ga Pu	96-152-3831	0.6375
barium tantalum oxynitride	Ba N0.58 O2.42 Ta	96-451-9033	0.6372
	Li Pb	96-152-2615	0.6357
Ankerite	C2 Ca0.997 Fe0.676 Mg0.273 Mn0.054 O6	96-900-1413	0.6350
Silver niobium sulfide (0.6/1/2)	Ag0.6 Nb S2	96-150-9008	0.6348
Lead Barium Zirconium Titanium Oxide	Ba0.3 O3 Pb0.7 Ti0.35 Zr0.65	96-210-2952	0.6342
	Ba Li0.2 N0.19 O2.81 Ta0.8	96-451-2486	0.6339

and 1064 others...

Search-Match

Settings

Reference database used	COD-Inorg 2023.06.06
Automatic zeropoint adaptation	Yes

Downgrade entries with low scaling factors	Yes
Minimum figure-of-merit (FoM)	0.60
2theta window for peak corr.	0.30 deg.
Minimum rel. int. for peak corr.	0
Parameter/influence 2theta	0.50
Parameter/influence intensities	0.50
Parameter multiple/single phase(s)	0.50

Criteria for entries added by user

Reference:

Entry number:

96-101-1241;96-101-1268;96-210-1168;96-210-1169;96-210-8028;96-210-8029;96-591-0083;96-900-0140;96-900-2161;96-900-2162;96-900-2163;96-900-9783;96-901-4881;96-901-5066;96-901-5504;96-901-5965;96-901-6458;96-901-7091;96-901-7519;96-101-1098;96-101-1160;96-101-1173;96-101-1177;96-101-1201;96-110-0020;96-500-0036;96-900-0776;96-900-0777;96-900-0778;96-900-0779;96-900-0780;96-900-0781;96-900-5018;96-900-5019;96-900-5020;96-900-5021;96-900-5022;96-900-5023;96-900-5024;96-900-5025;96-900-5026;96-900-5027;96-900-5028;96-900-5029;96-900-5030;96-900-5031;96-900-5032;96-900-5033;96-900-5034;96-900-7379;96-900-8093;96-900-8094;96-900-9667;96-901-0145;96-901-0146;96-901-0147;96-901-1494;96-901-1495;96-901-1496;96-901-1497;96-901-2601;96-901-2602;96-901-2603;96-901-2604;96-901-2605;96-901-2606;96-901-3322;96-901-5023;96-100-8792;96-100-8793;96-100-8794;96-151-4008;96-151-4042;96-151-4043;96-151-4051;96-154-4335;96-154-4336;96-154-4337;96-154-4563;96-154-4565;96-154-4566;96-154-4567;96-154-4568;96-154-4569;96-154-4570;96-154-4576;96-154-5122;96-154-9040;96-154-9041;96-154-9042;96-155-9487;96-155-9488;96-221-0103;96-400-1006;96-500-0121;96-591-0029;96-810-3495;96-810-3496;96-810-5667;96-900-1365;96-900-1366;96-900-1367;96-900-1368;96-900-1369;96-900-1370;96-900-1371;96-900-1372;96-900-1373;96-900-1374;96-900-1375;96-900-1376;96-900-1377;96-900-1378;96-900-1422;96-900-1433;96-900-1434;96-900-1435;96-900-1436;96-900-1437;96-900-1438;96-900-1439;96-900-1440;96-900-1441;96-900-1442;96-900-1443;96-900-1444;96-900-1445;96-900-1693;96-900-1694;96-900-2045;96-900-2046;96-900-2047;96-900-2048;96-900-2049;96-900-2050;96-900-2051;96-900-2052;96-900-2053;96-900-2054;96-900-2055;96-900-2056;96-900-2057;96-900-2058;96-900-2059;96-900-2060;96-900-2061;96-900-2062;96-900-2063;96-900-2064;96-900-2065;96-900-2066;96-900-2067;96-900-2068;96-900-2069;96-900-2070;96-900-2071;96-900-2072;96-900-2073;96-900-2074;96-900-2075;96-900-2076;96-900-2077;96-900-2078;96-900-2079;96-900-2080;96-900-2081;96-900-2082;96-900-2083;96-900-2084;96-900-2085;96-900-2086;96-900-2087;96-900-2088;96-900-2089;96-900-2090;96-900-2091;96-900