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LAMPIRAN

Lampiran 1

Hasil Analisis X-*Ray Diffraction* (XRD) Sampel Awal

Match! Phase Analysis Report

Sample: Ni-UGA (5-70)

Sample Data

File name	Ni-UGA.RAW
File path	F:/
Data collected	Dec 13, 2023 19:07:55
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

Matched Phases

Index	*Amount (%)*	*Name*	*Formula sum*
A	39.0	Goethite	Fe O2
B	31.7	Lizardite	Al0.22 Fe0.15 H4 Mg2.79 O9 Si1.84
C	10.4	Silicon oxide Quartz low	O2 Si
D	10.1	Talc	H2 Mg3 O12 Si4
E	8.8	Montmorillonite	Al2 Ca0.5 O12 Si4
	7.6	*Unidentified peak area*	

A: Goethite (39.0 %)*

Formula sum	Fe O2
Entry number	96-901-5697
Figure-of-Merit (FoM)	0.787427*
Total number of peaks	85
Peaks in range	85
Peaks matched	14
Intensity scale factor	0.91*
Space group	P b n m
Crystal system	orthorhombic
Unit cell	a= 4.6188 Å b= 9.9528 Å c= 3.0236 Å
I/Ic	3.62
Calc. density	4.198 g/cm³
Reference	Hazemann J.-L., Bérar J. F., Manceau A., "Rietveld studies of the aluminium-iron substitution in synthetic goethite", Materials Science Forum **79-82**, 821-826 (1991)

B: Lizardite (31.7 %)*

Formula sum	Al0.22 Fe0.15 H4 Mg2.79 O9 Si1.84
Entry number	96-900-4995
Figure-of-Merit (FoM)	0.585618*
Total number of peaks	57
Peaks in range	57
Peaks matched	7
Intensity scale factor	0.30*
Space group	P 3 1 m
Crystal system	trigonal (hexagonal axes)
Unit cell	a= 5.3160 Å c= 7.1500 Å
I/Ic	1.47
Calc. density	2.674 g/cm³
Reference	Mellini M., Zanazzi P. F., "Effects of pressure on the structure of lizardite-1TSample: at P = 12.5 kbarLocality: Val Sissone", European Journal of Mineralogy **1**, 13-19 (1989)

C: Silicon oxide Quartz low (10.4 %)*

Formula sum	O2 Si
Entry number	96-101-1160
Figure-of-Merit (FoM)	0.756477*
Total number of peaks	35
Peaks in range	35
Peaks matched	6
Intensity scale factor	0.23*
	P 32 2 1 S
	trigonal (hexagonal axes)
	a= 4.9100 Å c= 5.4000 Å
	3.37
	2.660 g/cm³
	2.654 g/cm³

Reference	Machatschki F, "Kristallstruktur von Tiefquarz", Fortschritte der Mineralogie **20**, 45-47 (1936)

D: Talc (10.1 %)*

Formula sum	H2 Mg3 O12 Si4
Entry number	96-900-8298
Figure-of-Merit (FoM)	0.709180*
Total number of peaks	251
Peaks in range	251
Peaks matched	40
Intensity scale factor	0.08*
Space group	C -1
Crystal system	triclinic (anorthic)
Unit cell	a= 5.2900 Å b= 9.1730 Å c= 9.4600 Å α= 90.460º β= 98.680 º γ= 90.090 º
I/Ic	1.21
Calc. density	2.776 g/cm³
Reference	Perdikatsis B., Burzlaff H., "Strukturverfeinerung am talk Mg3[(OH)2Si4O10]", Zeitschrift fur Kristallographie **156**, 177-186 (1981)

E: Montmorillonite (8.8 %)

Formula sum	Al2 Ca0.5 O12 Si4
Entry number	96-900-2780
Figure-of-Merit (FoM)	0.554662
Total number of peaks	92
Peaks in range	92
Peaks matched	16
Intensity scale factor	1.17
Space group	P 1
Crystal system	triclinic (anorthic)
Unit cell	a= 5.1800 Å b= 8.9800 Å c= 15.0000 Å α= 90.000º β= 90.000 º γ= 90.000 º
I/Ic	20.54
Calc. density	1.801 g/cm³
Reference	Viani A., Gualtieri A., Artioli G., "The nature of disorder in montmorillonite by simulation of X-ray powderpatterns Note: Structural simulation model", American Mineralogist **87**, 966-975 (2002)

