GEOCHEMICAL WORK ASSESSMENT REPORT

ON

AW GROUP OF CLAIMS

CLINTON MINING DIVISION

Location: NTS Maps 92P 013 and 92P 003

Map center: 51 8' N, 121 28' W

Work Performed

May 20, 2012 to July 16, 2012

Report Prepared by:

W. Kovacevic

Willy Kovacevic

For
Tilava Mining Corporation

August 20, 2012

BRITISH COLUMBIA

MINERAL TITLES BRANCH
File Rec'd
AUG 28 2012
L.I.D.
VANCOUVER, B.C.

Ministry of Energy & Mines
Energy & Minerals Division
Geological Survey Branch

ASSESSMENT REPORT
TITLE PAGE AND SUMMARY

TITLE OF REPORT [type of survey(s)]	GEOCHEMICAL SURVEY	TOTAL COST $8,950

AUTHOR(S) WILLY KOVACEVIC SIGNATURE(S) W. Kovacevic

NOTICE OF WORK PERMIT NUMBER(S)/DATE(S) N/A YEAR OF WORK 2012

STATEMENT OF WORK - CASH PAYMENT EVENT NUMBER(S)/DATE(S) EVENT No 5324317 - MAY 26/12
EVENT No 5395240 - JULY 20/12 EVENT No 5400205 Aug. 17/12

PROPERTY NAME AW PROPERTY

CLAIM NAME(S) (on which work was done) TENURE 522332

COMMODITIES SOUGHT BENTONITE CLAY

MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN

MINING DIVISION CLINTON NTS 92P003

LATITUDE 51 ° 8 ' " LONGITUDE 121 ° 28 ' " (at centre of work)

OWNER(S)

1) TLAVA MINING CORPORATION 2)

MAILING ADDRESS

BOX 372
CLINTON, B.C. V0K 1K0

OPERATOR(S) [who paid for the work]

1) TLAVA MINING CORPORATION 2)

MAILING ADDRESS

SAME AS ABOVE

PROPERTY GEOLOGY KEYWORDS (lithology, age, stratigraphy, structure, alteration, mineralization, size and attitude):

Ultramafic rocks in contact with Cache Creek volcanics. The Ultramafite is zoned, contains both peridotite and dunite phases. All rocks are moderately to highly serpentinized, and in places, are completely steatized.

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS RS # 1146, RS # 8111, RS # 38677 AND # 26373

(OVER)

TYPE OF WORK IN THIS REPORT	EXTENT OF WORK (IN METRIC UNITS)	ON WHICH CLAIMS	PROJECT COSTS APPORTIONED (incl. support)
GEOLOGICAL (scale, area)			
Ground, mapping			
Photo interpretation			
GEOPHYSICAL (line-kilometres)			
Ground			
Magnetic			
Electromagnetic			
Induced Polarization			
Radiometric			
Seismic			
Other			
Airborne			
GEOCHEMICAL (number of samples analysed for ...)			
Soil			
Silt			
Rock	16 ROCK SAMPLES - WRA / XRD	TENURE 522332	
Other			
DRILLING (total metres; number of holes, size)			
Core			
Non-core			
RELATED TECHNICAL			
Sampling/assaying			$8,950 -
Petrographic			
Mineralographic			
Metallurgic			
PROSPECTING (scale, area)			
PREPARATORY/PHYSICAL			
Line/grid (kilometres)			
Topographic/Photogrammetric (scale, area)			
Legal surveys (scale, area)			
Road, local access (kilometres)/trail			
Trench (metres)			
Underground dev. (metres)			
Other			
		TOTAL COST	$8,950 -

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LIST OF ILLUSTRATIONS

INTRODUCTION

Ultramafic belt, containing Chromium and allied metals Nickel and PGM stretches for some 30 kilometers north and south of Village of Clinton, British Columbia. Recorded occurrences on the belt are Scottie Creek, Mika Showing (AW Property) and Ferguson Creek Chromium (WK Property). The modern geophysical surveys (notably 1st Vertical Gradient Magnetic Survey) have well outlined the extension of the ultramafics. Tilava Mining Corporation is a 100% owner of the Ferguson Creek and AW Property. Historic exploration was concentrated mainly on Chromium and to some extension on Magnesite on AW claims. Both of these claims also contain sizable deposits of Bentonite; WK claims contain swelling bentonite and AW claims contain swelling and non swelling calcium bentonite.

This report represents the results of 2012 exploration program conducted by Tilava Mining Corporation on AW Group of claims in Clinton Mining Division of British Columbia. The exploration target was known but underexplored deposit of Bentonite.

LOCATION AND ACCESS

AW claims are located in south-central British Columbia approximately 8.6 kilometers northeast of Village of Clinton, B.C. The geographic center of the claims is 51 8' N, 121 29' W. The claims are reached by taking Mound Road, which leaves Hwy 97 two kilometers north of Clinton, and traveling it along a distance of 8 kilometers.
The CN Rail is traversing the property as well as B.C. Hydro Power, Fortis Gas line, and major HWY 97.
Most basic services are in nearby town of Clinton and 100 Mile House located some 75 km north of Clinton. The City of Kamloops located about 145 km .to the east has complete support facilities including assay laboratories, drilling companies, exploration contractors and mining consultants.

AW Claims Location Map

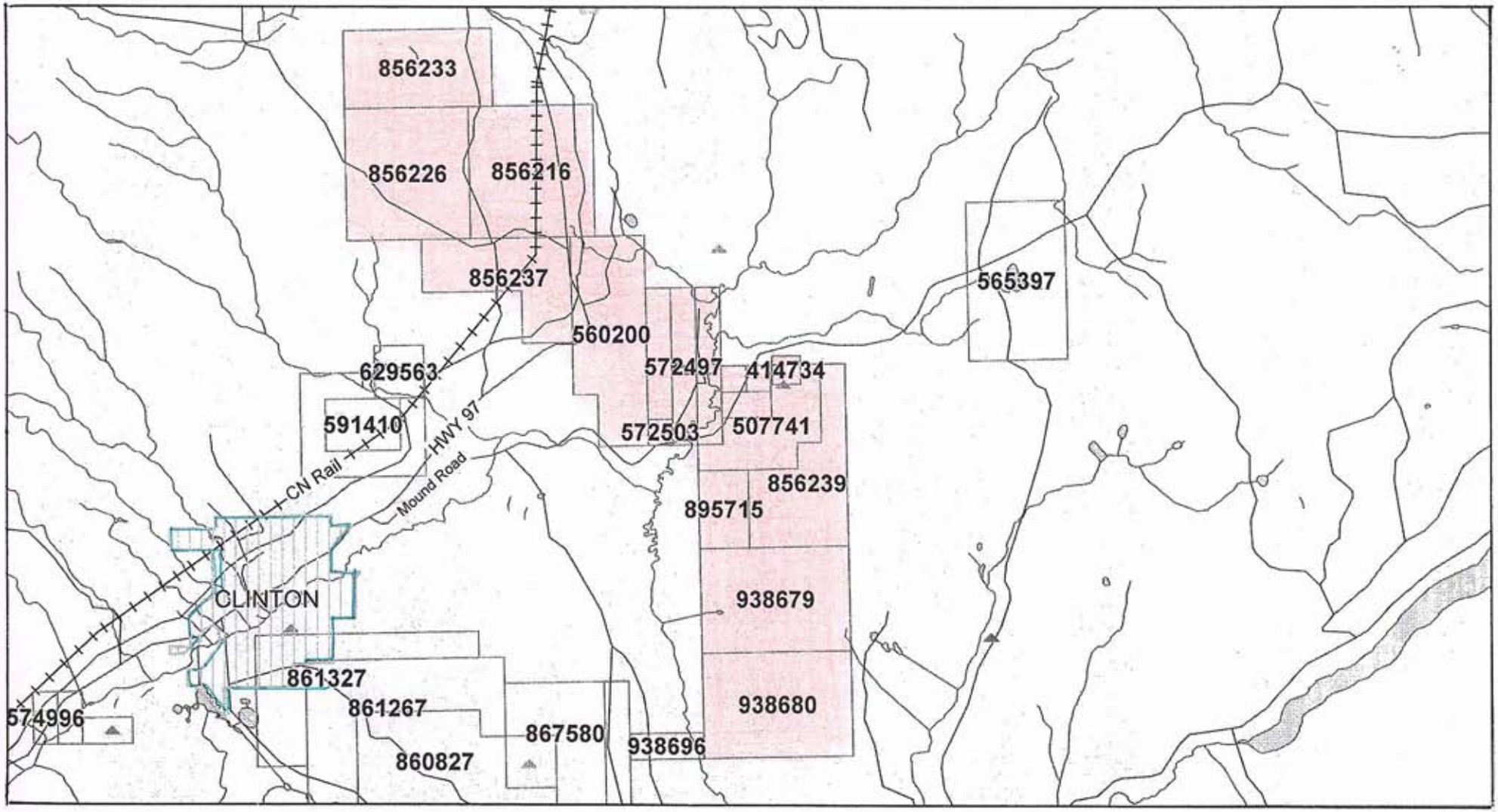
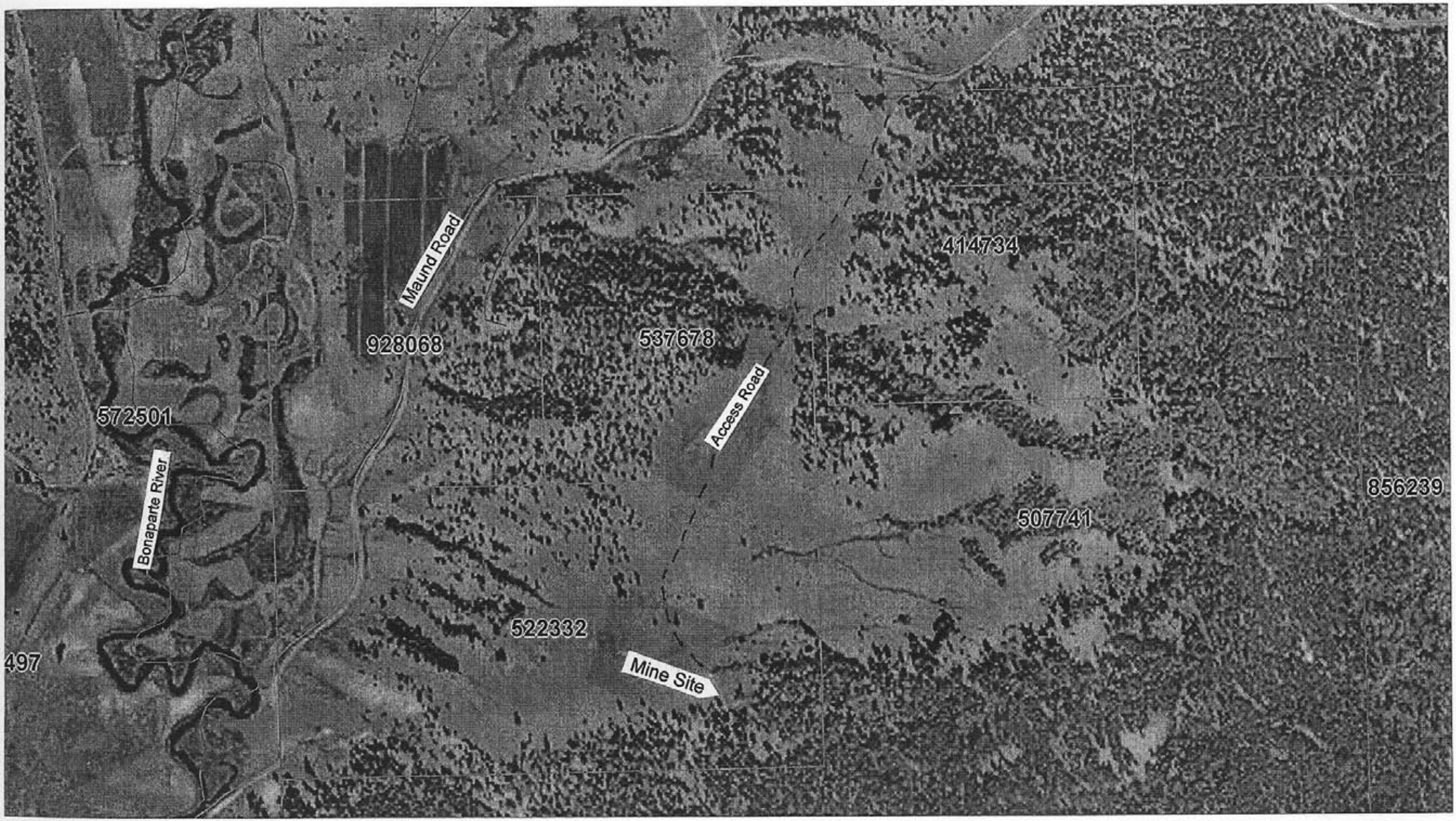