-2092;96-900-2093;96-900-2094;96-900-2095;96-900-2096;96-900-2097;96-900-2098;96-900-2099;96-900-2100;96-900-2101;96-900-2102;96-900-2103;96-900-2104;96-900-2105;96-900-2106;96-900-2107;96-900-2108;96-900-2109;96-900-2110;96-900-2111;96-900-2112;96-900-2113;96-900-2114;96-900-2115;96-900-2116;96-900-2117;96-900-2118;96-900-2119;96-900-2120;96-900-2121;96-900-2122;96-900-2123;96-900-2124;96-900-2125;96-900-2126;96-900-2127;96-900-2128;96-900-2129;96-900-2130;96-900-2131;96-900-2132;96-900-2133;96-900-2134;96-900-2135;96-900-2136;96-900-2137;96-900-2138;96-900-2139;96-900-2140;96-900-2164;96-900-2165;96-900-2166;96-900-2167;96-900-2168;96-900-2169;96-900-2393;96-900-2394;96-900-2395;96-900-2396;96-900-2397;96-900-2398;96-900-2399;96-900-2400;96-900-2401;96-900-2402;96-900-2403;96-900-2404;96-900-2405;96-900-2406;96-900-2407;96-900-2735;96-900-2736;96-900-2737;96-900-2738;96-900-2739;96-900-2740;96-900-2741;96-900-2742;96-900-2743;96-900-2744;96-900-2745;96-900-2746;96-900-2747;96-900-2748;96-900-2749;96-900-2750;96-900-2751;96-900-2752;96-900-2753;96-900-2754;96-900-2755;96-900-2756;96-900-2757;96-900-2758;96-900-2759;96-900-2784;96-900-2845;96-900-2846;96-900-2847;96-900-2848;96-900-2849;96-900-2850;96-900-2851;96-900-2852;96-900-2853;96-900-2854;96-900-2855;96-900-2856;96-900-2857;96-900-2858;96-900-2859;96-900-2860;96-900-2861;96-900-2862;96-900-2863;96-900-2864;96-900-2865;96-900-2866;96-900-3480;96-900-3481;96-900-3482;96-900-3483;96-900-3484;96-900-3485;96-900-3486;96-900-3487;96-900-3488;96-900-3489;96-900-3532;96-900-3533;96-900-3534;96-900-3535;96-900-3536;96-900-3537;96-900-3538;96-900-3539;96-900-3540;96-900-3541;96-900-3542;96-900-3543;96-900-3544;96-900-3545;96-900-3546;96-900-3547;96-900-3548;96-900-3895;96-900-3896;96-900-3897;96-900-3898;96-900-3899;96-900-3900;96-900-3901;96-900-3902;96-900-3903;96-900-3904;96-900-3905;96-900-3906;96-900-3907;96-900-3908;96-900-3909;96-900-3910;96-900-3911;96-900-3912;96-900-3913;96-900-3914;96-900-3915;96-900-3916;96-900-3917;96-900-3918;96-900-3919;96-900-3920;96-900-3921;96-900-3922;96-900-3923;96-900-3924;96-900-3925;96-900-3926;96-900-3927;96-900-3928;96-900-3929;96-900-3930;96-900-3931;96-900-3932;96-900-3933;96-900-3934;96-900-3935;96-900-3936;96-900-3937;96-900-3938;96-900-3939;96-900-3940;96-900-3941;96-900-3942;96-900-3943;96-900-3944;96-900-3945;96-900-3946;96-900-3947;96-900-3948;96-900-3949;96-900-3950;96-900-3951;96-900-3952;96-900-3953;96-900-3954;96-900-3955;96-900-3956;96-900-3957;96-900-3958;96-900-3959;96-900-3960;96-900-3961;96-900-3962;96-900-3963;96-900-3964;96-900-3965;96-900-3966;96-900-3967;96-900-3968;96-900-3969;96-900-3970;96-900-3971;96-900-3972;96-900-3973;96-900-3974;96-900-3975;96-900-3976;96-900-3977;96-900-3978;96-900-3979;96-900-3980;96-900-3981;96-900-3982;96-900-3983;96-900-3984;96-900-3985;96-900-4938;96-900-4941;96-900-4943;96-900-4946;96-900-4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Peak List