(*)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*
	C12 O7 P2 Zn	96-431-1830	0.8325
	C12 Cu2 O7 P2	96-431-1828	0.8292
Traskite	Ba24 Ca Cl6 Fe10 H58 O122 Si24 Ti6	96-900-9537	0.8289
	C7 F N O7 P2 Zr	96-723-8536	0.8277
Dy-NDC	C144 Dy12 O64	96-154-9851	0.8201
	C54 H95 N9 O17	96-200-0438	0.8152
Copper(II)-phenylphosphonate monohydrate (alphaCuPhP)	C6 H7 Cu O4 P	96-704-0826	0.8132
	C30 H26 I N O5 S	96-721-8374	0.8122
(Ga2 Ge2 S8) (C9 H20 N2)0.333	Ga2 Ge2 N0.666667 S8	96-154-1767	0.8121
Niobium selenide (1/3)	Nb Se3	96-100-8953	0.8114
Poly[bis(\m-pentafluorobenzenethiolato)lead(II)]	C12 F10 Pb S2	96-220-9191	0.8103
Na4 (N H4) P5 O15 (H2 O)4	N Na4 O18 P5	96-210-7010	0.8094
	C12 H10 O6 P2 Zr	96-210-1068	0.8088
catena-(1,8-Octanediammonium (\m~2~-fluoro)-tetrafluoro-aluminium)	C8 H22 Al F5 N2	96-110-0116	0.8078
	C54 Br18 N6 Pb6	96-434-5878	0.8035
	C8 H24 Cd Cl4 N2	96-200-0748	0.7988
	C26 H45 Ga6 N4 O42 P9 Zn3	96-410-0205	0.7982
Aerinite	C0.59 H18 Al3.05 Ca2.52 Fe1.36 Mg0.5 Na0.24 O31.77 Si6	96-900-5638	0.7978
La33.1 (H3 O)16 Al92 Si100 O384 (O H)23.3 (H2 O)143.9	Al92 H359.1 La33.1 O567.2 Si100	96-152-1727	0.7965
(Ga4 Se8) (C13 H26 N2)	Ga4 Se8	96-154-1834	0.7954
	C12 H28 B6 F24 N4 Na2	96-723-4759	0.7950
Silicon oxide - $-alpha (Quartz low)	O2 Si	96-101-1177	0.7932
Na0.99 Ba46.32 Si98.37 Al93.63 O384 (D2 O)51.296	Al93.63 Ba46.32 D102.592 Na0.99 O435.296 Si98.37	96-152-1760	0.7929
	C10.8 H25.2 Ga0.8 N1.8 O2.8 S6.5 Sn2.7	96-711-0246	0.7919
	C20 H20 Cl N5.5	96-720-0698	0.7918
	C48 H172 Cu4 Ge2 N12 O82 W18	96-430-1085	0.7917
	C48 H162 Cu4 Ge2 N12 O77 W18	96-430-1086	0.7911
potassium hydroxopentafluoroarsenate	As F5 H K O	96-200-3122	0.7910
	C4 Cl2 N2 O6 P2 Zr	96-434-8077	0.7900
(C6 H12 (N H2)2)2 Zn Ga7 (H P O4)2 (P O4)6 (O H) F4 (H2 O)3	C12 H41 F4 Ga7 N4 O36 P8 Zn	96-152-6075	0.7898
	C8 N2 O20 P5 Zr2	96-434-1851	0.7890
Rb27.74 Na27.6 (Al56 Si136 O384) (H2 O)4.32	Al56 H8.64 Na27.6 O388.32 Rb27.74 Si136	96-152-1414	0.7877
NO2	C36 H0 N2 O8 Zn2	96-721-4549	0.7862
	O4 S20 Sn10	96-155-0918	0.7859
	O2 Si	96-412-4031	0.7856
	C52 B6 Co F3 N7 O2	96-723-4123	0.7850
	Ge24 S48	96-412-3671	0.7846
l96 Si96 O384)	Al96 Na36 O384 Si96 Te38.1	96-152-6657	0.7834

Melanovanadite	Ca1.02 H10 O15 V4	96-901-0027	0.7825
Si O2	O2 Si	96-152-6861	0.7815
	C8 H24 Cd Cl4 N2	96-200-0749	0.7813
catena-bis(tris(2-Amineoethyl)amine-cadmium(ii)) hexacyano-iron(ii) trihydrate	C99 Cd11 Fe10.5 N77 O33	96-700-9718	0.7813
Al (P O4)	Al O4 P	96-153-3443	0.7811
Retgersite	Ni O10 S	96-901-1290	0.7810
	Er12 H172 K6 Na4 O410 W87	96-704-4078	0.7808
(Zn4 In16 S33) ((C5 H9 N H)2 (C H2)3)	In16 S33 Zn4	96-412-3976	0.7779
	C60 Cl24	96-154-8327	0.7768
Sm0.56 Sr0.94 Nb S3.5	S1.5 Sm0.56 Sr0.94	96-153-3478	0.7765
(Co4 In16 S33) ((C5 H9 N H)2 (C H2)3)	Co4 In16 S33	96-412-3977	0.7756
Melanovanadite	Ca1.02 H5 O15 V4	96-900-1074	0.7750
Ca V4 O10 (H2 O)5	Ca H10 O15 V4	96-153-8820	0.7735
	H172 K6 Na4 O410 Sm12 W87	96-704-4074	0.7731

and 2272 others...

Search-Match

Settings

Reference database used	COD-Inorg REV248644 2020.03.03
Automatic zeropoint adaptation	Yes
Minimum figure-of-merit (FoM)	0.60
2theta window for peak corr.	0.30 deg.
Minimum rel. int. for peak corr.	1
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: 96-900-0849;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;96-101-1153;96-300-0049;96-900-8041;96-900-8298;96-900-8732;96-901-4436;96-110-1055;96-900-2780;96-901-0957;96-901-0958;96-901-0959;96-901-0960;96-900-1226;96-900-1227;96-900-1228;96-900-1245;96-900-4374;96-900-4375;96-900-4376;96-900-4377;96-900-4378;96-900-4379;96-900-4380;96-900-4381;96-900-4384;96-900-4434;96-900-5257;96-900-9977