Fig. 1

AW Group of Claims 2012



SCALE 1 : 8,572

200 0 200 400 600

METERS

N

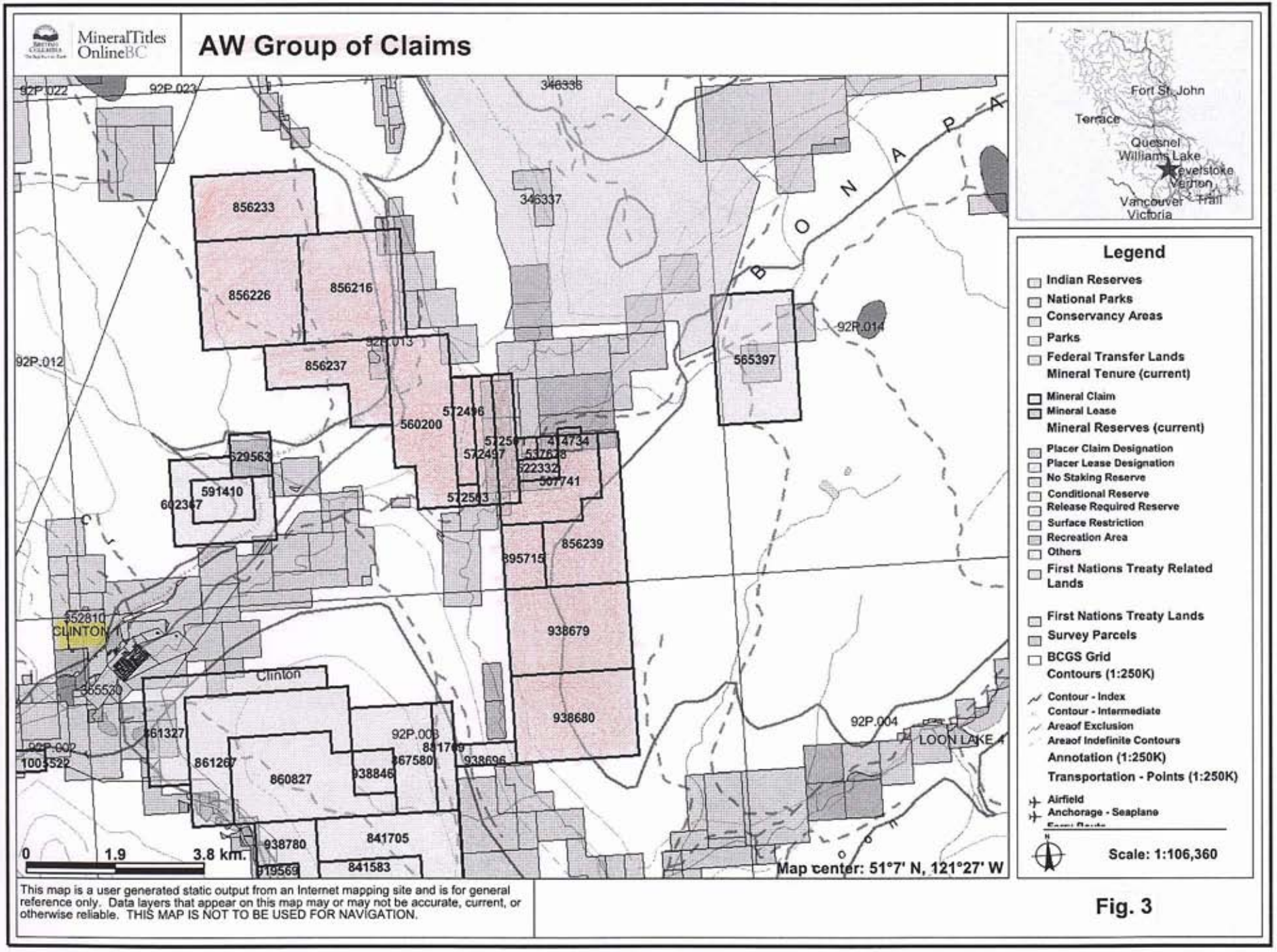
Fig. 2

PROPERTY AND OWNERSHIP

AW Group of claims described in this report consists of 20 Tenures, all in one block, totaling 4,457. hectares located in Clinton Mining Division (NTS maps 92P 013 and 92P 003) and shown in Figure 3. The tenures are a 100% owned by Tilava Mining Corporation.

Tenure No.	Hectares	Expiry Dates
856233	364.73	November 10, 2012
856226	506.74	November 10, 2012
856216	506.74	November 10, 2012
856237	324.43	November 10, 2012
560200	446.18	March 30, 2013
572496	101.41	March 30, 2013
572497	121.70	March 30, 2013
572501	121.70	March 30, 2013
928068	20.28	March 30, 2013
414734	25.00	March 30, 2013
537678	20.29	March 30, 2013
522332	40.57	March 30, 2013
572503	20.29	March 30, 2013
507741	243.46	March 30, 2013
895715	121.76	March 30, 2013
856239	344.97	March 30, 2013
938679	487.21	March 30, 2013
938680	487.37	March 30, 2013
938696	60.93	March 30, 2013
881769	101.55	March 30, 2013

The Bentonite Mine is located on Tenure 522332 on **DL 3768** which Lot is surveyed Crown Land.



This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.

Fig. 3

PREVIOUS WORK

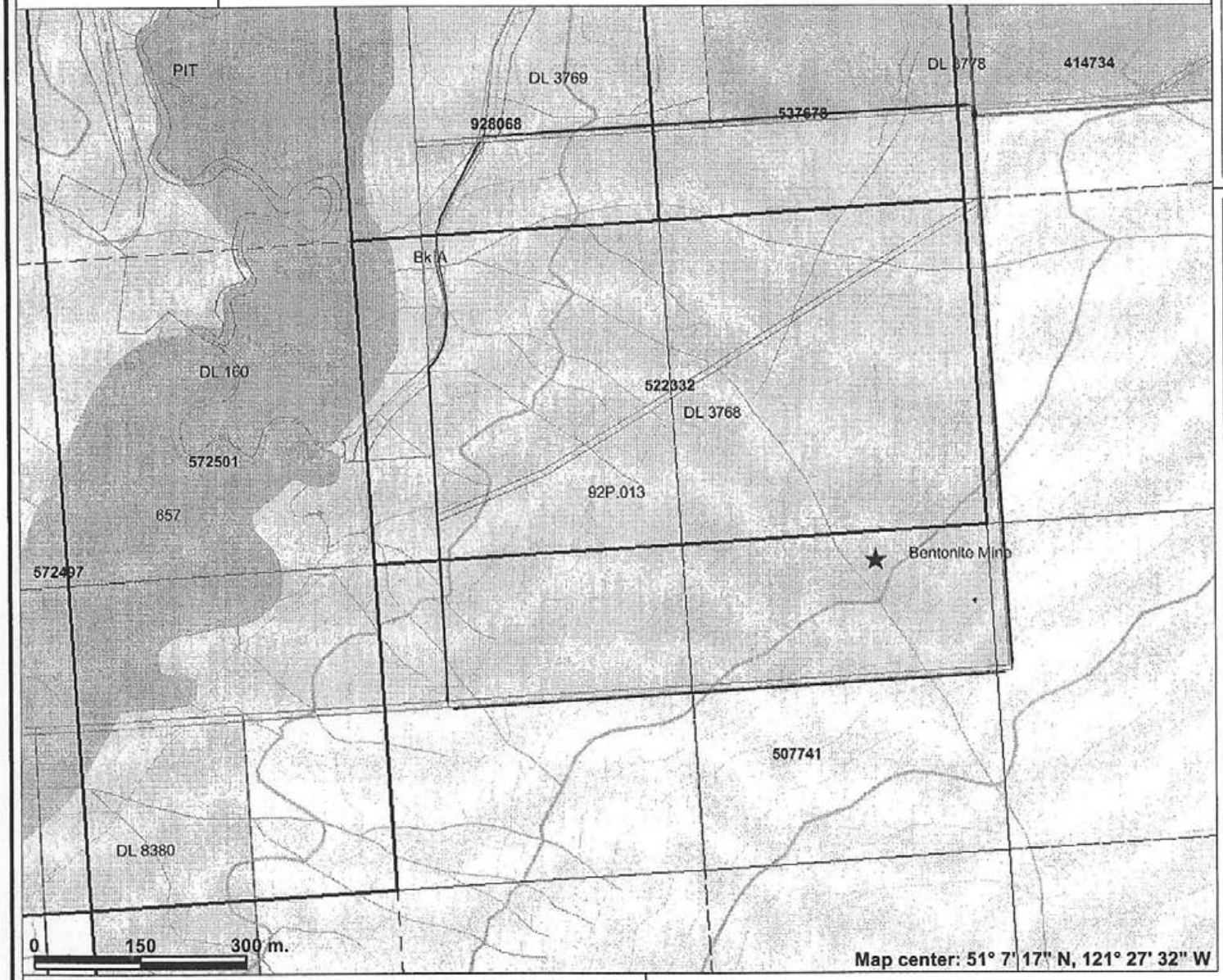
Historical works are best described in Assessment Reports: #1146, # 8111, # #38677and # 26373.
Tilava acquired the property in 2000 and main exploration targets were Chromite and Magnesite. Sporadic work was done on known Bentonite showings consisting of small hand excavated trenches and pits and geochemical samplings

AW BENTONITE DEPOSITS

Bentonite is exposed in curved ridges rising from the valley floor originally projected as clay slump over curved surfaces. Initial works consisting of small trenching and hand excavated pits and prospecting the ridge, connecting east toward Pipeline Minfile, suggested that the deposit is much larger as originally projected.
In the valley floor immediately below bentonite ridges Tilava excavated eight pits in 2008 using hand held auger originally to test Leonardite overlaying the valley floor.
The Leonardite was encountered uniformly in the first 60-75 cm and the bottom 35 cm ended in soft bentonite. The dept capacity of the auger was only one meter therefore total thickness of the bentonite was unknown until the recent work using the large size excavator. It appears that the bentonite beneath the valley floor is at least five meters thick and may represent an enormous deposit.

In 2011 an area approximately covering 0.2 hectares were stripped of thin overburden 20-30 cm and rarely exceeding 50 cm exposing Bentonite. The equipment used consisting of dozer D6 Cat and Hitachi EX 270 owned by the contractor Ken Bolster from Clinton, B.C. This work was done in preparation for auger drilling and geochemical sampling.

AW Bentonite DL 3768



Legend

- Indian Reserves
- National Parks
- Conservancy Areas
- Parks

MTO Grid (MTO)

- Blocked by MEM
- Other

Mineral Tenure (current)

- Mineral Claim
- Mineral Lease

Mineral Reserves (current)

- Placer Claim Designation
- Placer Lease Designation
- No Staking Reserve
- Conditional Reserve
- Release Required Reserve
- Surface Restriction
- Recreation Area
- Others

Integrated Cadastral Fabric

- Survey Parcels
- BCGS Grid

Contours (TRIM)

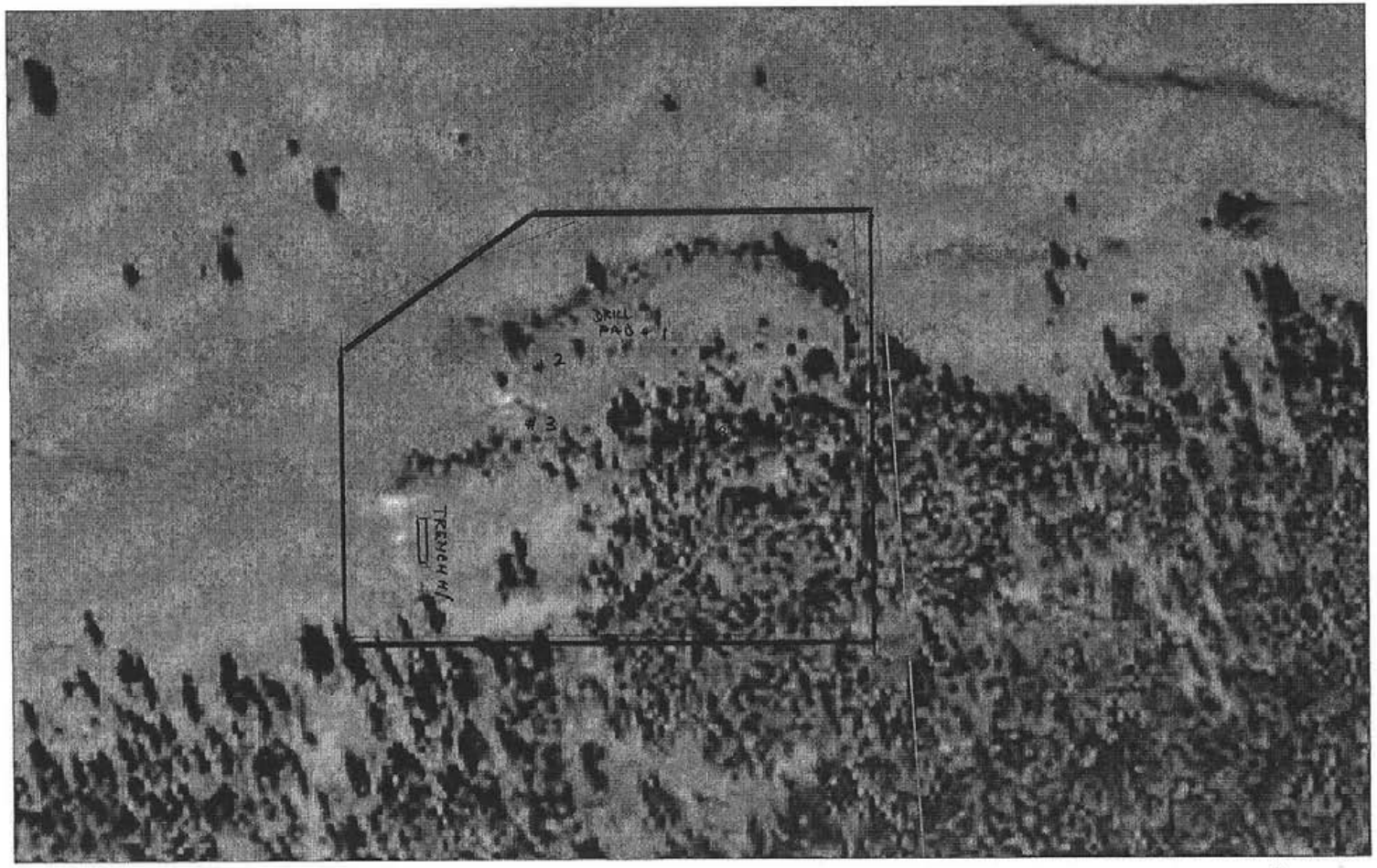
- Contour - Index
- Contour - Index.Indefinite
- Contour - Index.Depression
- Contour - Index.Depression Indefinite
- Contour - Intermediate
- Contour - Intermediate.Indefinite
- Contour - Intermediate.Depression
- Contour - Intermediate.Depression Indefinite
- Areaof Exclusion

Scale: 1:8,509

DL 3768

Fig. 4

AW BENTONITE MINE SITE # 1



SCALE 1 : 2,500

50 0 50 100 150

METERS

N

Fig. 5

Previously hand excavated three small trenches and pits were enlarged and deepened and two small but deep pits of approximately 5 meters were excavated by excavator. After taking the representative samples these pits were covered and reclaimed. In order to compare WRA results from the 2008 bentonite samples obtained by hand held auger (30 cm layer) the composite sample of 2011 deep excavated samples are submitted to WRA analyze with Eco-Tech lab in Kamloops.. The results were similar, with notably elevated values of calcium (12-14%) in both sampling where normal calcium content should be 2-5% as previously detected in the samples of the main bentonite deposit located above the valley floor. The importance of the elevated calcium will be further evaluated during the next stage of exploration.