No.	*2theta [°]*	*d [Å]*	*I/I0 (peak height)*	*Counts (peak area)*	*FWHM*	*Matched*
1	25.12	3.5429	379.05	21.95	0.3684	E
2	29.40	3.0356	60.72	8.08	0.8468	E
3	30.86	2.8952	435.58	49.81	0.7275	A
4	31.08	2.8752	117.55	8.13	0.4400	B

5	31.66	2.8238	536.21	19.98	0.2370	E
6	34.10	2.6272	173.12	10.47	0.3847	E
7	35.04	2.5588	390.79	26.37	0.4294	E
8	35.98	2.4941	1000.00	102.31	0.6509	E
9	36.44	2.4636	689.28	38.41	0.3545	A,B,D
10	37.38	2.4038	141.31	9.77	0.4400	E
11	39.14	2.2997	127.13	15.78	0.7898	C,E
12	41.27	2.1859	67.45	4.39	0.4138	C,E
13	43.80	2.0652	783.48	33.88	0.2751	A,E
14	44.60	2.0299	323.08	32.25	0.6350	B
15	49.55	1.8380	74.28	5.08	0.4354	E
16	51.02	1.7886	208.29	8.37	0.2558	
17	52.00	1.7573	72.07	6.97	0.6150	E
18	54.76	1.6750	98.96	22.05	1.4174	A,E
19	58.28	1.5820	156.17	21.56	0.8783	A,C,E
20	58.80	1.5693	157.65	10.18	0.4109	B
21	61.02	1.5173	115.73	13.79	0.7579	D,E
22	64.23	1.4490	208.48	43.29	1.3211	A,E
23	64.54	1.4428	133.52	3.82	0.1822	C,E

Integrated Profile Areas

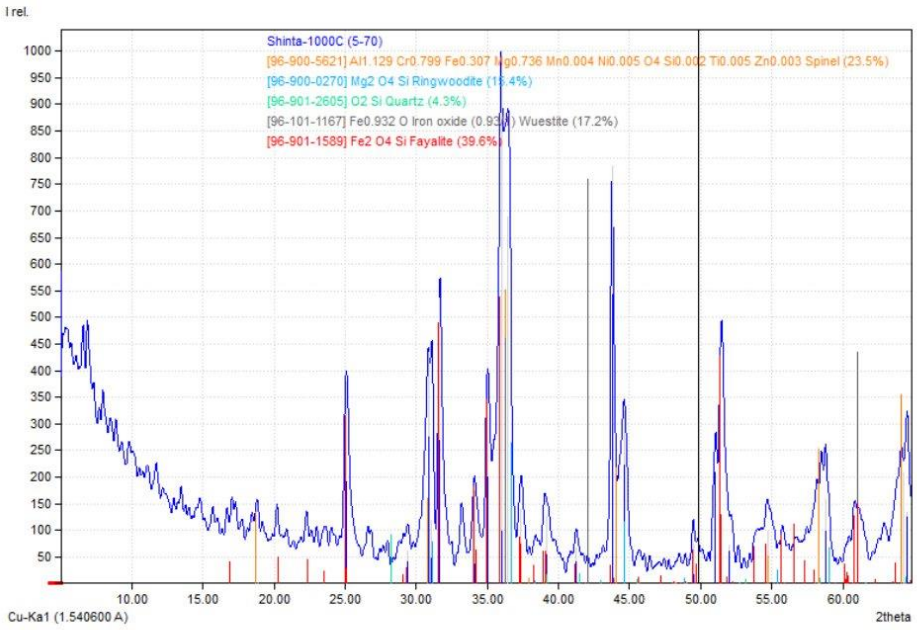
Based on calculated profile

Profile area	*Counts*	*Amount*
Overall diffraction profile	62715	100.00%
Background radiation	35808	57.10%
Diffraction peaks	26907	42.90%
Peak area belonging to selected phases	22644	36.11%
Peak area of phase A (Spinel)	*5833*	*9.30%*
Peak area of phase B (Ringwoodite)	*2362*	*3.77%*
Peak area of phase C (Quartz)	*406*	*0.65%*
Peak area of phase D (Iron oxide (0.93/1) Wuestite)	*2173*	*3.47%*
Peak area of phase E (Fayalite)	*11869*	*18.93%*
Unidentified peak area	4263	6.80%

Peak Residuals

Peak data	*Counts*	*Amount*
Overall peak intensity	517	100.00%
Peak intensity belonging to selected phases	368	71.16%
Unidentified peak intensity	149	28.84%