Peak List

No.	2theta [°]	d [Å]	I/I0	FWHM	Matched
1	5.88	15.0185	708.21	1.7330	E
2	9.28	9.5222	157.90	0.2838	D
3	10.46	8.4505	160.59	0.2754	
4	12.36	7.1554	790.37	0.4516	B
5	18.68	4.7464	483.10	0.3955	D
6	19.76	4.4893	367.13	1.0251	D,E
7	20.74	4.2793	694.71	2.6970	C,D,E
8	21.16	4.1953	1000.00	1.1694	A
9	21.48	4.1336	806.93	1.6014	D
10	22.20	4.0011	254.86	1.1694	
11	24.50	3.6304	341.45	1.5448	
12	24.90	3.5730	644.39	0.5981	B
13	26.64	3.3435	738.84	0.3938	C,E
14	28.22	3.1598	248.02	0.3687	
15	28.62	3.1165	643.20	0.3435	D
16	29.90	2.9859	120.66	0.3209	E
17	31.24	2.8608	211.36	0.4535	E
18	33.22	2.6947	336.28	1.0660	A
19	34.80	2.5759	333.30	1.0660	A,D
20	35.84	2.5035	525.12	1.0660	A,B,D,E
21	36.62	2.4519	979.91	0.9692	A,C,D,E
22	40.04	2.2500	221.03	2.1518	A,C,D,E
23	41.06	2.1965	196.90	2.3400	A,B,D,E
24	48.20	1.8865	84.96	0.8000	A,D
25	50.18	1.8166	98.96	0.7651	C,D
26	53.36	1.7156	368.72	1.3760	A,D
27	59.06	1.5629	163.43	1.9069	A,B,D
28	60.10	1.5383	160.38	1.9422	B,C,D
29	61.44	1.5079	214.10	1.9776	A,D
30	61.76	1.5009	172.94	2.9553	B,D,E

Integrated Profile Areas

ılated profile

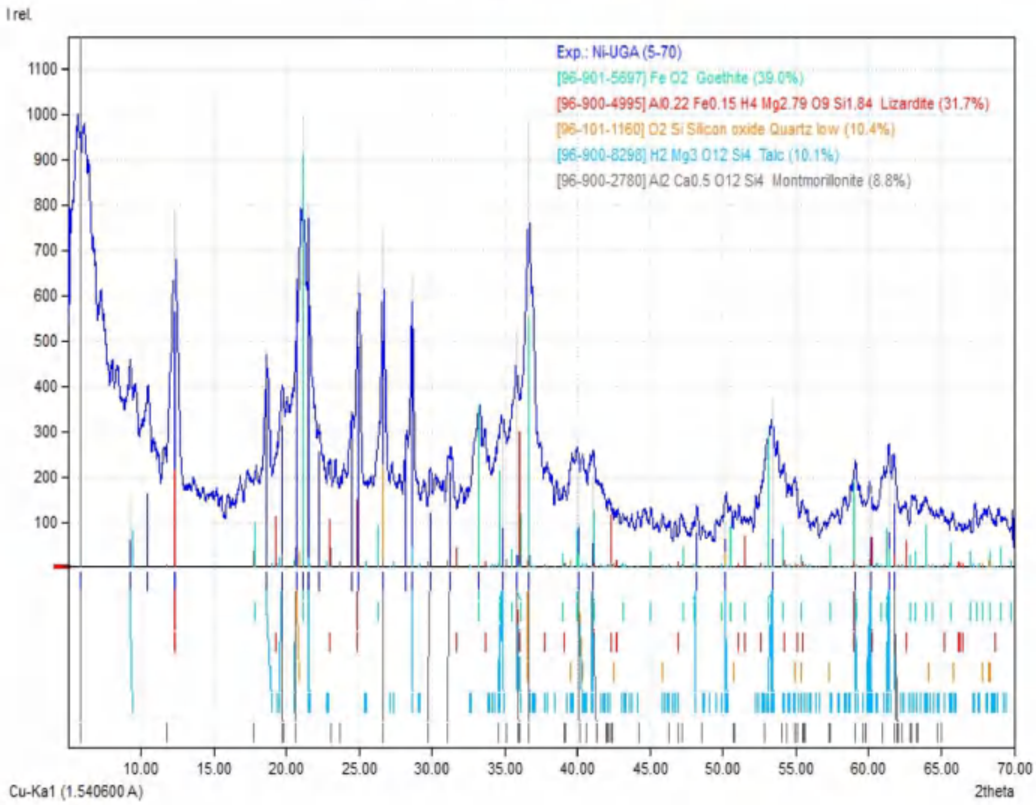
Counts ***Amount***

Overall diffraction profile	98810	100.00%
Background radiation	60466	61.19%
Diffraction peaks	38344	38.81%
Peak area belonging to selected phases	30852	31.22%
Peak area of phase A (Goethite)	*16020*	*16.21%*
Peak area of phase B (Lizardite)	*5097*	*5.16%*
Peak area of phase C (Silicon oxide Quartz low)	*1707*	*1.73%*
Peak area of phase D (Talc)	*2154*	*2.18%*
Peak area of phase E (Montmorillonite)	*5874*	*5.94%*
Unidentified peak area	7492	7.58%

Peak Residuals

Peak data	***Counts***	***Amount***
Overall peak intensity	1433	100.00%
Peak intensity belonging to selected phases	453	31.60%
Unidentified peak intensity	980	68.40%

Diffraction Pattern Graphics



Lampiran 2

Hasil Analisis X-*Ray Diffraction* (XRD) Sampel 2 Jam - FF 10%G

Match! Phase Analysis Report

Sample: FF-2J-2G-M2

Sample Data	
File name	FF-2J-2G-M2.txt
File path	D:/FRYAN/FF-2J-2G-M2
Data collected	May 9, 2024 18:27:43
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