2012 GEOCHEMICAL SURVEY COMPLETED

In May, 2012 5 rock grab samples were collected from excavated trenches or stripped area. The samples are predominately light colored solid chunks of bentonite which are flaky when dried. AW-RS #1 was collected from the pipeline bench cut described by Minfile Pipeline 092P 052 to be diatomeus earth.

	UTM Coordinates	
AW-RS#1	608598 E - 5664969 N	Minfile No.092P 052
AW-RS#2	608257 E - 5664552 N	Central east end of the stripped area
AW-RS#3	608295 E - 5664606 N	Trench#2
AW-RS#4	608293 E - 5664616 N	Trench#3
AW-RS#5	608256 E - 5664580 N	Trench# 4 and 5
AW-RS#6	608228 E - 5664510 N	Trench #1

In July, 2012 additional 10 composite bentonite samples from these locations were collected as follows:

RS-2-A	608257 E - 5664553 N	Sample collected 1 meter south of AW-RS#2 – lose rock material from 1 meter depth on the road cut bench.
RS-2-B	608259 E - 5664553 N	Sample collected 2 meters north of AW- RS#2 – buff to rusty colored solid hard rock bentonite on the Road cut bench.
RS-2-C	608255 E – 5664548 N	Sample collected 4 meters south of AW-RS#2 from 1 meter dept – lose bentonite fragments..
RS-#6-A	Trench #1 608228 E - 5654510 south end of the trench 608219 E - 5664550 north end of the trench 10 RS of lose bentonite collected at app. 3 meters intervals from Trench #1 excavated material covering app. 30 meters - (composite sample).	
RS -#7	608240 E - 5664545 N (center) 4 composite samples taken over 10 meters at depth of 35-40 cm.	

RS-3-B	608295 E – 5664606 N Composite sample from inside of Trench #3
RS-4-A	608256 E – 5664580 N Composite sample from inside of Trench #4
RS-5-A	Composite sample from inside of Trench #5
RS - Composite #1	Composite light color and weight grab samples collected from the above listed locations. The rocks are light and flaky.
RS – Composite #2	Composite light colored and harder and dense bentonite, grab samples, collected from the some above mentioned locations.

All samples were delivered to ALS Lab in Vancouver for WRA (whole rock) analyze and to Department of Earth & Ocean Sciences at University of British Columbia for XRD (X-ray diffraction) analyze.

RESULTS AND DISCUSSION (XRD) for AW- RS2 to AW-RS6

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4+ and Search-Match software by Bruker AXS. X-ray powder-diffraction data were refined using Ritveld software Topas 4.2 (Broker AXS).The results of quantitative phase analysis by Ritveld refinement are given in table 1. These amounts represent the relative amounts of crystalline phase normalized to 100%.

The samples contain **abundant swelling clay** (smectite group) like montmorillonite. As the crystal structure of the mineral is disordered and not predictable, the UBC have used an empirical model to fit the patterns and to estimate the amount the results are considered to be semi-quantitative.

RESULTS AND DISCUSSION (XRD) for Composite Sample RS-Composite #2 and RS-2-B

The samples contain **abundant swelling clay** (smectite group) like montmorillonite similar to previous 6 samples AW-RS2 to AW-RS6

*

The XRD results for the first six samples are stored in Appendix "B".

The XRD results from the last ten samples are stored in Appendix "C" and Appendix "D".

RESULTS AND DISCUSSION (WRA)

Whole rock analyzes (WRA) of all 16 bentonite samples detected that at least 9 samples are considered to be sodium swelling type Bentonite (AW-RS2 to AW-RS6 and RS#2-B, RS#4-A, RS#6-A and RS-Composite #2). By adding sodium hydroxide the swelling capacity maybe improved. Tilava intends to carry experimentations with sodium hydroxide and other methods of beneficiations of bentonite in order to improve marketability of the AW Bentonite. The analytical results of WRA are stored in Appendix "A".

SUMMARY–CONCLUSION AND RECOMMENDATION

The 2012 geochemical sampling detected abundant swelling bentonite (smectite) montmorillonite indicating presence of sodium bentonite. Out of 16 rock samples 9 contained sodium bentonite which bentonite maybe further improved by adding sodium hydroxide improving marketability of the deposit.

The present knowledge of the bentonite deposit suggests that it will continue in north and north-east directions following the prominent ridge under a shallow overburden. Tilava has applied for permit for enlargement of the present AW Bentonite Mine and for 10,000 tones bulk sampling excavation. On August 16, 2012 Tilava has received Work Permits for both work applied; an Amended Work Permit which will considerably enlarge the Bentonite Mine size and the Permit to extract 10,000 tones of bentonite as bulk sampling.

REFERENCES

1. Harben P.W & Bets R.L (1990)
   Industrial Minerals Geology and World Deposits- Chromite p, 52-61 and Diatomite p, 101-195)

2. Harben P.W. (1992) –The Industrial Handy Book – A Guide to Markets, Specification & Price – (Chromite p, 21-22)

3. Robert G. Wilson (1980) Report on Geology and Soil & Rock Geochemistry On Mika Claims for CCH Resources Ltd.

4. Robert G. Wilson (1981) Report on Geology and Soil Geochemistry On Mika Group for Campbell Resources Inc.

5. K.D. Hancock Ultramafic associated Chromite and Nickel Occurrences in British Columbia (Open File 1900-27 Chrome Ridge, Scottie Creek, Mika and Ferguson Creek occurrences p, 21-23)

6. Grant A. (2000) Geophysical Report AW Claims, Clinton Mining District, for Tilava Mining Corporation (Assessment Report 26373)

Statement of Expenses

1. Labor

Willy Kovacevic – Project Manager

May 20, 21 and 25, 2012

July, 6, 7 and 16, 2012

6 days @ 350/day	$350/day	$2,100	
Ken Bolster – Assistant			
May 21, 2012			
1 day @ 350/day		350	
		$2,450	$2,450.00

2. Transportation

4 x 4 pick-up truck			
6 days @ 75/day	$450		
Gas	275		
Samples delivery	165		
	$890		890.00
3. Groceries			150.00

4. Miscellaneous

Photos and field supplies			75.00

5. Contractors

ALS Minerals Lab			
Vancouver, B.C.		$1,135.11	
UBC Earth & Ocean Sciences			
Vancouver, B.C.		2,500.00	
		$3,635.11	3,635.11

6. Report	$1,500.00		
Drafting & Misc	250. 00		
	$1,750.00		1,750.00
		Total	**$8,950.11**
		PAC 30% withdrawal	**1,983.79**
		Total Work Filed	**$10,933.90**

Filed on May 26, 2012	**-**	**Event No 5324317**	**$ 4,248.60**
Filed on July 20. 2012	**-**	**Event No 5395240**	**5,729.35**
Filed on August 17, 2012	**-**	**Event No 5400205**	**956.28**
			$10,933.69

Statement of Qualification

I, Willy Kovacevic, of the Village of Clinton, British Columbia, DO HEREBY CERTYFY THAT I have the following prospecting and related experience:

1971	Completed The Canadian Securities Course (The Investment Dealers Association of Canada)
1972	Attended a prospecting course (hard rock) organized by the B.C. & Yukon Chamber of Mines.
1975-1976	Developed and shipped polymetallic ore from Adams Plateau, B.C. to Cominco (Borex Mining Ltd. Spar 1 and Spar 2 claims).
1976	Attended a prospecting course (placer gold recovery) organized by B.C. & Yukon Chamber of Mines.
1977-1978	As the President of Lorcan Resources Ltd. (VSE public company) supervised and participated in geophysical survey and diamond drilling (Lost Cabin Mine, California) – worked as diamond driller helper.
1977-1979	Prospected and geochemically surveyed group of claims owned by Mineta Resources Ltd. (VSE public company) in Monashee Range, B.C. Prospected and geochemically surveyed in south-central B.C. for Tilava Mining Corporation (as owner).
1980-1983	Explored for oil and gas in USA, produced and marketed oil in Clinton County, Kentucky for Robico Investment Ltd (as owner) and for group of VSE public companies, Mineta Resources Ltd., Westam Oil Ltd and Boram Oil Ltd (as principal).
1983-1900	Supervised and participated in various phases of exploration on the properties owned by Star of Mineta Ltd (VSE public company) as principal (Kirkland Lake, Ontario, Adams Plateau, B.C. and Golden Loon claims, Little Fort, B.C.)
1993-2012	Prospected Golden Loon Claims, Little Fort, B.C. for Star of Mineta (VSE public company) as principal and Tilava Mining Corporation as owner and WK and AW claims group, Clinton, B.C as owner mainly for Industrial minerals: Chromium, Pozzolan and Bentonite.

Willy Kovacevic
Prospector

Appendix "A"

ALS Canada Ltd.
2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: 604 984 0221 Fax: 604 984 0218 www.alsglobal.com

To: TILAVA MINING
BOX 372
CLINTON BC V0K 1K0

Finalized Date: 5-JUN-2012
Account: TILMIN

CERTIFICATE KL12118380

Project: AW Bentonite

P.O. No.:

This report is for 6 Rock samples submitted to our lab in Kamloops, BC, Canada on 25-MAY-2012.

The following have access to data associated with this certificate:

W. KOVACEVIC		

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI-21	Received Sample Weight
CRU-QC	Crushing QC Test
LOG-22	Sample login - Rcd w/o BarCode
CRU-31	Fine crushing - 70% < 2mm
SPL-21	Split sample - riffle splitter
PUL-31	Pulverize split to 85% < 75 um

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	INSTRUMENT
ME-ICP06	Whole Rock Package - ICP-AES	ICP-AES
OA-GRA05	Loss on Ignition at 1000C	WST-SEQ
TOT-ICP06	Total Calculation for ICP06	ICP-AES

To: TILAVA MINING
ATTN: W. KOVACEVIC
BOX 372
CLINTON BC V0K 1K0

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

Signature:
Colin Ramshaw, Vancouver Laboratory Manager

ALS Canada Ltd.
2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: 604 984 0221 Fax: 604 984 0218 www.alsglobal.com

To: TILAVA MINING
BOX 372
CLINTON BC V0K 1K0

Finalized Date: 5- JUN- 2012
Account: TILMIN

Project: AW Bentonite

CERTIFICATE OF ANALYSIS KL12118380

Sample Description	Method Analyte Units LOR	WEI-21 Recvd Wt. kg 0.02	ME-ICP06 SiO2 % 0.01	ME-ICP06 Al2O3 % 0.01	ME-ICP06 Fe2O3 % 0.01	ME-ICP06 CaO % 0.01	ME-ICP06 MgO % 0.01	ME-ICP06 Na2O % 0.01	ME-ICP06 K2O % 0.01	ME-ICP06 Cr2O3 % 0.01	ME-ICP06 TiO2 % 0.01	ME-ICP06 MnO % 0.01	ME-ICP06 P2O5 % 0.01	ME-ICP06 SrO % 0.01	ME-ICP06 BaO % 0.01	OA-GRA05 LOI % 0.01
AW-RS#1		0.58	59.3	12.85	3.62	3.21	2.96	0.91	0.78	0.02	0.53	0.03	0.07	0.01	0.04	16.45
AW-RS#2		0.58	70.1	10.55	3.99	0.57	1.46	1.15	0.69	0.01	0.45	0.02	0.07	0.01	0.03	12.60
AW-RS#3		0.60	66.6	13.70	4.04	0.81	1.72	1.44	0.87	0.01	0.56	0.03	0.08	0.02	0.04	11.55
AW-RS#4		0.61	67.6	12.70	3.74	0.61	2.26	1.39	0.81	0.01	0.57	0.02	0.08	0.01	0.04	11.95
AW-RS#5		0.55	72.5	10.10	2.81	0.66	1.63	1.22	0.71	0.01	0.39	0.01	0.05	0.01	0.03	10.95
AW-RS#6		0.46	66.2	12.35	3.97	0.62	2.12	1.56	0.81	0.02	0.54	0.02	0.07	0.01	0.04	12.35

ALS Canada Ltd.
2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: 604 984 0221 Fax: 604 984 0218 www.alsglobal.com

To: TILAVA MINING
BOX 372
CLINTON BC V0K 1K0

Finalized Date: 5- JUN- 2012
Account: TILMIN

Project: AW Bentonite

CERTIFICATE OF ANALYSIS KL12118380

Sample Description	Method Analyte Units LOR	TOT- ICP06 Total % 0.01
AW- RS#1		100.78
AW- RS#2		101.70
AW- RS#3		101.47
AW- RS#4		101.77
AW- RS#5		101.08
AW- RS#6		100.68

ALS Canada Ltd.
2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone 604 984 0221 Fax: 604 984 0218 www.alsglobal.com

To: TILAVA MINING
BOX 372
CLINTON BC V0K 1K0

Finalized Date: 5- AUG- 2012
Account: TILMIN

CERTIFICATE KL12160516

Project:

P.O. No.:

This report is for 10 Other samples submitted to our lab in Kamloops, BC, Canada on 16- JUL- 2012.