Diffraction Pattern Graphics



LAMPIRAN 2

HASIL ANALISIS *X-RAY FLUORESCENCE* (XRF)

HASIL ANALISIS XRF

Sample id	Kadar Unsur/ Senyawaan yang dianalisa sesuai dengan komoditi (%)													
Element Dimension	**Ni**	**Co**	**Fe**	**Cr**	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**Cr_2O_3**	**MnO**	**Fe_2O_3**
Detection Limit	**0,005**	**0,001**	**0,01**	**0,005**	**0,01**	**0,01**	**0,01**	**0,01**	**0,001**	**0,003**	**0,01**	**0,005**	**0,01**	**0,01**
Method	**WDXRF**	**WDXRF**	**WDXRF**	**WDXRF**	**WDXRF**	**WDXRF**	**WDXRF**	**WDXRF**	**WDXRF**	**WDXRF**	**WDXRF**	**WDXRF**	**WDXRF**	**WDXRF**
Unit	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
DS 001 ORI	1,52	0,03	37,47	2,03	0,01	2,63	10,69	12,16	0,00	0,06	0,23	2,97	0,45	53,59
DS 002 ORI	1,60	0,05	39,82	2,17	0,03	3,27	12,67	14,72	0,29	0,06	0,24	3,17	0,63	56,95
DS 003 ORI	1,51	0,04	40,17	2,13	0,02	2,99	12,92	13,79	0,29	0,09	0,24	3,11	0,59	57,45
DS 004 ORI	1,41	0,05	38,97	1,94	0,02	2,92	12,75	13,45	0,27	0,08	0,24	2,84	0,63	55,72
DS 005 ORI	1,63	0,05	41,19	2,24	0,01	3,63	13,48	15,42	0,29	0,07	0,25	3,27	0,71	58,90
DS 006 ORI	1,52	0,04	41,20	2,11	0,03	3,04	12,81	13,85	0,28	0,08	0,25	3,09	0,60	58,91
DS 007 ORI	1,51	0,05	40,97	2,11	0,03	3,13	13,55	14,24	0,28	0,07	0,26	3,08	0,61	58,59
DS 008 ORI	1,74	0,06	42,87	2,40	0,02	3,83	14,42	16,48	0,26	0,06	0,27	3,51	0,75	61,31
DS 009 ORI	1,71	0,05	43,58	2,36	0,05	3,50	14,43	15,59	0,22	0,07	0,27	3,45	0,63	62,31
DS 010 ORI	1,64	0,04	46,08	2,39	0,06	3,65	14,56	15,69	0,19	0,08	0,29	3,50	0,62	65,89
DS 011 ORI	1,63	0,09	44,95	2,49	0,08	4,91	16,56	16,34	0,24	0,06	0,29	3,64	1,30	64,28
DS 012 ORI	1,73	0,04	47,98	2,53	0,05	4,01	15,39	16,50	0,26	0,07	0,29	3,70	0,67	68,62
DS 013 ORI	1,66	0,04	47,01	2,46	0,12	3,78	14,99	15,87	0,27	0,08	0,30	3,60	0,60	67,22

LAMPIRAN 3

PERHITUNGAN *RECOVERY*

A. Nikel

Suhu (°C)	Ukuran fraksi (*Mesh*)	Kadar awal Ni (%)	Berat sampel awal + reduktor (gr)	Berat setelah *roasting* (gr)	Kadar akhir Ni (%)	*Recovery* Ni (%)
800	100	1,52	20	16,1	1,60	84,58
	150	1,52	20	16,0	1,51	79,41
	200	1,52	20	16,1	1,41	74,47
900	100	1,52	20	15,4	1,63	82,58
	150	1,52	20	15,2	1,52	76,25
	200	1,52	20	15,5	1,51	76,89
1000	100	1,52	20	14,6	1,74	83,36
	150	1,52	20	14,5	1,71	81,76
	200	1,52	20	14,4	1,64	77,60
1100	100	1,52	20	13,5	1,63	72,35
	150	1,52	20	13,6	1,73	77,23
	200	1,52	20	13,3	1,66	72,36

Recovery Ni dihitung menggunakan rumus sebagai berikut:

$$\textit{Recovery}\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Ni}{Berat\ sampel\ awal\ x\ kadar\ awal\ Ni}\ x\ 100\%$$