Matched Phases

Index	*Amount (%)*	*Name*	*Formula sum*
A	34.5	Magnetite	Fe3 O4
B	32.2	Tetrataenite	Fe Ni
C	14.7	Forsterite	Fe0.278 Mg1.722 O4 Si
D	9.4	Enstatite	Mg O3 Si
E	9.2	Quartz	O2 Si
	8.0	*Unidentified peak area*	

A: Magnetite (34.5 %)	
Formula sum	Fe3 O4
Entry number	96-900-5842
Figure-of-Merit (FoM)	0.827492
Total number of peaks	68
Peaks in range	68
Peaks matched	11
Intensity scale factor	0.61
Space group	F d -3 m
Crystal system	cubic
Unit cell	a= 8.3440 Å
I/Ic	6.03
Calc. density	5.295 g/cm³
Reference	Nakagiri N., Manghnani M. H., Ming L. C., Kimura S., "Crystal structure of magnetite under pressureSample: P = 3.67 GPa", Physics and Chemistry of Minerals **13**, 238-244 (1986)

B: Tetrataenite (32.2 %)	
Formula sum	Fe Ni
Entry number	96-901-0018
Figure-of-Merit (FoM)	0.202627
Total number of peaks	30
Peaks in range	30
Peaks matched	3
Intensity scale factor	1.00
Space group	P 4/m m m
Crystal system	tetragonal
Unit cell	a= 2.5330 Å c= 3.5820 Å
I/Ic	10.57
Calc. density	8.276 g/cm³
Reference	Clarke R. S., Scott E. R. D., "Tetrataenite - ordered FeNi, a new mineral in meteoritesLocality: Cape Town iron meteorite", American Mineralogist **65**, 624-630 (1980)

C: Forsterite (14.7 %)	
Formula sum	Fe0.278 Mg1.722 O4 Si
Entry number	96-900-4325
Figure-of-Merit (FoM)	0.509162
Total number of peaks	336
Peaks in range	336
Peaks matched	11
Intensity scale factor	0.05
Space group	P b n m
Crystal system	orthorhombic
Unit cell	a= 4.7673 Å b= 10.2490 Å c= 5.9996 Å
	1.22
	3.387 g/cm³
	Liang J., Hawthorne F. C., "Characterization of fine-grained mixtures of rock-forming minerals byRietveld structure refinement: olivine + pyroxene Sample: P1 Rietveld, 9.9%olivine", The Canadian Mineralogist **32**, 541-552 (1994)

D: Enstatite (9.4 %)

Formula sum	Mg O3 Si
Entry number	96-901-1582
Figure-of-Merit (FoM)	0.455253
Total number of peaks	398
Peaks in range	398
Peaks matched	15
Intensity scale factor	0.02
Space group	C 1 2/c 1
Crystal system	monoclinic
Unit cell	a= 9.2010 Å b= 8.6210 Å c= 4.9080 Å β= 101.500 °
I/Ic	0.60
Calc. density	3.496 g/cm³
Reference	Angel R. J., Chopelas A., Ross N. L., "Stability of high-density clinoenstatite at upper-mantle pressuresSample: P = 7.93 GPa", Nature **358**, 322-324 (1992)

E: Quartz (9.2 %)

Formula sum	O2 Si
Entry number	96-900-5023
Figure-of-Merit (FoM)	0.680756
Total number of peaks	70
Peaks in range	70
Peaks matched	5
Intensity scale factor	0.08
Space group	P 32 2 1 S
Crystal system	trigonal (hexagonal axes)
Unit cell	a= 4.9628 Å c= 5.4360 Å
I/Ic	3.11
Calc. density	2.581 g/cm³
Reference	Kihara K., "An X-ray study of the temperature dependence of the quartz structureSample: at T = 773 K", European Journal of Mineralogy **2**, 63-77 (1990)

Candidates

Name	*Formula*	*Entry No.*	*FoM*
Hematite-proto	Fe1.9 H0.06 O3	96-900-2162	0.6864
Potassium	K	96-901-1983	0.6845
Hematite-proto	Fe1.9 H0.06 O3	96-900-2163	0.6842
Na.5 H2.5 P O3	H2.5 Na0.5 O3 P	96-210-6978	0.6833
Nitrogen	N2	96-901-2480	0.6804
	Cd2 Pr	96-152-4583	0.6795
K (N O3)	K N O3	96-153-9090	0.6693
	Fe2 O3	96-154-6384	0.6673
(Nd5 Ni2 Si8)0.2	Nd Ni0.4 Si1.6	96-153-8812	0.6655
Ti O2	O2 Ti	96-153-0152	0.6633
lithium chlorite	Cl Li O2	96-201-4618	0.6632
	Mn2 O3	96-900-7521	0.6606
U H3	H3 U	96-153-8599	0.6587
Pr (Ni0.5 Si1.5)	Ni0.5 Pr Si1.5	96-152-9997	0.6577
Graphite	C	96-900-0047	0.6572
Carbon (Graphite 2H)	C	96-110-0004	0.6553
Carbon (Graphite 3R)	C	96-110-1022	0.6553
Carbon (Graphite 3R)	C	96-120-0019	0.6553
Graphite	C	96-901-2706	0.6553
Graphite	C	96-900-8570	0.6541
Hematite-proto	Fe1.76 H0.06 O3	96-900-2161	0.6532
(Ni2 Pr5 Si8)0.2	Ni0.4 Pr Si1.6	96-153-8814	0.6504
Al P O4	Al O4 P	96-153-1952	0.6494
Quartz	O2 Si	96-900-5023	0.6472
(Nd2 Ni Si3)0.5	Nd Ni0.5 Si1.5	96-153-8821	0.6461
Graphite	C	96-901-2231	0.6450
	Gd3 Sn7	96-152-2913	0.6443
Didysprosium Aluminium Digermanide	Al Dy2 Ge2	96-220-8445	0.6433
	Ge5 Sm3	96-433-2826	0.6431
Quartz	O2 Si	96-901-0145	0.6403
Ba (V Se3)	Ba Se3 V	96-152-1757	0.6398
Quartz	O2 Si	96-900-5024	0.6388
(Ce5 Co2 Si8)0.2	Ce Co0.4 Si1.6	96-153-9777	0.6369
Dimanganese Trioxide	Mn2 O3	96-201-9466	0.6366
Rb H3 (Se O3)2	H3 O6 Rb Se2	96-153-0501	0.6363
Srilankite	O2 Ti0.45 Zr0.55	96-901-0850	0.6360
	Ge O7 P2	96-591-0254	0.6358
Quartz	O2 Si	96-900-5020	0.6358
Quartz	O2 Si	96-900-5019	0.6354
Cu (C N)	C Cu N	96-434-4115	0.6352
	Al O4 P	96-901-0368	0.6347
	O2 Si	96-901-1494	0.6341
	C	96-901-1578	0.6332
	Al O4 P	96-900-6549	0.6327
	O2 Ti	96-900-9087	0.6306
2	H3 O6 Rb Se2	96-153-0867	0.6294