The following have access to data associated with this certificate:

W. KOVACEVIC

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI- 21	Received Sample Weight
CRU- QC	Crushing QC Test
LOG- 22	Sample login - Rcd w/o BarCode
CRU- 31	Fine crushing - 70% < 2mm
SPL- 21	Split sample - riffle splitter
PUL- 31	Pulverize split to 85% < 75 um
WSH- 21	"Wash" crushers

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	INSTRUMENT
ME- XRF06	Whole Rock Package - XRF	XRF
OA- GRA06	LOI for ME- XRF06	WST- SIM

To: TILAVA MINING
ATTN: W. KOVACEVIC
BOX 372
CLINTON BC V0K 1K0

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

Signature:
Colin Ramshaw, Vancouver Laboratory Manager

ALS Canada Ltd
2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: 604 984 0221 Fax: 604 984 0218 www.alsglobal.com

To: TILAVA MINING
BOX 372
CLINTON BC V0K 1K0

Finalized Date: 5- AUG- 2012
Account: TILMIN

CERTIFICATE OF ANALYSIS KL12160516

Sample Description	Method Analyte Units LOR	WEI- 21 Recvd Wt. kg 0.02	ME- XRF06 SiO2 % 0.01	ME- XRF06 Al2O3 % 0.01	ME- XRF06 Fe2O3 % 0.01	ME- XRF06 CaO % 0.01	ME- XRF06 MgO % 0.01	ME- XRF06 Na2O % 0.01	ME- XRF06 K2O % 0.01	ME- XRF06 Cr2O3 % 0.01	ME- XRF06 TiO2 % 0.01	ME- XRF06 MnO % 0.01	ME- XRF06 P2O5 % 0.001	ME- XRF06 SrO % 0.01	ME- XRF06 BaO % 0.01	ME- XRF06 LOI % 0.01
RS#2- A		4.32	54.64	13.13	6.31	2.03	2.19	1.49	0.93	0.02	0.54	0.08	0.137	0.02	0.03	17.20
RS#2- B		3.39	55.74	12.13	10.43	1.12	1.81	1.50	0.67	0.01	0.47	0.30	0.124	0.02	0.03	15.85
RS#2- C		4.23	53.59	12.77	6.25	2.38	2.25	1.31	0.90	0.01	0.51	0.09	0.149	0.01	0.03	18.45
RS#3- B		6.07	57.74	11.30	5.18	1.89	1.93	1.28	0.80	0.01	0.47	0.07	0.132	0.61	0.03	17.60
RS#4- A		6.08	58.23	12.28	4.80	1.26	2.30	1.40	0.89	0.01	0.52	0.07	0.118	0.01	0.04	17.40
RS#5- A		4.87	56.78	12.16	5.59	1.20	2.37	1.16	0.86	0.01	0.49	0.09	0.212	0.01	0.03	18.35
RS#6- A		6.70	55.46	12.33	5.32	1.59	2.47	1.61	0.87	0.01	0.50	0.07	0.137	0.01	0.04	18.35
RS#7		4.98	56.71	11.41	5.90	2.25	2.26	1.41	0.92	0.02	0.46	0.08	0.274	0.01	0.03	16.85
RS - Composite #1		16.09	52.09	13.39	6.77	2.41	3.91	1.38	0.78	0.09	0.57	0.06	0.106	0.02	0.02	17.80
RS - Composite #2		10.43	61.65	12.36	3.89	0.83	2.18	1.43	0.91	0.01	0.51	0.03	0.086	0.01	0.02	15.05

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Finalized Date: 5- AUG- 2012
Account: TILMIN

CERTIFICATE OF ANALYSIS KL12160516

Sample Description	Method Analyte Units LOR	ME-XRF06 Total % 0.01
RS#2 - A		98.74
RS#2 - B		100.20
RS#2 - C		98.70
RS#3 - B		98.24
RS#4 - A		99.33
RS#5 - A		99.31
RS#6 - A		98.77
RS#7		98.58
RS - Composite #1		99.40
RS - Composite #2		98.96

Appendix "B"

QUANTITATIVE PHASE ANALYSIS OF 6 SAMPLES USING THE RIETVELD METHOD AND X-RAY POWDER DIFFRACTION DATA

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July 4, 2012

EXPERIMENTAL METHOD

The particle size of the samples was reduced to the optimum grain-size range for X-ray analysis (<5 μm) by grinding under ethanol in a vibratory McCrone Micronising Mill for 5 minutes. Continuous-scan X-ray powder-diffraction data were collected over a range 3-80°2θ with CoKa radiation on a Bruker D8 Focus Bragg-Brentano diffractometer equipped with an Fe monochromator foil, 0.6 mm (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a LynxEye detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of 6°.

RESULTS AND DISCUSSION

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4+ and Search-Match software by Bruker AXS. X-ray powder-diffraction data were refined using Rietveld software Topas 4.2 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinement are given in Table1. These amounts represent the relative amounts of crystalline phases normalized to 100%.

The samples contain abundant swelling clay (smectite group), likely montmorillonite. As the crystal structure of this mineral is disordered and not predictable, we have used an empirical model to fit the patterns and to estimate the amount. Consider the results semi-quantitative.

Table 1. Rietveld Refinement Results (wt.%)

Phase	**Ideal Chemical Formula**	**AW-RS1**	**AW-RS2**	**AW-RS3**	**AW-RS4**	**AW-RS5**	**AW-RS6**
Albite low, calcian	$NaAlSi_3O_8 - CaAl_2Si_2O_8$	12	12	17	15	17	16
Calcite, magnesian	$(Ca,Mg)CO_3$	11					
Kaolinite	$Al_2Si_2O_5(OH)_4$	7	4	5	5	4	6
Montmorillonite	$\sim(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \_ nH_2O$	53	70	62	65	63	61
Muscovite 2M1	$KAl_2(AlSi_3O_{10})(OH)_2$	4	3	4	4	3	4
Orthoclase	$KAlSi_3O_8$	3	2	2	2	2	3
Quartz low	SiO_2	11	9	10	9	11	11
Total		100	100	100	100	100	100

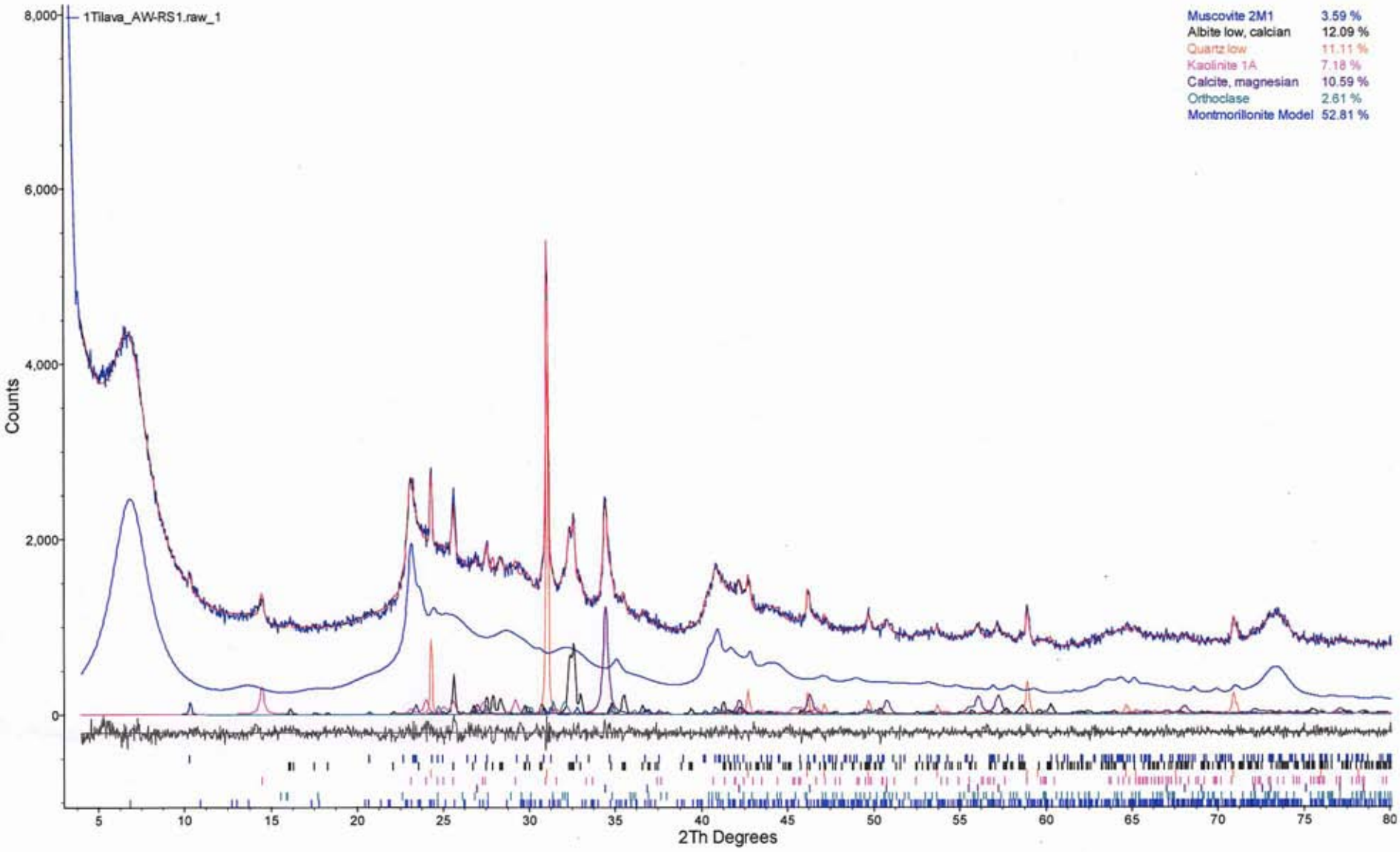

Figure 1. Rietveld refinement plot for Sample **1Tilava_AW-RS1** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

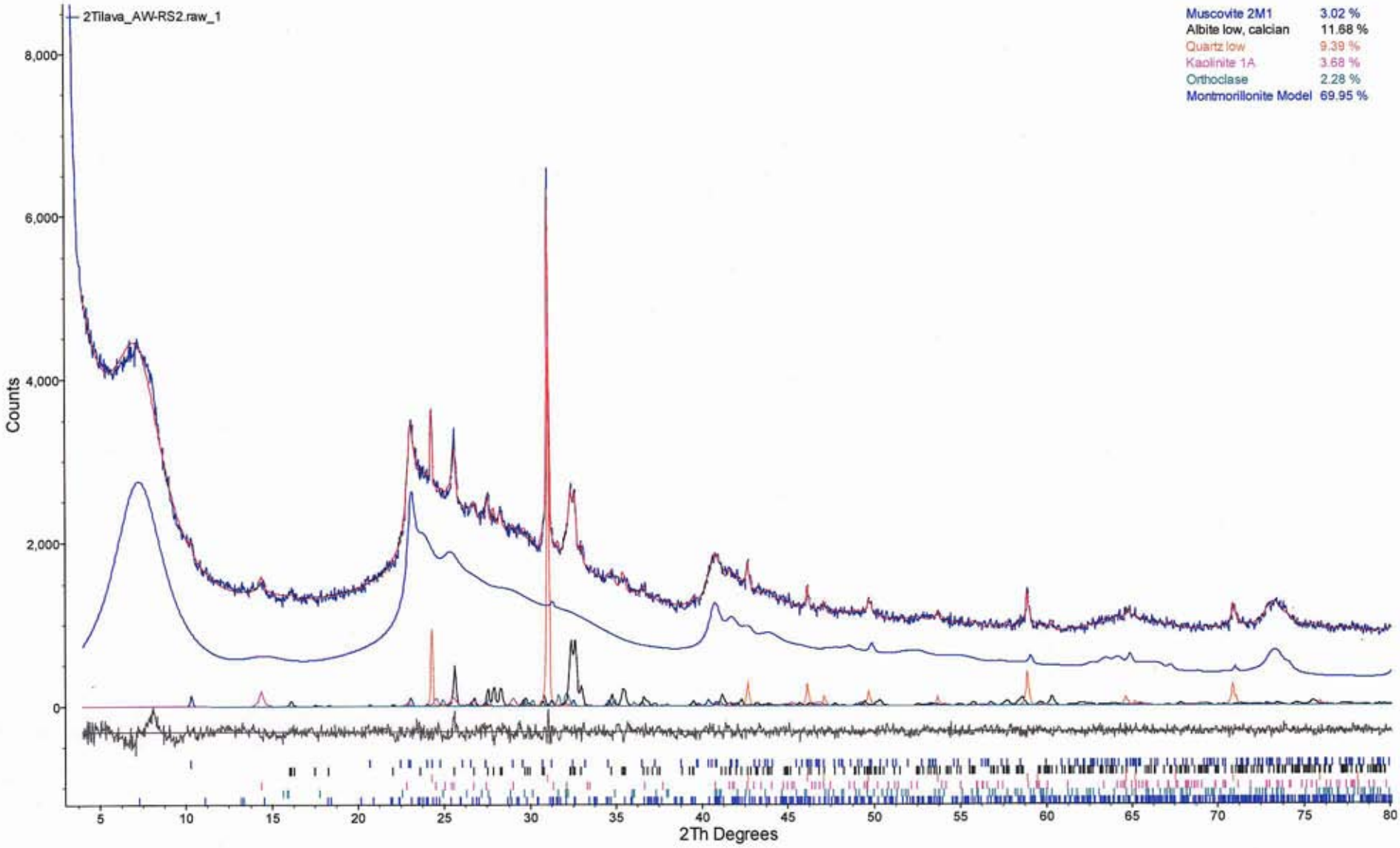

Figure 2. Rietveld refinement plot for Sample **2Tilava_AW-RS2** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