1. *Recovery* Ni pada suhu 800°C menggunakan fraksi 100 *mesh*

$$\textit{Recovery}\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Ni}{Berat\ sampel\ awal\ x\ kadar\ awal\ Ni}\ x\ 100\%$$

$$\textit{Recovery}\ (\%) = \frac{16{,}1\ (gr)x\ 1{,}60\ (\%)}{20\ (gr)\ x\ 1{,}52\ (\%)}\ x\ 100\%$$

Recovery (%) = 84,58%

2. *Recovery* Ni pada suhu 800°C menggunakan fraksi 150 *mesh*

$$\textit{Recovery}\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Ni}{Berat\ sampel\ awal\ x\ kadar\ awal\ Ni}\ x\ 100\%$$

$$\textit{Recovery}\ (\%) = \frac{16\ (gr)x\ 1{,}51\ (\%)}{20\ (gr)\ x\ 1{,}52\ (\%)}\ x\ 100\%$$

Recovery (%) = 79,41%

3. *Recovery* Ni pada suhu 800°C menggunakan fraksi 200 *mesh*

$$\textit{Recovery}\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Ni}{Berat\ sampel\ awal\ x\ kadar\ awal\ Ni}\ x\ 100\%$$

$$\textit{Recovery}\ (\%) = \frac{16{,}1\ (gr)x\ 1{,}41\ (\%)}{20\ (gr)\ x\ 1{,}52\ (\%)}\ x\ 100\%$$

Recovery (%) = 74,47%

4. *Recovery* Ni pada suhu 900^{o}C menggunakan fraksi 100 *mesh*

$$\textit{Recovery}\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Ni}{Berat\ sampel\ awal\ x\ kadar\ awal\ Ni}\ x\ 100\%$$

$$\textit{Recovery}\ (\%) = \frac{15{,}4\ (gr) x\ 1{,}63\ (\%)}{20\ (gr)\ x\ 1{,}52\ (\%)}\ x\ 100\%$$

Recovery (%) = 82,58%

5. *Recovery* Ni pada suhu 900^{o}C menggunakan fraksi 150 *mesh*

$$\textit{Recovery}\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Ni}{Berat\ sampel\ awal\ x\ kadar\ awal\ Ni}\ x\ 100\%$$

$$\textit{Recovery}\ (\%) = \frac{15{,}2\ (gr) x\ 1{,}52\ (\%)}{20\ (gr)\ x\ 1{,}52\ (\%)}\ x\ 100\%$$

Recovery (%) = 76,25%

6. *Recovery* Ni pada suhu 900^{o}C menggunakan fraksi 200 *mesh*

$$\textit{Recovery}\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Ni}{Berat\ sampel\ awal\ x\ kadar\ awal\ Ni}\ x\ 100\%$$

$$\textit{Recovery}\ (\%) = \frac{15{,}5\ (gr) x\ 1{,}51\ (\%)}{20\ (gr)\ x\ 1{,}52\ (\%)}\ x\ 100\%$$

Recovery (%) = 76,89%

7. *Recovery* Ni pada suhu 1000^{o}C menggunakan fraksi 100 *mesh*

$$\textit{Recovery}\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Ni}{Berat\ sampel\ awal\ x\ kadar\ awal\ Ni}\ x\ 100\%$$

$$\textit{Recovery}\ (\%) = \frac{14{,}6\ (gr) x\ 1{,}74\ (\%)}{20\ (gr)\ x\ 1{,}52\ (\%)}\ x\ 100\%$$

Recovery (%) = 83,36%

8. *Recovery* Ni pada suhu 1000^{o}C menggunakan fraksi 150 *mesh*

$$\textit{Recovery}\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Ni}{Berat\ sampel\ awal\ x\ kadar\ awal\ Ni}\ x\ 100\%$$

$$\textit{Recovery}\ (\%) = \frac{14{,}5\ (gr) x\ 1{,}71\ (\%)}{20\ (gr)\ x\ 1{,}52\ (\%)}\ x\ 100\%$$

Recovery (%) = 81,76%

9. *Recovery* Ni pada suhu 1000^{o}C menggunakan fraksi 200 *mesh*

$$\textit{Recovery}\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Ni}{Berat\ sampel\ awal\ x\ kadar\ awal\ Ni}\ x\ 100\%$$

$$\textit{Recovery}\ (\%) = \frac{14{,}4\ (gr) x\ 1{,}64\ (\%)}{20\ (gr)\ x\ 1{,}52\ (\%)}\ x\ 100\%$$