Ba8 Fe4.8 In0.532 U2.668 O24	Ba8 Fe4.8 In0.532 O24 U2.668	96-154-1813	0.6286
Li0.026 Ti O2	Li0.026 O2 Ti	96-412-4519	0.6286
Ba8 Fe5.064 In0.268 U2.668 O24	Ba8 Fe5.064 In0.268 O24 U2.668	96-154-1950	0.6282
(Ba0.267 Sr0.733) (Zr0.979 Ti0.021) O3	Ba0.267 O3 Sr0.733 Ti0.021 Zr0.979	96-152-1275	0.6270
(Ba0.282 Sr0.718) (Zr0.983 Ti0.017) O3	Ba0.282 O3 Sr0.718 Ti0.017 Zr0.983	96-152-1342	0.6265
Quartz	O2 Si	96-901-0146	0.6258

and 302 others...

Search-Match

Settings

Reference database used	COD-Inorg REV218120 2019.09.10
Automatic zeropoint adaptation	Yes
Minimum figure-of-merit (FoM)	0.60
2theta window for peak corr.	0.30 deg.
Minimum rel. int. for peak corr.	1
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:

96-101-1098;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;96-154-4616;96-154-4617;96-900-0167;96-900-0168;96-900-0268;96-900-0315;96-900-0316;96-900-0317;96-900-0318;96-900-0319;96-900-0320;96-900-0321;96-900-0322;96-900-0323;96-900-0324;96-900-0325;96-900-0326;96-900-0327;96-900-0535;96-900-0536;96-900-0537;96-900-0538;96-900-0539;96-900-0540;96-900-0541;96-900-0542;96-900-0788;96-900-1667;96-900-1668;96-900-1669;96-900-1670;96-900-1671;96-900-4323;96-900-4324;96-900-4325;96-900-4326;96-900-4327;96-900-4328;96-900-4329;96-900-4330;96-900-4331;96-900-4332;96-900-4333;96-900-7378;96-901-0755;96-901-0756;96-901-0757;96-901-0758;96-901-0759;96-901-0760;96-901-0761;96-901-0762;96-901-0763;96-901-0764;96-901-0765;96-901-0766;96-901-0776;96-901-0777;96-901-0778;96-901-0779;96-901-0780;96-901-0781;96-901-1462;96-901-1463;96-901-1464;96-901-1465;96-901-1466;96-901-1467;96-901-1468;96-901-3094;96-901-3095;96-901-3096;96-901-3097;96-901-3098;96-901-3099;96-901-3100;96-901-3101;96-901-3102;96-901-3640;96-901-3641;96-901-3642;96-901-4298;96-901-5075;96-901-5346;96-901-5659;96-901-6386;96-101-1241;96-101-1268;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;96-152-6261;96-152-6270;96-152-7336;96-152-8612;96-152-9900;96-154-4685;96-100-0048;96-101-1019;96-154-5543;96-154-8550;96-154-8551;96-154-8552;96-900-1179;96-900-1221;96-900-1594;96-900-1595;96-900-1596;96-900-1597;96-900-1598;96-900-1599;96-900-1600;96-900-1601;96-900-1602;96-900-1642;96-900-1643;96-900-1644;96-900-1645;96-900-1646;96-900-1700;96-900-1701;96-900-2711;96-900-2712;96-900-2713;96-900-2714;96-900-2715;96-900-2716;96-900-2717;96-900-4030;96-900-4031;96-900-4032;96-900-4033;96-900-4034;96-900-4118;96-900-4119;96-900-4957;96-900-4958;96-900-5542;96-900-5543;96-900-5544;96-900-5545;96-900-5589;96-900-5590;96-900-5776;96-900-5777;96-900-6338;96-900-6339;96-900-6340;96-900-6341;96-900-6342;96-900-6343;96-900-6428;96-900-6429;96-900-6430;96-900-6431;96-900-6432;96-900-6433;96-900-6434;96-900-6435;96-900-6436;96-900-6437;96-900-6438;96-900-6439;96-900-6440;96-900-6441;96-900-6442;96-900-6443;96-900-8078;96-900-8165;96-901-0242;96-901-0872;96-901-0873;96-901-0874;96-901-0888;96-901-0889;96-901-0890;96-901-0891;96-901-0892;96-901-0893;96-901-0894;96-901-0895;96-901-0896;96-901-0897;96-901-0898;96-901-0899;96-901-1582;96-901-3659;96-901-4118;96-901-4448;96-901-4536;96-901-4861;96-901-4978;96-901-4984;96-901-5810;96-901-6053;96-901-6154;96-901-6258;96-901-6266;96-901-6573;96-901-0018;96-901-1507