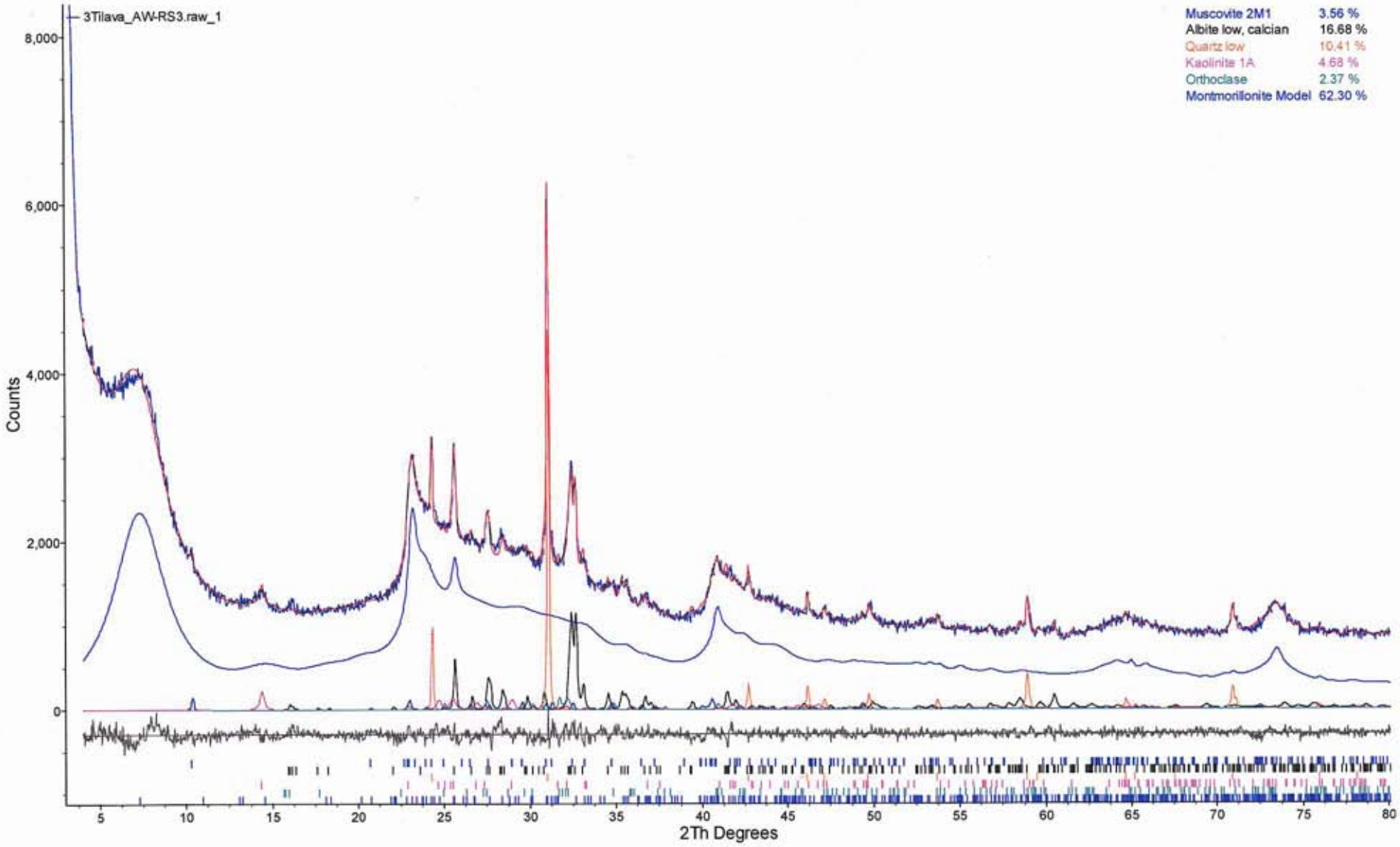

Figure 3. Rietveld refinement plot for Sample **3Tilava_AW-RS3** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

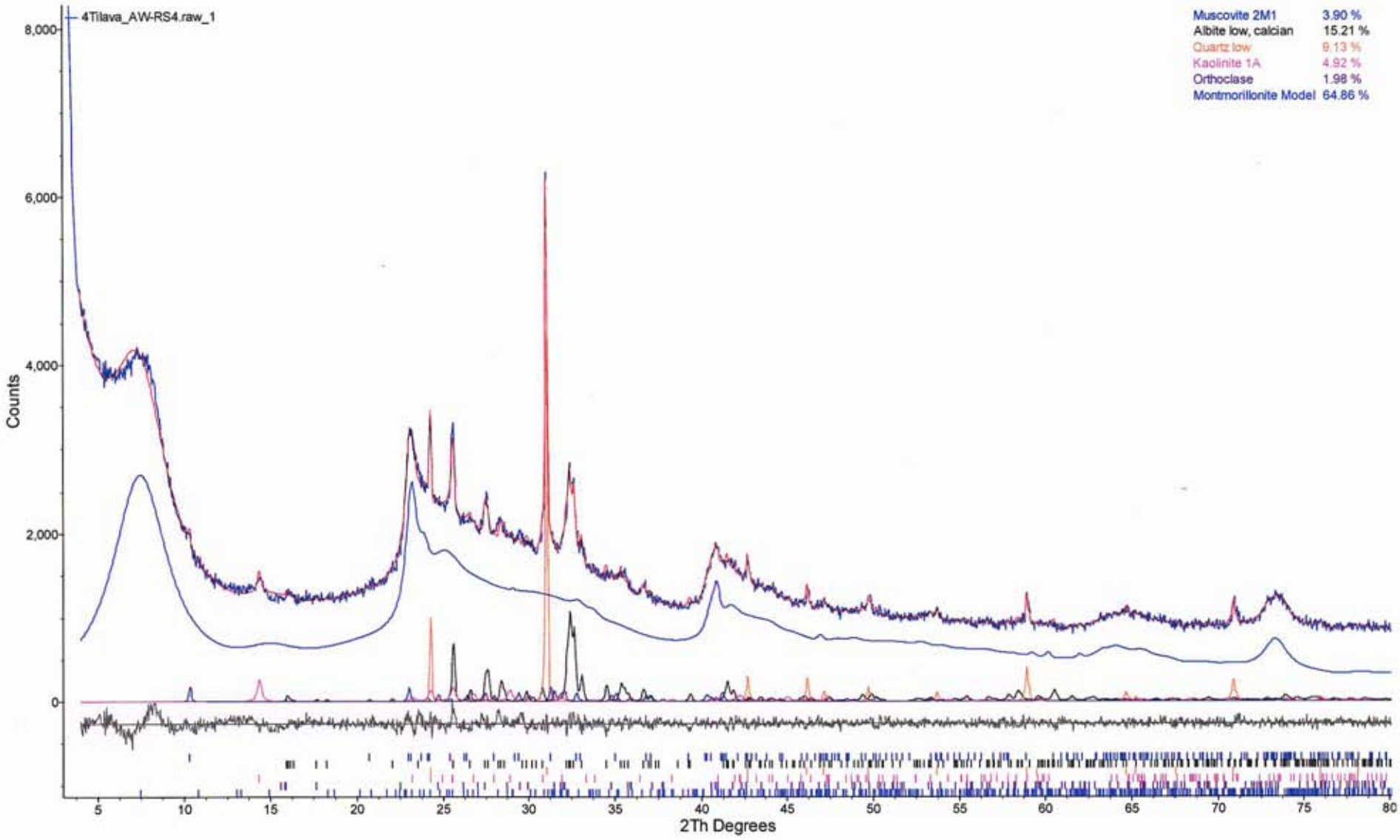

Figure 4. Rietveld refinement plot for Sample **4Tilava_AW-RS4** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

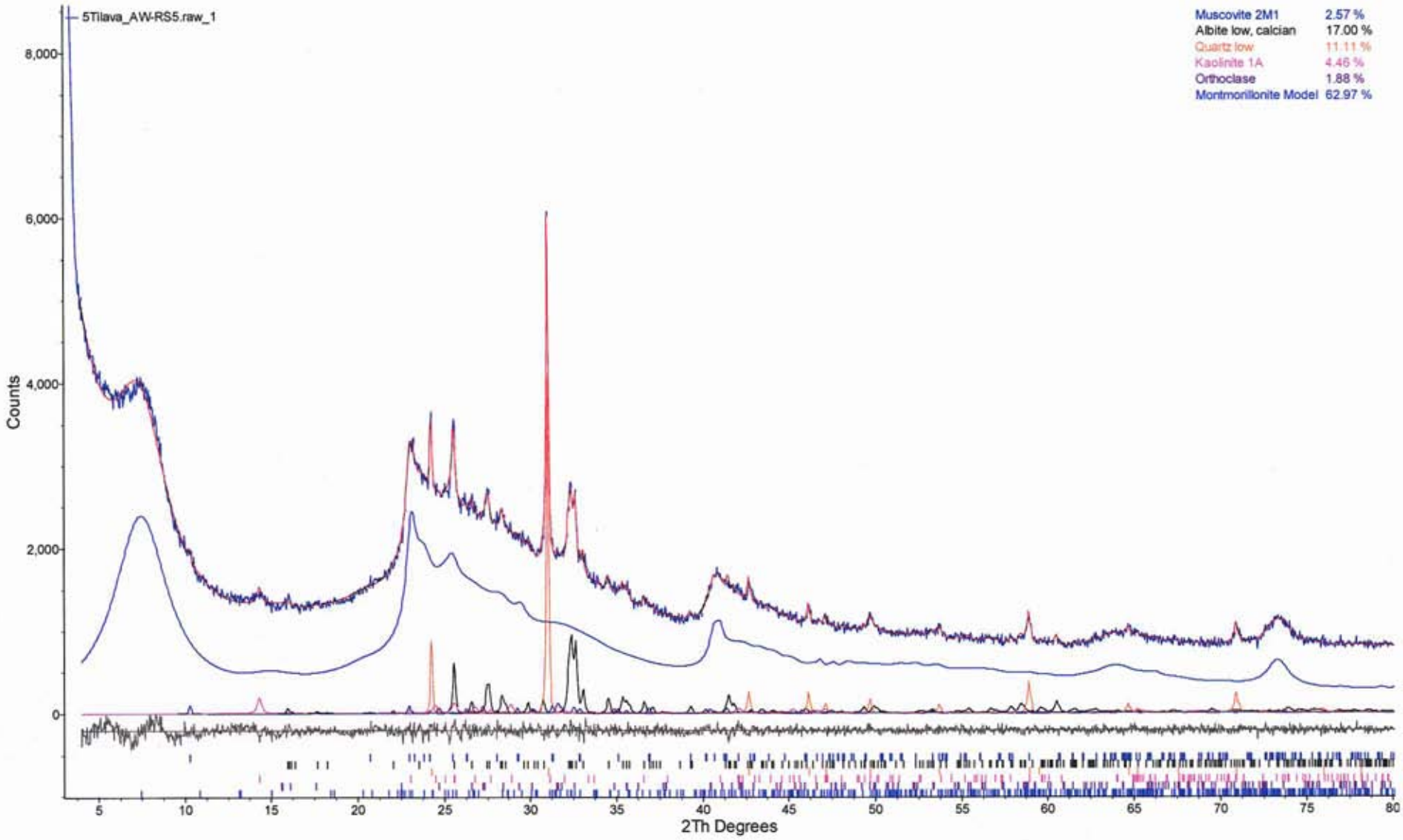

Figure 5. Rietveld refinement plot for Sample **5Tilava_AW-RS5** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

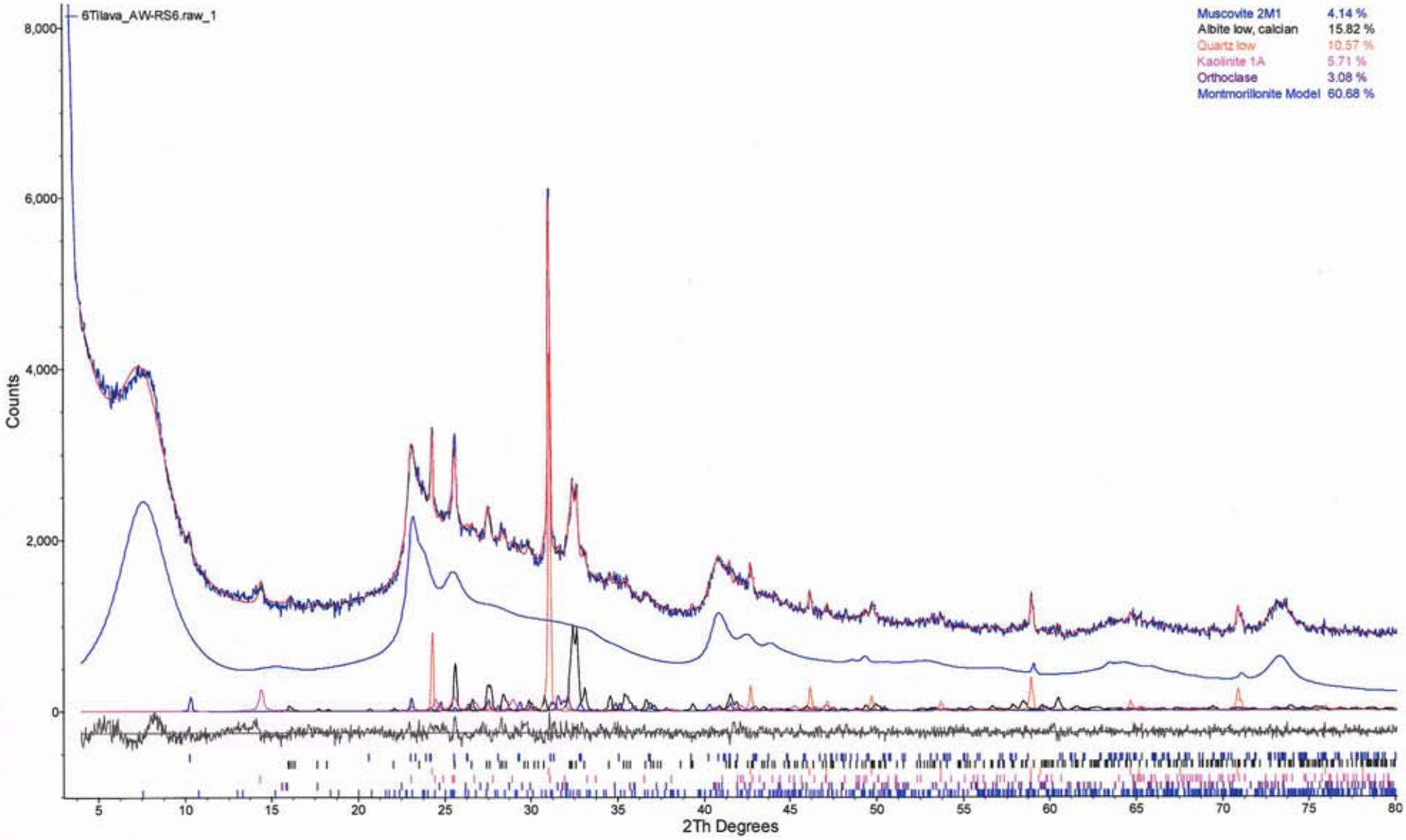

Figure 6. Rietveld refinement plot for Sample **6Tilava_AW-RS6** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

Appendix "C"

QUANTITATIVE AND QUALITATIVE PHASE ANALYSIS OF 10 SAMPLES USING THE RIETVELD METHOD AND X-RAY POWDER DIFFRACTION DATA

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August 23, 2012

EXPERIMENTAL METHOD

The particle size of the samples **RS#2-B** and **RS-Composite#2** was reduced to the optimum grain-size range for X-ray analysis (<5 μm) by grinding under ethanol in a vibratory McCrone Micronising Mill for 7 minutes. The other eight samples were ground into fine powder with a corundum mortar and smeared on to a glass slide with ethanol. Continuous-scan X-ray powder-diffraction data for all the samples were collected over a range 3-80°2θ with CoKa radiation on a Bruker D8 Focus Bragg-Brentano diffractometer equipped with an Fe monochromator foil, 0.6 mm (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a LynxEye detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of 6°.