Recovery (%) = 77,60%

10. *Recovery* Ni pada suhu 1100^{o}C menggunakan fraksi 100 *mesh*

$$Recovery\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Ni}{Berat\ sampel\ awal\ x\ kadar\ awal\ Ni}\ x\ 100\%$$

$$Recovery\ (\%) = \frac{13{,}5\ (gr) x\ 1{,}63\ (\%)}{20\ (gr)\ x\ 1{,}52\ (\%)}\ x\ 100\%$$

Recovery (%) = 72,35%

11. *Recovery* Ni pada suhu 1100^{o}C menggunakan fraksi 150 *mesh*

$$Recovery\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Ni}{Berat\ sampel\ awal\ x\ kadar\ awal\ Ni}\ x\ 100\%$$

$$Recovery\ (\%) = \frac{13{,}6\ (gr) x\ 1{,}63\ (\%)}{20\ (gr)\ x\ 1{,}52\ (\%)}\ x\ 100\%$$

Recovery (%) = 77,23%

12. *Recovery* Ni pada suhu 1100^{o}C menggunakan fraksi 150 *mesh*

$$Recovery\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Ni}{Berat\ sampel\ awal\ x\ kadar\ awal\ Ni}\ x\ 100\%$$

$$Recovery\ (\%) = \frac{13{,}3\ (gr) x\ 1{,}66\ (\%)}{20\ (gr)\ x\ 1{,}52\ (\%)}\ x\ 100\%$$

Recovery (%) = 72,36%

B. Iron

Suhu (^{o}C)	**Ukuran fraksi (*Mesh*)**	**Kadar awal Fe (%)**	**Berat awal sampel + reduktor (gr)**	**Berat sampel akhir (gr)**	**Kadar akhir Fe (%)**	***Recovery* Fe (%)**
800	100	37,47	20	16,1	39,82	85,40
	150	37,47	20	16,0	40,17	85,70
	200	37,47	20	16,1	38,97	83,49
900	100	37,47	20	15,4	41,19	84,65
	150	37,47	20	15,2	41,20	83,84
	200	37,47	20	15,5	40,97	84,63
1000	100	37,47	20	14,6	42,87	83,31
	150	37,47	20	14,5	43,58	84,53
	200	37,47	20	14,4	46,08	88,45
1100	100	37,47	20	13,5	44,95	80,94
	150	37,47	20	13,6	47,98	86,89
	200	37,47	20	13,3	47,01	83,12

Recovery Fe dihitung menggunakan rumus sebagai berikut:

$$Recovery\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Fe}{Berat\ sampel\ awal\ x\ kadar\ awal\ Fe}\ x\ 100\%$$

1. *Recovery* Fe pada suhu 800^{o}C menggunakan fraksi 100 *mesh*

$$Recovery\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Fe}{Berat\ sampel\ awal\ x\ kadar\ awal\ Fe}\ x\ 100\%$$

$$Recovery\ (\%) = \frac{16{,}1\ (gr) x\ 39{,}82\ (\%)}{20\ (gr)\ x\ 37{,}47\ (\%)}\ x\ 100\%$$

Recovery (%) = 85,40%

2. *Recovery* Fe pada suhu 800^{o}C menggunakan fraksi 150 *mesh*

$$Recovery\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Fe}{Berat\ sampel\ awal\ x\ kadar\ awal\ Fe}\ x\ 100\%$$

$$Recovery\ (\%) = \frac{16(gr) x\ 40{,}17\ (\%)}{20\ (gr)\ x\ 37{,}47\ (\%)}\ x\ 100\%$$

Recovery (%) = 85,70%

3. *Recovery* Fe pada suhu 800^{o}C menggunakan fraksi 200 *mesh*

$$Recovery\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Fe}{Berat\ sampel\ awal\ x\ kadar\ awal\ Fe}\ x\ 100\%$$

$$Recovery\ (\%) = \frac{16{,}1\ (gr) x\ 38{,}97\ (\%)}{20\ (gr)\ x\ 37{,}47\ (\%)}\ x\ 100\%$$