Peak List

No.	2theta [°]	d [Å]	I/I0	FWHM	Matched
1	25.48	3.4959	121.99	0.3315	C
2	26.62	3.3487	283.51	0.2995	E
3	30.38	2.9423	303.80	0.5988	A
4	33.22	2.6969	246.05	0.2671	D
5	35.68	2.5164	1000.00	0.4397	A,B,C
6	43.38	2.0860	153.60	0.4002	A,D
7	49.58	1.8387	88.71	0.4296	C,D,E
8	54.16	1.6935	106.38	0.5695	A,D,E
9	57.38	1.6059	192.61	0.6707	A,B,C,D
10	63.00	1.4755	236.85	0.8132	A,C,D

Integrated Profile Areas

...ulated profile

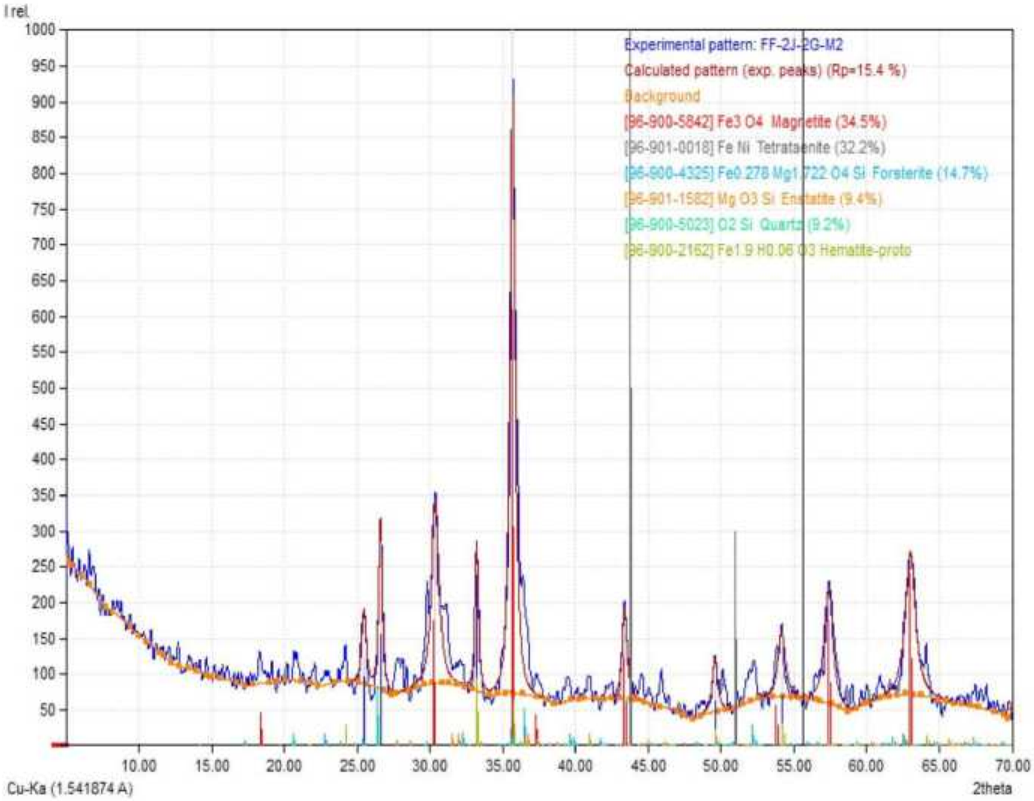
	Counts	Amount
...n profile	78927	100.00%
...iation	57375	72.69%
...s	21552	27.31%

Peak area belonging to selected phases	15210	19.27%
Peak area of phase A (Magnetite)	*10200*	*12.92%*
Peak area of phase B (Tetrataenite)	*1161*	*1.47%*
Peak area of phase C (Forsterite)	*1971*	*2.50%*
Peak area of phase D (Enstatite)	*1061*	*1.34%*
Peak area of phase E (Quartz)	*817*	*1.04%*
Unidentified peak area	6342	8.03%

Peak Residuals

Peak data	***Counts***	***Amount***
Overall peak intensity	304	100.00%
Peak intensity belonging to selected phases	266	87.49%
Unidentified peak intensity	38	12.51%

Diffraction Pattern Graphics



Lampiran 3

Hasil Analisis X-*Ray Fluorescence* (XRF)