RESULTS AND DISCUSSION

The X-ray diffractograms for all the samples were analyzed using the International Centre for Diffraction Database PDF-4+ and Search-Match software by Bruker AXS. X-ray powder-diffraction data of the samples **RS#2-B** and **RS-Composite#2** were refined using Rietveld software Topas 4.2 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinement are given in Table 1. These amounts represent the relative amounts of crystalline phases normalized to 100%. The X-ray diffractograms with results are shown in Figures 1 – 2.

The samples **RS#2-B** and **RS-Composite#2** contain abundant swelling clay (smectite group), likely montmorillonite. As the crystal structure of this mineral is disordered and not predictable, we have used an empirical model to fit the patterns and to estimate the amount. Consider the results semi-quantitative.

The results of qualitative phase analysis for the eight samples are shown in Table 2. The X-ray diffractograms are shown in Figures 3-10.

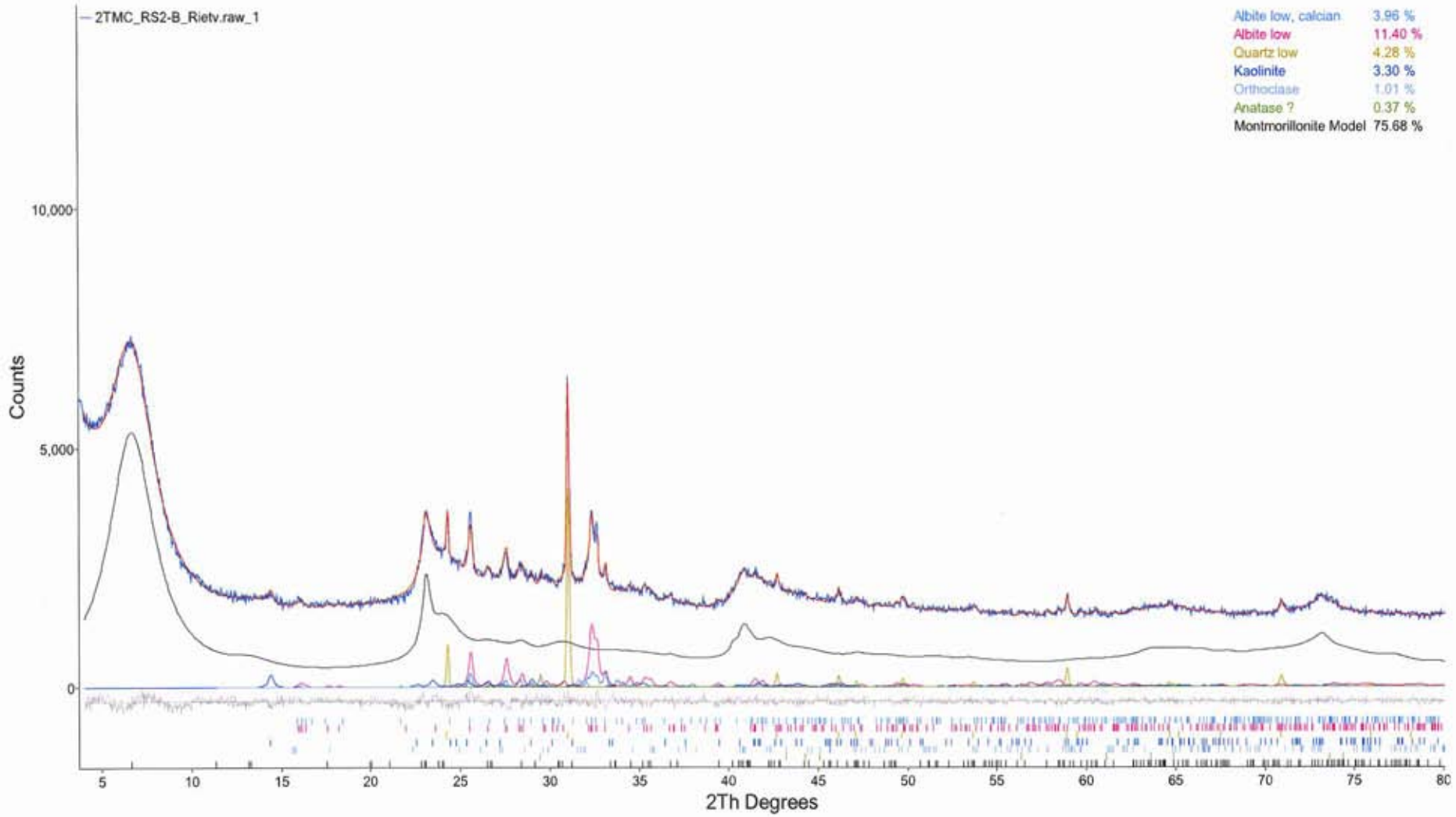

Figure 1. Rietveld refinement plot for sample **RS#2-B** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases. Approximate results.

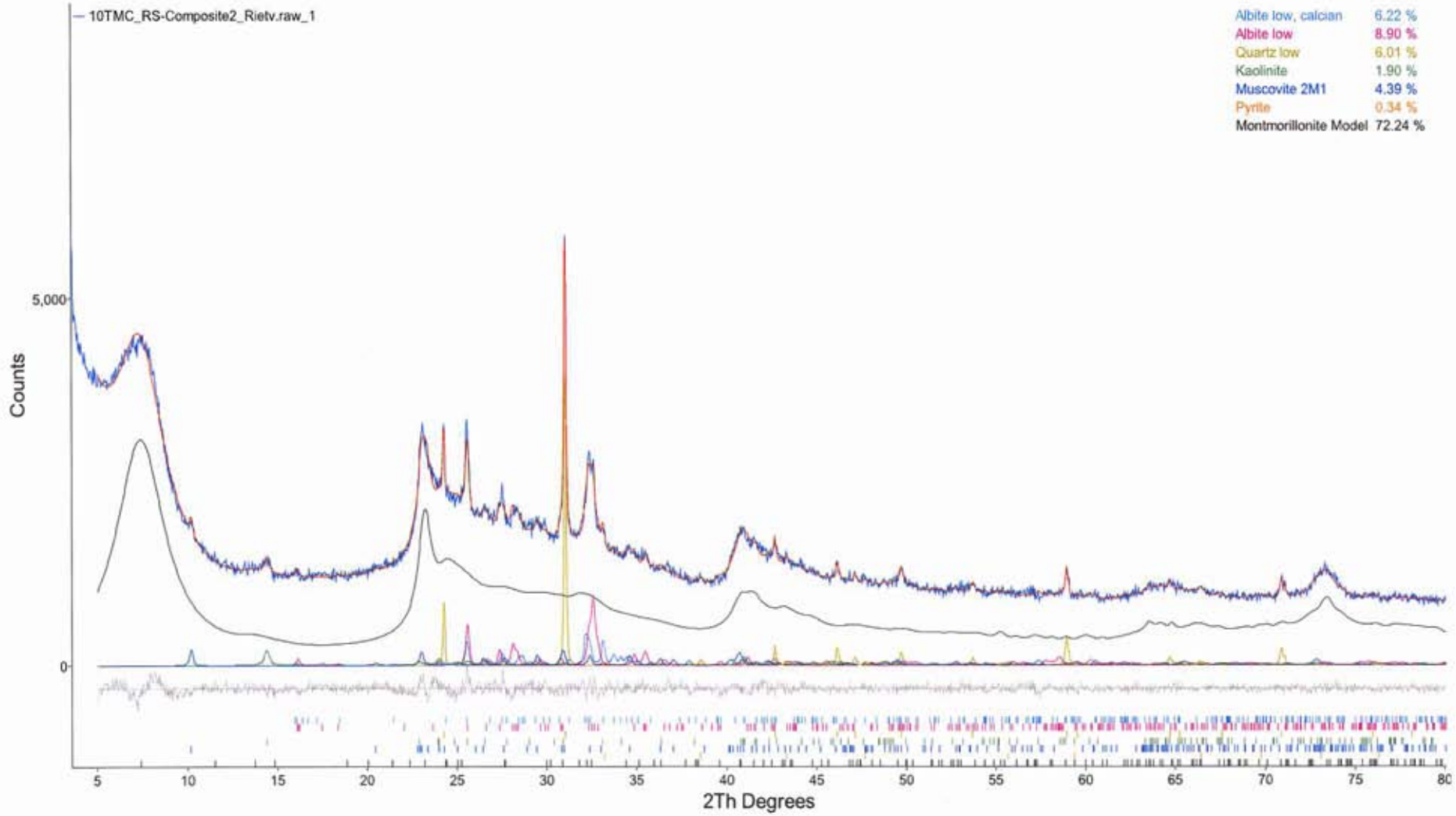

Figure 2. Rietveld refinement plot for sample **RS-Composite#2** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases. Approximate results.

Table 1. Rietveld Refinement Results (wt.%)

Phase	**Ideal Chemical Formula**	**RS#2-B**	**RS-Composite#2**
Plagioclase	$NaAlSi_3O_8 - CaAl_2Si_2O_8$	15	15
Kaolinite	$Al_2Si_2O_5(OH)_4$	3	2
Montmorillonite	$\sim(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2\square nH_2O$	76	72
Muscovite 2M1	$KAl_2(AlSi_3O_{10})(OH)_2$		4
Quartz	SiO_2	4	6
K-feldspar	$KAlSi_3O_8$	1	
Anatase ?	TiO_2	<0.5	
Pyrite ?	FeS_2		<0.5
Total		100	100

Appendix "D"

Table 2. Results of qualitative analysis

Phase	Ideal Chemical Formula	RS#2-A	RS#2-C	RS#3-B	RS#4-A	RS#5-A	RS#6-A	RS#7	RS-Composite#1
Plagioclase	$NaAlSi_3O_8$ $CaAl_2Si_2O_8$	X	X	X	X	X	X	X	X
Calcite, magnesian	$(Ca,Mg)CO_3$	X	X	X ?	X	X	X	X ?	X
Clinochlore	$(Mg,Fe^{2+})_5Al(Si_3Al)O_{10}(OH)_8$	X	X	X	X	X	X	X	
Gypsum	$CaSO_4 \cdot 2H_2O$	X	X	X	X	X	X	X	X
Hematite	α-Fe_2O_3								X
Kaolinite	$Al_2Si_2O_5(OH)_4$	X	X	X	X	X	X	X	X
Montmorillonite	$\sim(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2\square nH_2O$	X	X	X	X	X	X	X	X
Muscovite 2M1	$KAl_2(AlSi_3O_{10})(OH)_2$	X	X	X	X	X	X	X	X
K-feldspar	$KAlSi_3O_8$	X	X	X	X	X	X	X	X
Pyrite	FeS_2								X ?
Quartz low	SiO_2	X	X	X	X	X	X	X	X