Recovery (%) = 83,49%

4. *Recovery* Fe pada suhu 900^{o}C menggunakan fraksi 100 *mesh*

$$Recovery\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Fe}{Berat\ sampel\ awal\ x\ kadar\ awal\ Fe}\ x\ 100\%$$

$$Recovery\ (\%) = \frac{15{,}4\ (gr) x\ 41{,}19\ (\%)}{20\ (gr)\ x\ 37{,}47\ (\%)}\ x\ 100\%$$

Recovery (%) = 84,65%

5. *Recovery* Fe pada suhu 900^{o}C menggunakan fraksi 150 *mesh*

$$Recovery\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Fe}{Berat\ sampel\ awal\ x\ kadar\ awal\ Fe}\ x\ 100\%$$

$$Recovery\ (\%) = \frac{15{,}2\ (gr) x\ 41{,}20\ (\%)}{20\ (gr)\ x\ 37{,}47\ (\%)}\ x\ 100\%$$

Recovery (%) = 83,84%

6. *Recovery* Fe pada suhu 900^{o}C menggunakan fraksi 200 *mesh*

$$Recovery\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Fe}{Berat\ sampel\ awal\ x\ kadar\ awal\ Fe}\ x\ 100\%$$

$$Recovery\ (\%) = \frac{15{,}5\ (gr) x\ 40{,}97\ (\%)}{20\ (gr)\ x\ 37{,}47\ (\%)}\ x\ 100\%$$

Recovery (%) = 83,63%

7. *Recovery* Fe pada suhu 1000^{o}C menggunakan fraksi 100 *mesh*

$$Recovery\ (\%) = \frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Fe}{Berat\ sampel\ awal\ x\ kadar\ awal\ Fe}\ x\ 100\%$$

Recovery (%) = $\frac{14{,}6\ (gr)x\ 42{,}87\ (\%)}{20\ (gr)\ x\ 37{,}47\ (\%)}\ x\ 100\%$

Recovery (%) = 83,31%

8. *Recovery* Fe pada suhu 1000^{o}C menggunakan fraksi 150 *mesh*

Recovery (%) = $\frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Fe}{Berat\ sampel\ awal\ x\ kadar\ awal\ Fe}\ x\ 100\%$

Recovery (%) = $\frac{14{,}5\ (gr)x\ 43{,}58\ (\%)}{20\ (gr)\ x\ 37{,}47\ (\%)}\ x\ 100\%$

Recovery (%) = 84,53%

9. *Recovery* Fe pada suhu 1000^{o}C menggunakan fraksi 200 *mesh*

Recovery (%) = $\frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Fe}{Berat\ sampel\ awal\ x\ kadar\ awal\ Fe}\ x\ 100\%$

Recovery (%) = $\frac{14{,}4\ (gr)x\ 46{,}08(\%)}{20\ (gr)\ x\ 37{,}47\ (\%)}\ x\ 100\%$

Recovery (%) = 88,45%

10. *Recovery* Fe pada suhu 1100^{o}C menggunakan fraksi 100 *mesh*

Recovery (%) = $\frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Fe}{Berat\ sampel\ awal\ x\ kadar\ awal\ Fe}\ x\ 100\%$

Recovery (%) = $\frac{13{,}5\ (gr)x\ 44{,}95(\%)}{20\ (gr)\ x\ 37{,}47\ (\%)}\ x\ 100\%$

Recovery (%) = 80,94%

11. *Recovery* Fe pada suhu 1100^{o}C menggunakan fraksi 150 *mesh*

Recovery (%) = $\frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Fe}{Berat\ sampel\ awal\ x\ kadar\ awal\ Fe}\ x\ 100\%$

Recovery (%) = $\frac{13{,}6\ (gr)x\ 47{,}98(\%)}{20\ (gr)\ x\ 37{,}47\ (\%)}\ x\ 100\%$

Recovery (%) = 86,89%

12. *Recovery* Fe pada suhu 1100^{o}C menggunakan fraksi 200 *mesh*

Recovery (%) = $\frac{Berat\ sampel\ setelah\ pemanggangan\ x\ kadar\ akhir\ Fe}{Berat\ sampel\ awal\ x\ kadar\ awal\ Fe}\ x\ 100\%$

Recovery (%) = $\frac{13{,}3\ (gr)x\ 47{,}01(\%)}{20\ (gr)\ x\ 37{,}47\ (\%)}\ x\ 100\%$

Recovery (%) = 83,12%