SUPERINTENDING COMPANY OF INDONESIA

SAMPLE ID		(Ni)	(Co)	(Na_2O)	(MgO)	(Al_2O_3)	(SiO2)	(P_2O_5)	(SO_3)	(K2O)	(CaO)	(TiO_2)	(Cr_2O_3)	(MnO)	(Fe_2O_3)	NiO
AWAL	FF AWAL	1.90	0.05	0.02	6.86	4.87	32.58	0.01	-0.01	0.01	0.59	0.09	1.71	0.24	35.70	2.42
	FF AWAL	1.90	0.05	0.02	6.83	4.87	32.60	0.01	-0.01	0.01	0.59	0.09	1.71	0.24	35.69	2.42
		1.90	**0.05**	**0.02**	**6.84**	**4.87**	**32.59**	**0.01**	**-0.01**	**0.01**	**0.59**	**0.09**	**1.71**	**0.24**	**35.70**	2.42
1 JAM	1 JAM - FF 5%G	2.13	0.05	0.01	7.00	5.33	31.89	0.01	2.01	0.01	2.56	0.09	1.66	0.43	36.30	2.71
	1 JAM - FF 5%G	2.13	0.05	0.02	7.07	5.33	31.87	0.01	2.00	0.01	2.56	0.09	1.66	0.42	36.30	2.71
		2.13	**0.05**	**0.01**	**7.03**	**5.33**	**31.88**	**0.01**	**2.00**	**0.01**	**2.56**	**0.09**	**1.66**	**0.42**	**36.30**	2.71
	1 JAM - FF 10%G	2.35	0.05	0.01	7.00	5.07	31.95	0.01	3.44	0.01	4.51	0.08	1.63	0.40	36.90	2.99
	1 JAM - FF 10%G	2.35	0.05	0.02	6.98	5.09	31.84	0.01	3.44	0.01	4.51	0.08	1.62	0.40	36.90	2.99
		2.35	**0.05**	**0.01**	**6.99**	**5.08**	**31.90**	**0.01**	**3.44**	**0.01**	**4.51**	**0.08**	**1.63**	**0.40**	**36.90**	2.99
	1 JAM - FF 15%G	2.20	0.05	0.01	6.51	5.13	30.87	0.01	4.47	0.01	6.36	0.08	1.59	0.37	36.52	2.80
	1 JAM - FF 15%G	2.20	0.05	0.01	6.56	5.14	30.83	0.01	4.46	0.01	6.37	0.08	1.59	0.36	36.50	2.80
		2.20	**0.05**	**0.01**	**6.54**	**5.14**	**30.85**	**0.01**	**4.47**	**0.01**	**6.36**	**0.08**	**1.59**	**0.37**	**36.51**	2.80
	1 JAM - FF 20%G	2.03	0.05	0.01	7.07	4.89	31.13	0.01	5.13	0.01	8.26	0.08	1.55	0.37	32.50	2.58
	1 JAM - FF 20%G	2.03	0.05	0.01	7.08	4.90	31.08	0.01	5.14	0.01	8.24	0.08	1.55	0.37	32.49	2.58
		2.03	**0.05**	**0.01**	**7.07**	**4.89**	**31.10**	**0.01**	**5.13**	**0.01**	**8.25**	**0.08**	**1.55**	**0.37**	**32.50**	2.58
	5%G	2.28	0.06	0.01	6.84	5.14	31.01	0.01	1.93	0.01	2.66	0.09	1.68	0.41	37.06	2.90
	5%G	2.28	0.06	0.02	6.85	5.13	31.07	0.01	1.93	0.01	2.66	0.09	1.68	0.41	37.12	2.90
		2.28	**0.06**	**0.01**	**6.85**	**5.14**	**31.04**	**0.01**	**1.93**	**0.01**	**2.66**	**0.09**	**1.68**	**0.41**	**37.09**	2.90