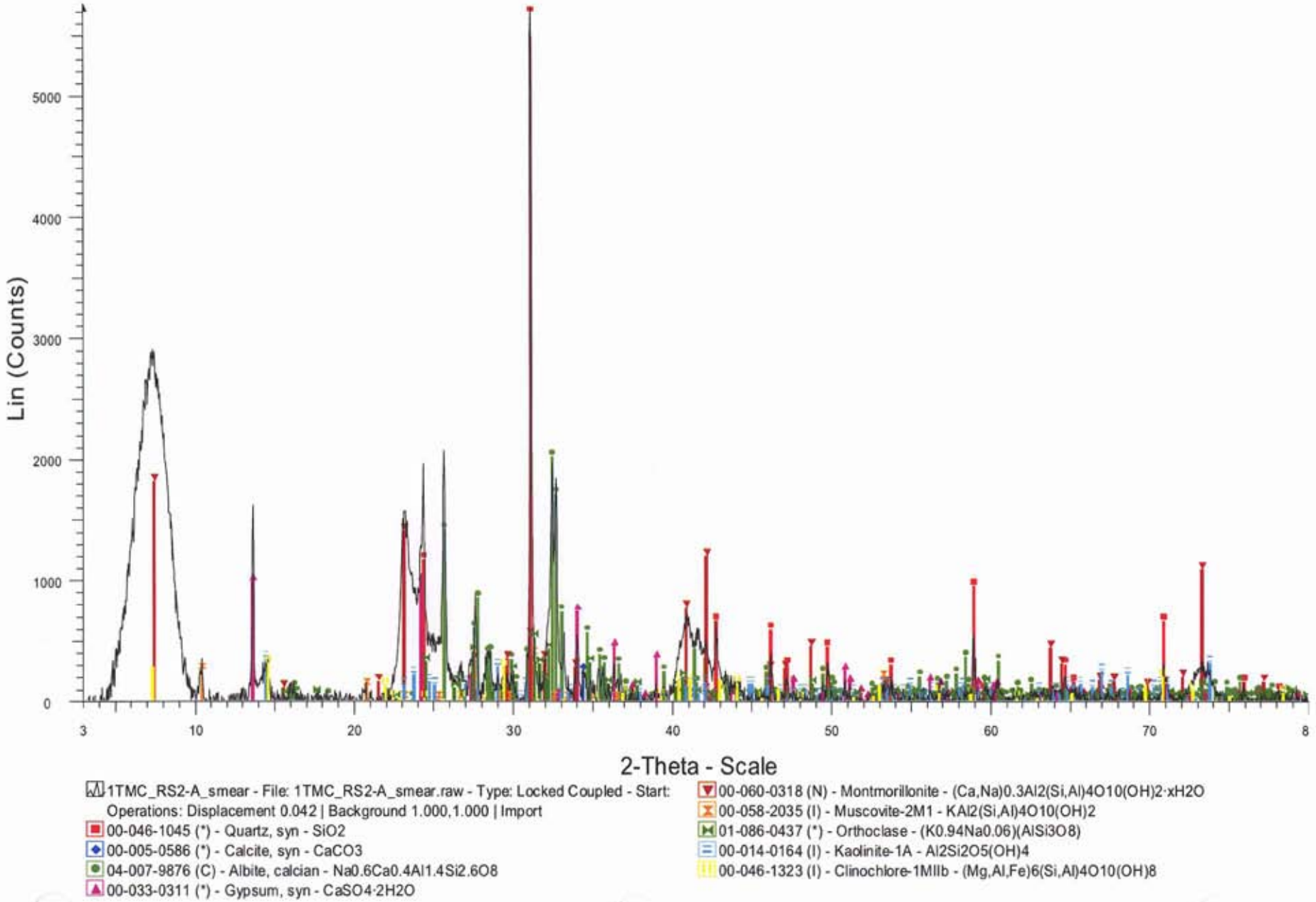

Fig. 3. X-ray diffractogram of sample **RS#2-A**. **(background su. acted)**

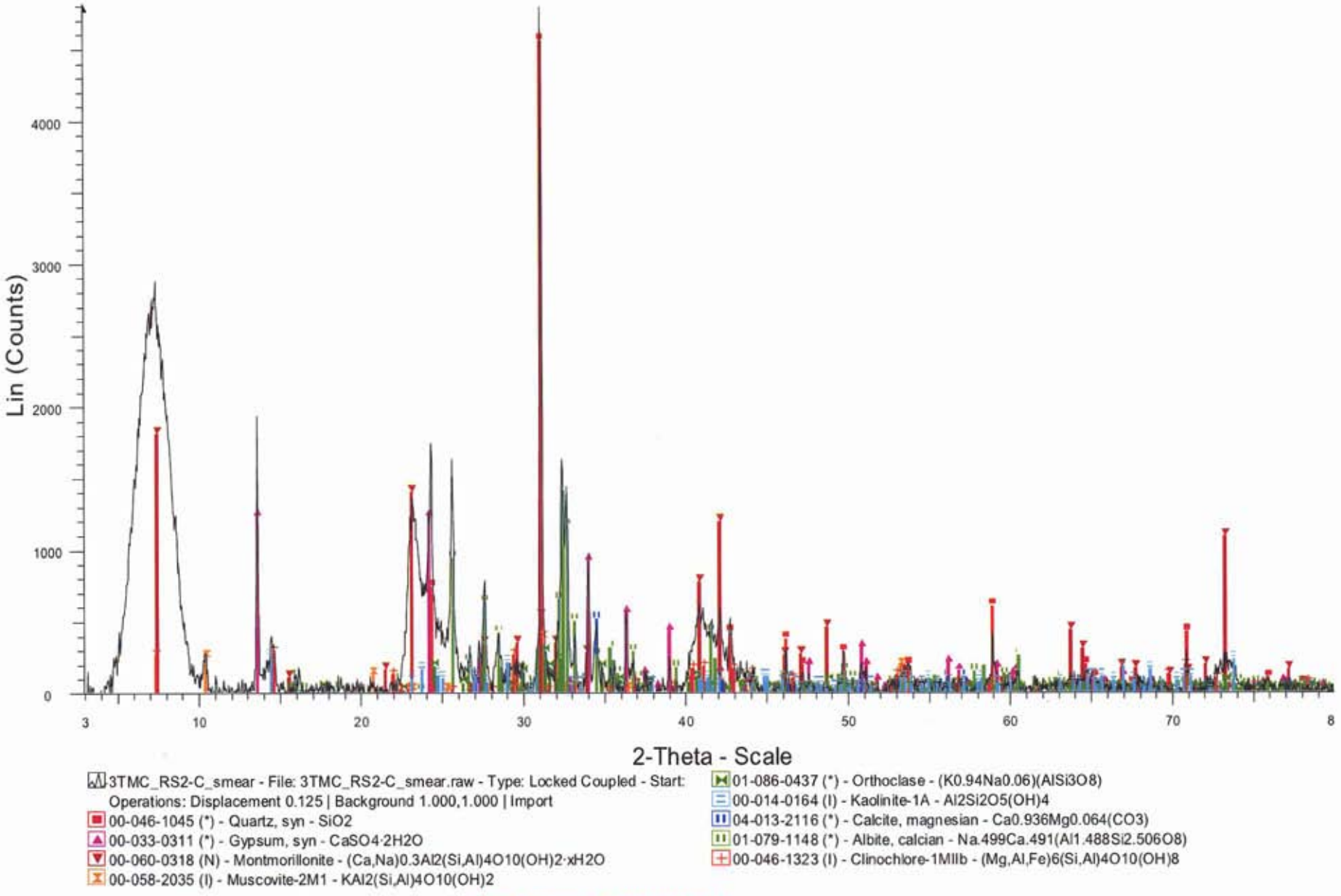

Figure 4. X-ray diffractogram of sample **RS#2-C.** **(background subtracted)**

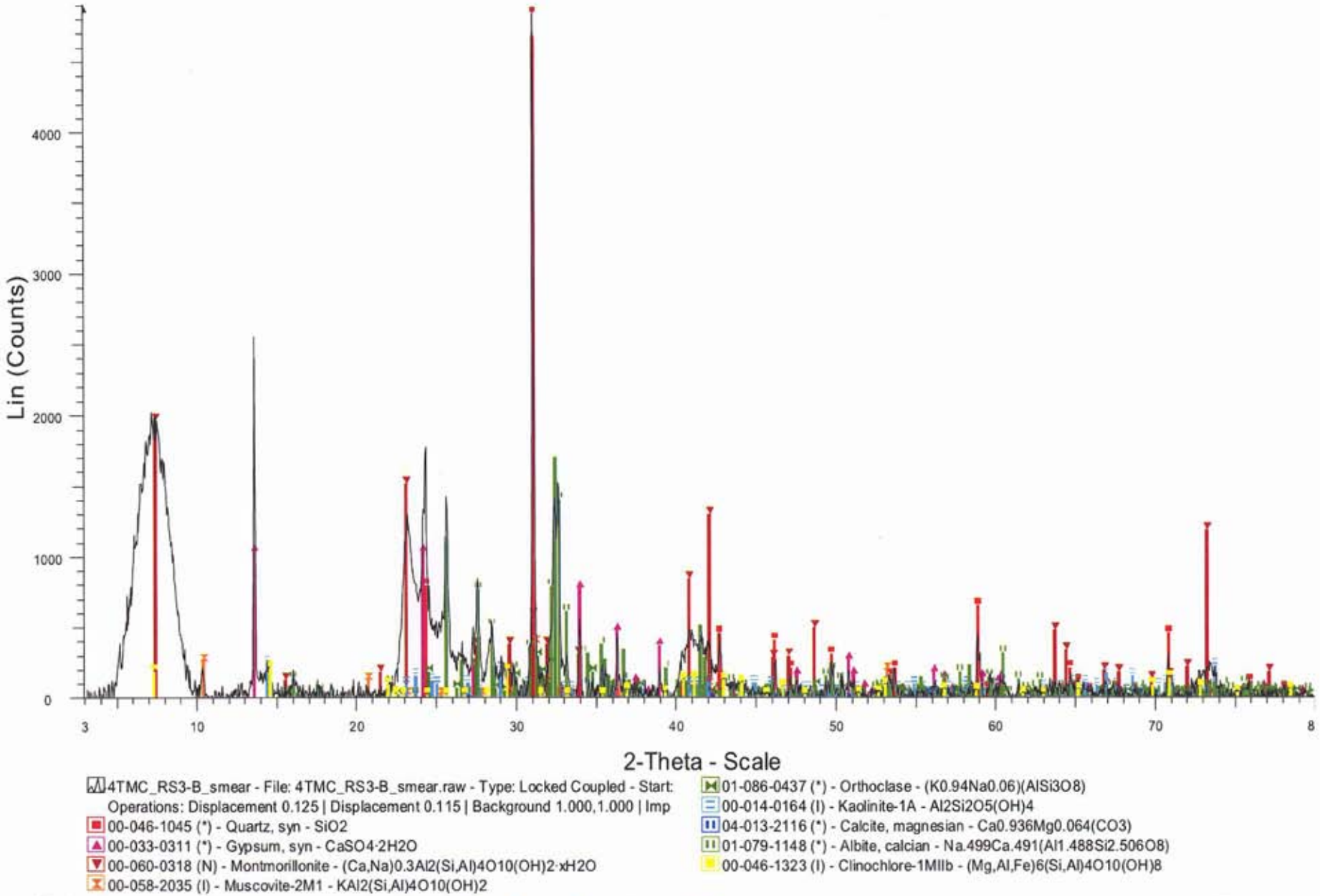

Fig. 5. X-ray diffractogram of sample **RS#3-B**. **(background su ıcted)**

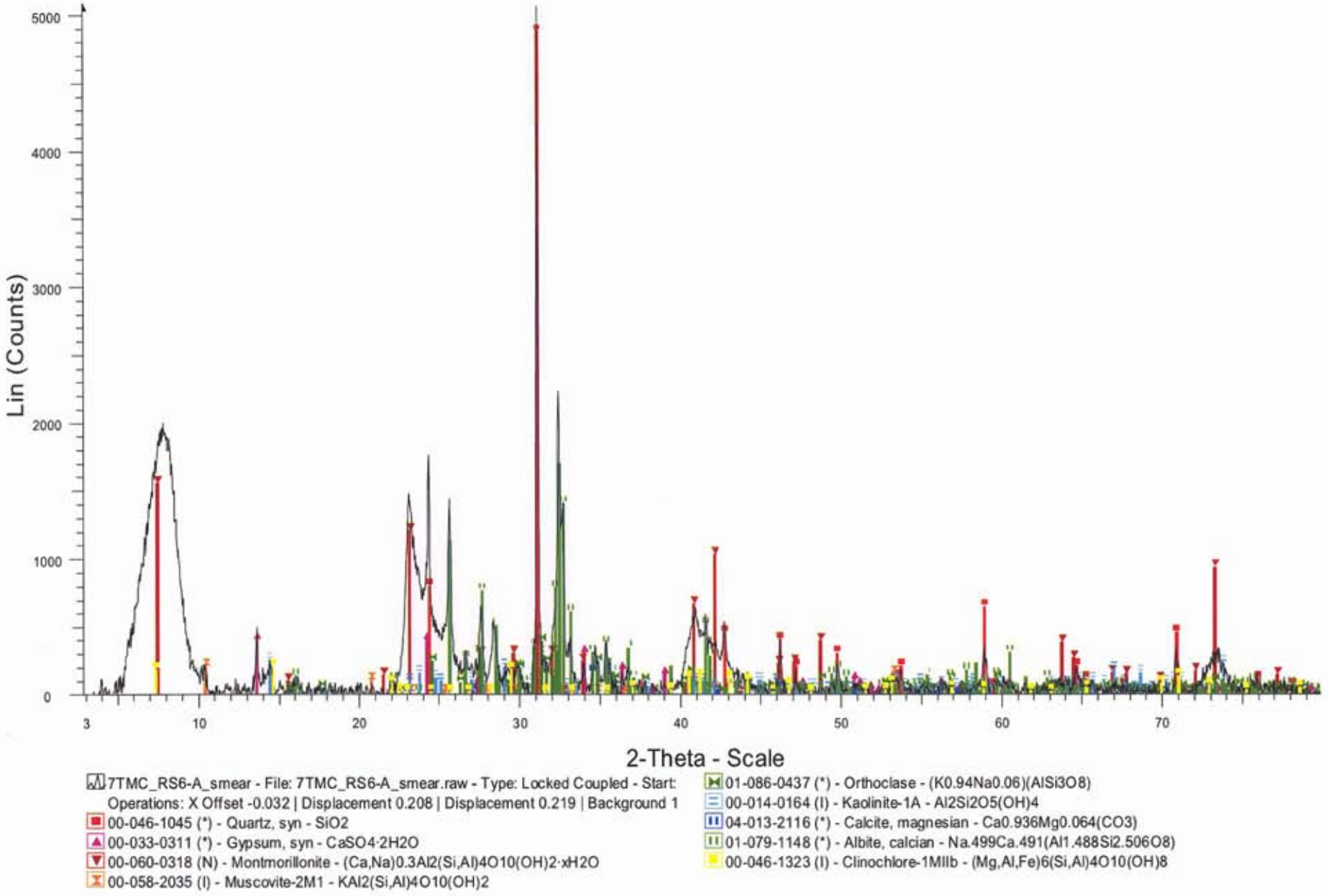

Fig 6. X-ray diffractogram of sample **RS#4-A.** **(background su ıcted)**

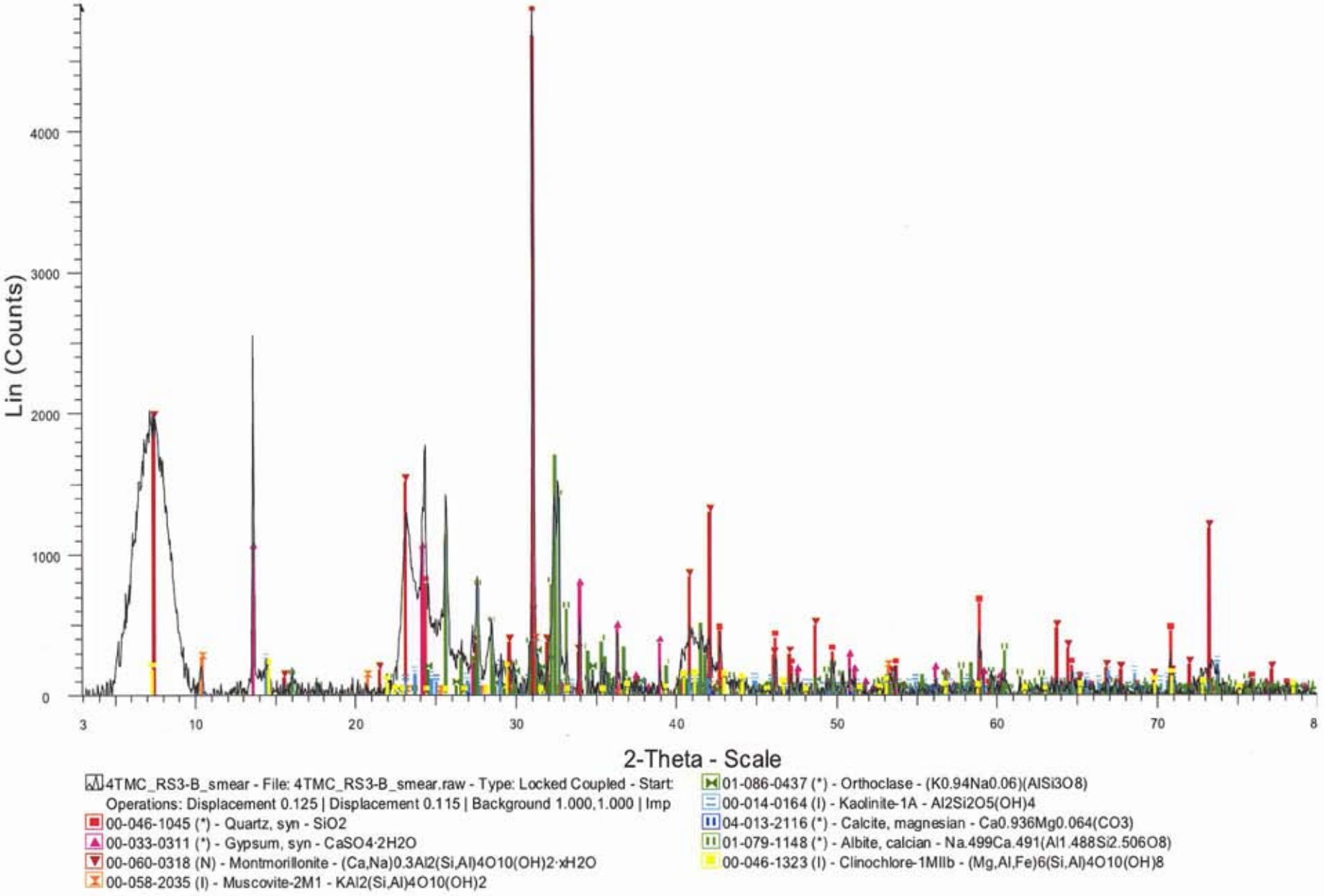

Fig 7. X-ray diffractogram of sample **RS#5-A**. **(background su ıcted)**

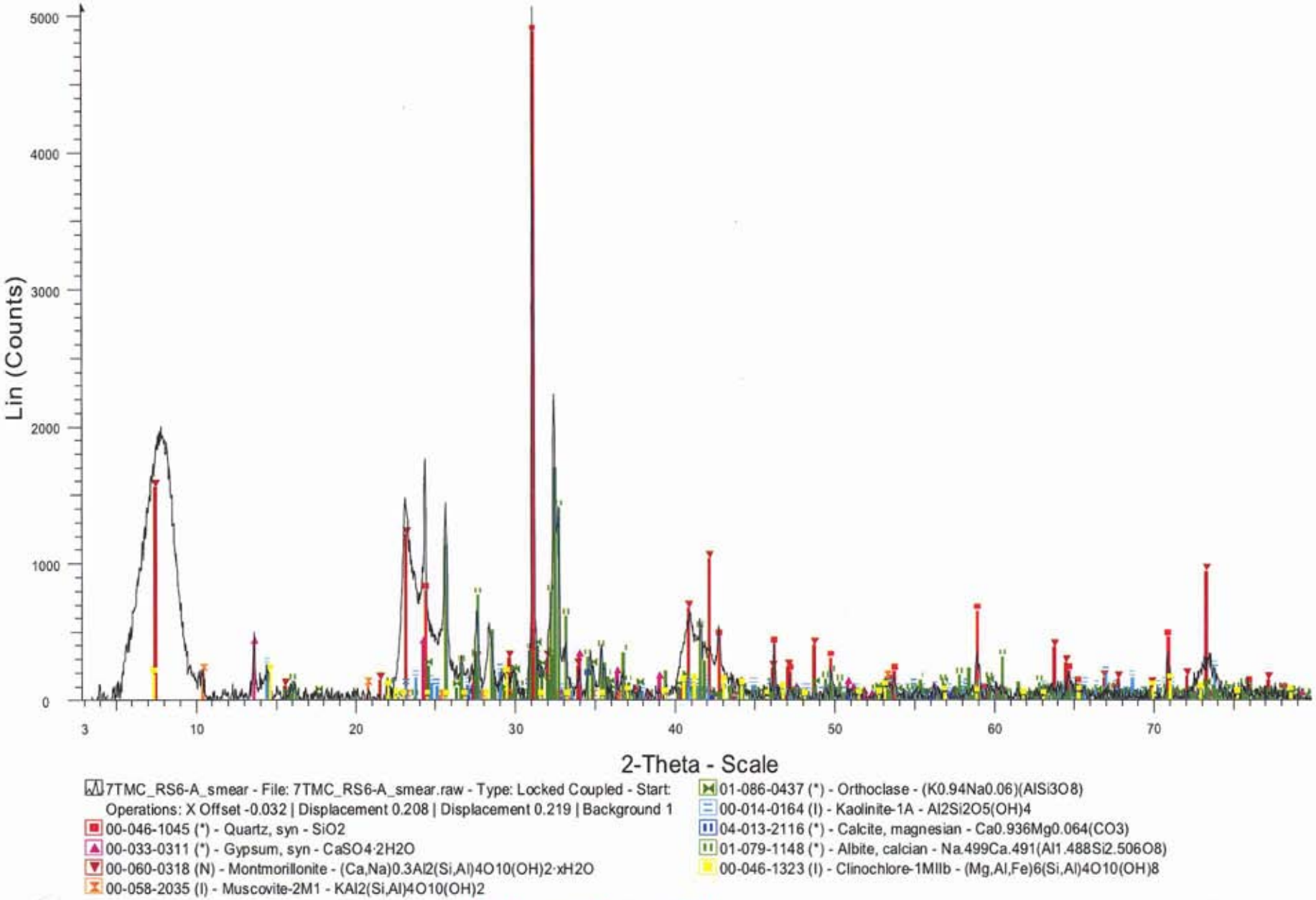

Fig 8. X-ray diffractogram of sample **RS#6-A**. **(background su acted)**

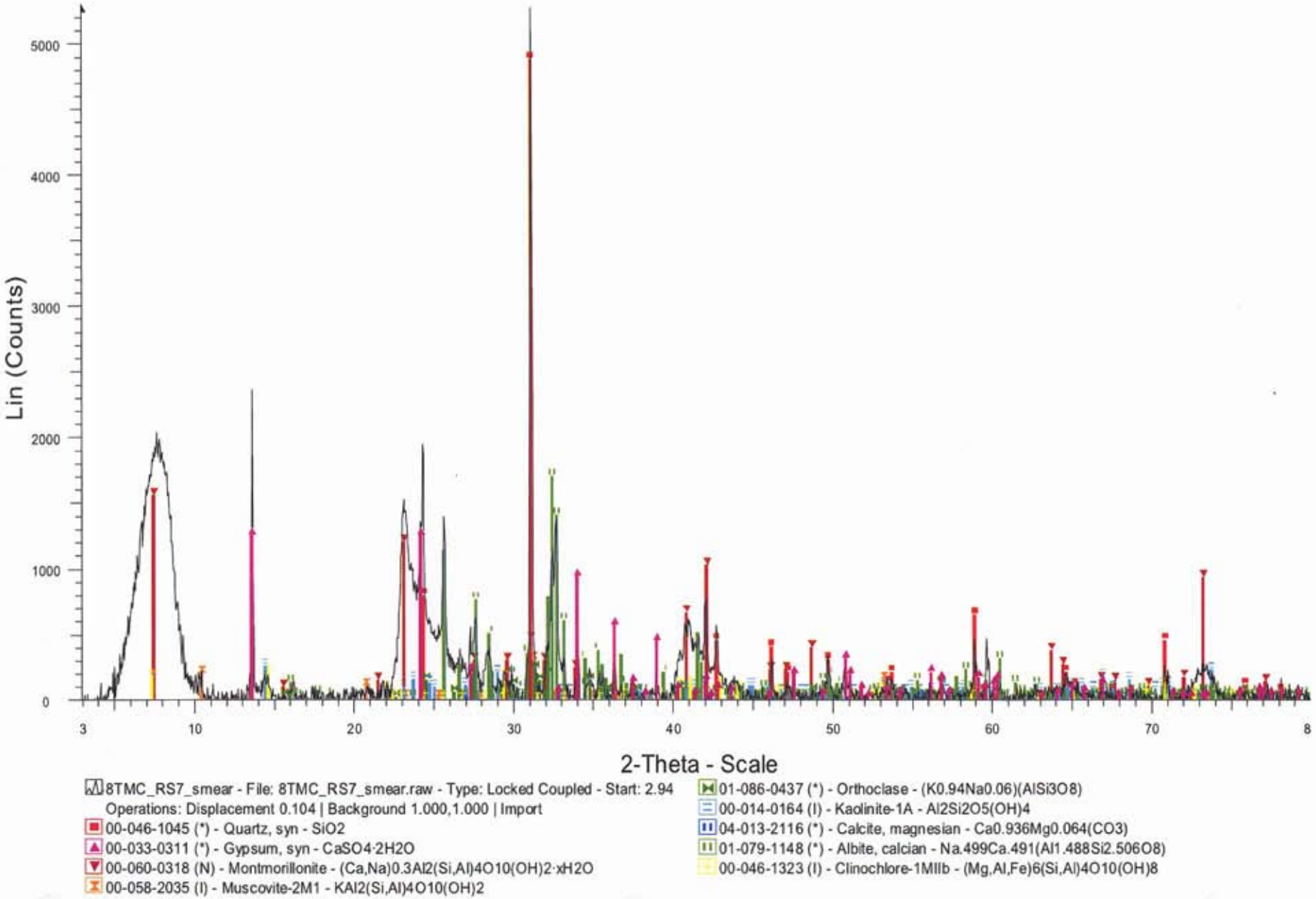

Fig. 9. X-ray diffractogram of sample **RS#7.** **(background subtracted)**

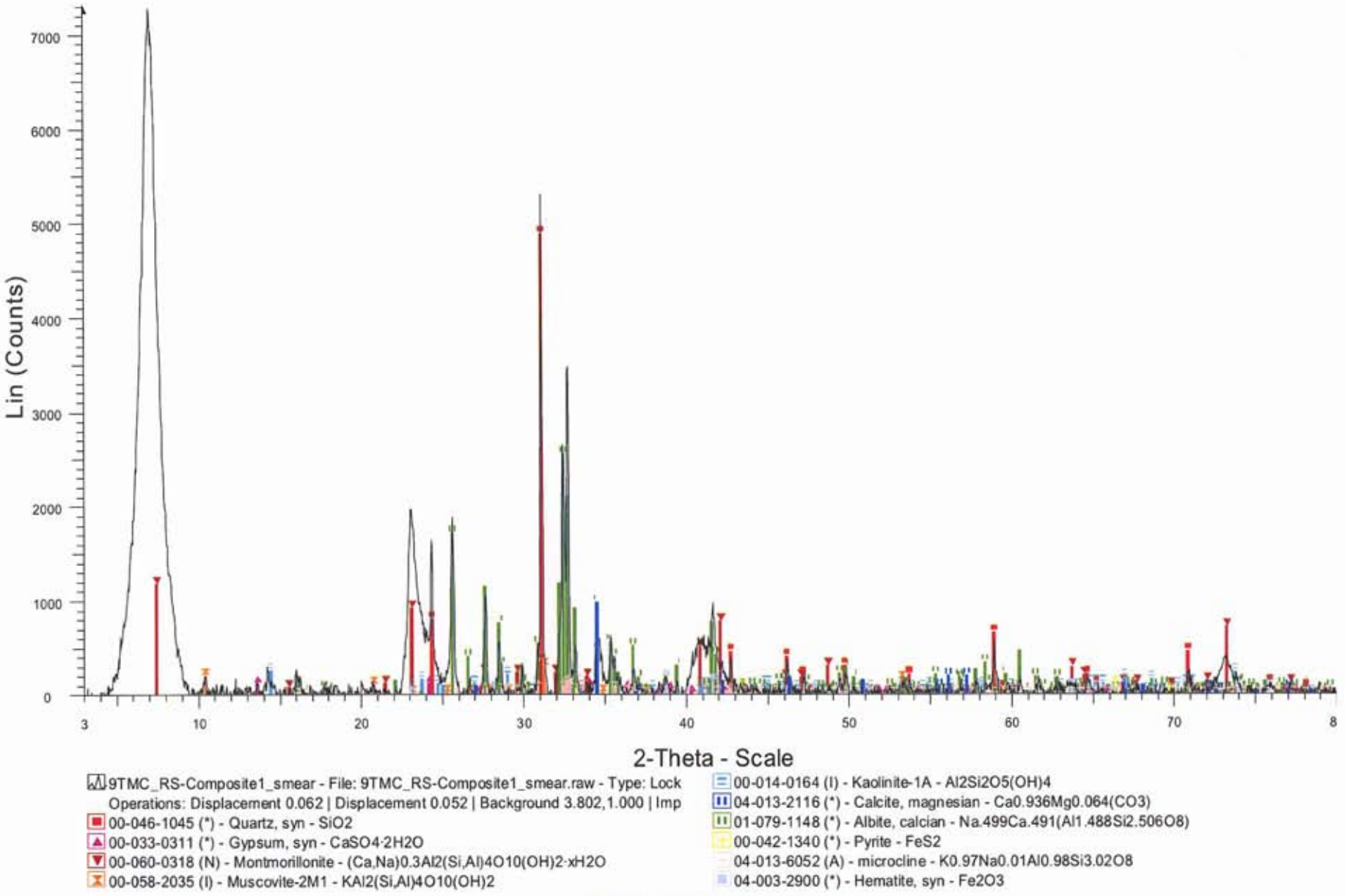

Figure 10. X-ray diffractogram of sample **RS-Composite#1.** **(background subtracted)**