2 JAM	2 JAM - FF 10%G	2.58	0.05	0.01	10.86	5.28	30.82	0.01	3.15	0.01	5.09	0.09	1.68	0.43	39.65	3.28
	2 JAM - FF 10%G	2.58	0.05	0.01	10.88	5.28	30.82	0.01	3.15	0.01	5.10	0.09	1.67	0.43	39.65	3.28
		2.58	**0.05**	**0.01**	**10.87**	**5.28**	**30.82**	**0.01**	**3.15**	**0.01**	**5.10**	**0.09**	**1.68**	**0.43**	**39.65**	3.28
	2 JAM - FF 15%G	2.39	0.05	0.01	6.68	5.07	30.76	0.01	4.26	0.01	6.86	0.09	1.61	0.39	38.38	3.04
	2 JAM - FF 15%G	2.39	0.05	0.01	6.73	5.08	30.75	0.01	4.26	0.01	6.86	0.08	1.61	0.39	38.37	3.04
		2.39	**0.05**	**0.01**	**6.71**	**5.08**	**30.76**	**0.01**	**4.26**	**0.01**	**6.86**	**0.08**	**1.61**	**0.39**	**38.38**	3.04
	2 JAM - FF 20%G	2.14	0.05	0.01	6.43	5.09	30.26	0.01	4.79	0.01	8.79	0.09	1.56	0.36	34.75	2.72
	2 JAM - FF 20%G	2.14	0.05	0.01	6.39	5.10	30.24	0.01	4.79	0.01	8.79	0.08	1.56	0.36	34.74	2.72
		2.14	**0.05**	**0.01**	**6.41**	**5.09**	**30.25**	**0.01**	**4.79**	**0.01**	**8.79**	**0.08**	**1.56**	**0.36**	**34.75**	2.72
3 JAM	3 JAM - FF 5%G	1.97	0.05	0.02	7.43	4.91	31.67	0.01	1.64	0.01	2.91	0.09	1.71	0.46	36.01	2.50
	3 JAM - FF 5%G	1.97	0.05	0.02	7.47	4.92	31.66	0.01	1.65	0.01	2.90	0.09	1.70	0.46	36.03	2.51
		1.97	**0.05**	**0.02**	**7.45**	**4.91**	**31.67**	**0.01**	**1.64**	**0.01**	**2.90**	**0.09**	**1.70**	**0.46**	**36.02**	2.51
	3 JAM - FF 10%G	2.15	0.05	0.01	6.68	4.90	30.76	0.01	2.84	0.01	4.98	0.09	1.65	0.40	36.61	2.73
	3 JAM - FF 10%G	2.16	0.05	0.01	6.70	4.93	30.67	0.01	2.84	0.01	4.97	0.09	1.65	0.41	36.62	2.75
		2.16	**0.05**	**0.01**	**6.69**	**4.91**	**30.71**	**0.01**	**2.84**	**0.01**	**4.97**	**0.09**	**1.65**	**0.40**	**36.61**	2.74
	3 JAM - FF 15%G	2.03	0.05	0.01	7.38	5.11	31.15	0.01	3.43	0.01	7.10	0.08	1.59	0.44	36.16	2.58
	3 JAM - FF 15%G	2.02	0.05	0.01	7.38	5.11	31.18	0.01	3.43	0.01	7.09	0.09	1.60	0.44	36.16	2.57
		2.03	**0.05**	**0.01**	**7.38**	**5.11**	**31.17**	**0.01**	**3.43**	**0.01**	**7.10**	**0.08**	**1.59**	**0.44**	**36.16**	2.57
	3 JAM - FF 20%G	1.85	0.05	0.01	7.19	5.00	31.38	0.01	2.77	0.01	8.56	0.09	1.61	0.38	32.13	2.35
	3 JAM - FF 20%G	1.85	0.05	0.01	7.17	5.02	31.31	0.01	2.77	0.01	8.55	0.09	1.60	0.38	32.14	2.35
		1.85	**0.05**	**0.01**	**7.18**	**5.01**	**31.35**	**0.01**	**2.77**	**0.01**	**8.55**	**0.09**	**1.60**	**0.38**	**32.14**	2.35
	[illegible] 5%G	1.75	0.05	0.01	6.05	5.04	32.01	0.01	1.39	0.01	3.11	0.08	1.63	0.54	35.44	2.22
	[illegible] 5%G	1.75	0.05	0.01	6.03	5.04	32.06	0.01	1.40	0.01	3.11	0.08	1.63	0.54	35.64	2.22
		1.75	**0.05**	**0.01**	**6.04**	**5.04**	**32.03**	**0.01**	**1.40**	**0.01**	**3.11**	**0.08**	**1.63**	**0.54**	**35.54**	2.22
	[illegible] 0%G	1.94	0.04	0.02	6.44	5.02	35.03	0.01	2.24	0.01	5.84	0.06	1.43	0.67	36.05	2.47
	[illegible] 0%G	1.94	0.04	0.01	6.41	4.99	35.13	0.01	2.24	0.01	5.86	0.06	1.43	0.67	36.07	2.47

4 JAM		**1.94**	**0.04**	**0.02**	**6.42**	**5.00**	**35.08**	**0.01**	**2.24**	**0.01**	**5.85**	**0.06**	**1.43**	**0.67**	**36.06**	2.47
	4 JAM - FF 15%G	1.82	0.05	0.01	5.81	5.27	31.08	0.01	3.35	0.01	7.86	0.09	1.59	0.46	35.62	2.31
	4 JAM - FF 15%G	1.82	0.05	0.01	5.82	5.28	31.10	0.01	3.35	0.01	7.88	0.08	1.60	0.47	35.67	2.31
		1.82	**0.05**	**0.01**	**5.82**	**5.28**	**31.09**	**0.01**	**3.35**	**0.01**	**7.87**	**0.09**	**1.59**	**0.46**	**35.65**	2.31
	4 JAM - FF 20%G	1.51	0.05	0.01	5.28	4.95	31.78	0.02	2.17	0.01	9.79	0.08	1.58	0.45	31.88	1.92
	4 JAM - FF 20%G	1.51	0.05	0.01	5.28	4.93	31.90	0.01	2.17	0.01	9.78	0.08	1.58	0.45	31.88	1.92
		1.51	**0.05**	**0.01**	**5.28**	**4.94**	**31.84**	**0.02**	**2.17**	**0.01**	**9.78**	**0.08**	**1.58**	**0.45**	**31.88**	1.92

Lampiran 4

Kartu Konsultasi Tugas Akhir

Lampiran B 10

Kartu Konsultasi Tugas Akhir

JUDUL: STUDI PENINGKATAN KADAR NIKEL BIJIH SAPROLIT DENGAN METODE REDUCTION ROASTING MENGGUNAKAN REDUKTOR ARANG TONGKOL JAGUNG DAN ADITIF GIPSUM

(Konsultasi minimal 8 kali)

TANGGAL	MATERI KONSULTASI	PARAF DOSEN
20 Mei 2024	Hasil analisis XRF	
22 Mei 2024	Perbaiki BAB 4, kesimpulan, keterangan gambar	
27 Mei 2024	Perbaiki perhitungan recovery, keterangan tabel, kesimpulan	
30 Mei 2024	Perbaiki letak tabel dan kesimpulan	
6 Juni 2024	Format artikel ilmiah	
19 Juni 2024	Perbaiki judul, abstrak, tabel artikel ilmiah, metode penelitian artikel ilmiah, ket. gambar artikel ilmiah, gambar	
21 Juni 2024	Perbaiki tabel dan ket. gambar	
10 Juli 2024	Ubah gambar dan perbaiki typo	