**Technical Report**

**Title:** ***Mineralogical and Lithogeochemical Analyses of DGR-5 and DGR-6 Core***

**Document ID:** **TR-09-06**

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**Revision:** **0**

**Date:** **April 11, 2011**

**DGR Site Characterization Document**
**Geofirma Engineering Project 08-200**

Geofirma
Engineering Ltd

| **Geofirma Engineering DGR Site Characterization Document** | | |
|---|---|---|
| Title: | Mineralogical and Lithogeochemical Analyses of DGR-5 and DGR-6 Core | |
| Document ID: | TR-09-06 | |
| Revision Number: | 0 | Date: April 11, 2011 |
| Authors: | Richard Jackson and Samantha Murphy | |
| Technical Review | Kenneth Raven; Laura Kennell (NWMO) | |
| QA Review: | John Avis | |
| Approved by: |  Kenneth Raven | |

| **Document Revision History** | | |
|---|---|---|
| Revision | Effective Date | Description of Changes |
| 0 | April 11, 2011 | Initial release |
| | | |
| | | |
| | | |

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# 1 Introduction

Geofirma Engineering Ltd. (formally Intera Engineering Ltd.) has been contracted by the Nuclear Waste Management Organization (NWMO) on behalf of Ontario Power Generation to implement the Geoscientific Site Characterization Plan (GSCP) for the Bruce nuclear site located near Tiverton, Ontario. The purpose of this site characterization work is to assess the suitability of the Paleozoic rocks beneath the Bruce nuclear site for the construction of a Deep Geologic Repository (DGR) to store low-level and intermediate-level radioactive waste. The GSCP is described by Intera Engineering Ltd. (2006, 2008).

As part of Phase 2B of the GSCP, Intera retained SGS Lakefield Research Ltd. (SGS) of Lakefield, Ontario to complete mineralogical and lithogeochemical testing of cores collected from boreholes DGR-5 and DGR-6. This report summarizes the results of those analyses of the core samples, quantifying the minerals present in the cores by X-ray diffraction (XRD) and by identifying the morphology and geochemical properties of most of these mineral specimens by Scanning Electron Microscopy (SEM) coupled with an X-ray spectrometer. SEM and X-ray spectrometry provides results equivalent to that from Electron Microprobe Analysis (EMPA), which is used to determine elemental compositions of the core specimen on the basis of the emitted x-ray spectra.

Work described in this Technical Report (TR) was completed in accordance with Test Plan TP-09-10 – Laboratory Testing of DGR-5 and DGR-6 Solid Core for Geochemistry and Mineralogy (Intera Engineering Ltd., 2009a), which was prepared following the general requirements of the DGR Project Quality Plan (Intera Engineering Ltd., 2009b).

# 2 Background

Core samples of 76 and 83 mm diameter were collected during diamond coring of boreholes DGR-5 and DGR-6, respectively, at the Bruce nuclear site from September 2009 until February 2010. Core samples were collected, preserved and handled as per the general preservation and handling requirements of TP-09-02 (Intera Engineering Ltd., 2010a). All core samples were vacuum sealed within nitrogen-flushed polyethylene and aluminum foil/polyethylene bags following core retrieval. Eighteen preserved core samples from boreholes DGR-5 (10) and DGR-6 (8) were shipped to SGS Lakefield, Ontario under chain of custody procedures (following procedure DGR P4).

At SGS a section of each of the 18 core samples was cut and sent to Dr. Eva Schandl, of GeoConsult, Toronto, Ontario, for petrographic analysis using optical microscopy and electron microprobe analysis, the results of which are presented in TR-09-05 (Intera Engineering Ltd., 2010b). SGS completed whole rock analysis (oxides), Loss-On-Ignition (LOI), total carbon (C-total), total organic carbon (C-organic)) and XRD analysis on all 18 samples to determine minerals and concentrations. SGS analysed the core samples for 54 trace elements by SEM, EMPA and ICP-MS/OES as well as total chloride (Cl-total), $CO_2$, and total sulphur (S-total). Clay mineralogy by XRD on shale samples from DGR-3 and DGR-4 was undertaken at Core Labs in Houston, Texas as part of an organic geochemical analysis program as reported in TR-08-29 (Intera Engineering Ltd., 2009c).

The objectives of this study were:

1. to estimate, where possible, the percentage of major minerals present by XRD;

2. to measure the elemental composition of the specimens by ICP-MS;

3. to identify soluble minerals, such as halite, gypsum, anhydrite and celestite, by SEM/EMPA; and

4. to image the morphology of the grains and pores present in the cores by SEM.

Tables 1 and 2 list samples collected from DGR-5 and DGR-6, respectively, for analysis at SGS. Because these were inclined boreholes, the Intera sample identifier is based on depth in metres length below ground surface (mLBGS). The analyses performed are described below in Section 3.

**Table 1 Depths, Formations, Descriptions and Analyses of DGR-5 Core Samples**

| *Intera Sample ID* | *Formation* | *Sample Description* | *Analyses* |
|---|---|---|---|
| DGR5-583.40 | Georgian Bay | Grey calcareous siltstone and shale | XRD; SEM/EMPA; Geochem |
| DGR5-605.55 | Georgian Bay | Green-grey calcareous shale with halite vein | XRD; SEM/EMPA; Geochem |
| DGR5-645.16 | Georgian Bay | Grey calcareous shale | XRD; SEM/EMPA; Geochem |
| DGR5-677.25 | Blue Mountain | Grey shale | XRD; SEM/EMPA; Geochem |
| DGR5-692.35 | Blue Mountain | Dark grey shale | XRD; SEM/EMPA; Geochem |
| DGR5-699.49 | Blue Mountain | Dark grey shale | XRD; SEM/EMPA; Geochem |
| DGR5-704.99 | Cobourg - Collingwood Member | Brown-grey fossiliferous limestone | XRD; SEM/EMPA; Geochem |
| DGR5-715.40 | Cobourg – Lower Member | Grey fossiliferous, argillaceous limestone | XRD; SEM/EMPA; Geochem |
| DGR5-725.33 | Cobourg – Lower Member | Grey fossiliferous, argillaceous limestone | XRD; SEM/EMPA; Geochem |
| DGR5-764.72 | Sherman Fall | Grey argillaceous limestone with shale | XRD; SEM/EMPA; Geochem |

# 3 Methods

## 3.1 Sample Preparation

A polished section was prepared (dry preparation) from a slice cut from of each of the 18 core samples selected for SEM/EMPA analysis. Representative sub-samples were split after grinding a homogeneous cut slice to a powder for XRD and chemical analysis from all core samples.

## 3.2 Geochemical Analysis

The cores underwent a lithogeochemical analysis that included measurement of 12 oxides (Whole Rock Analysis), loss-on-ignition (LOI), total Cl, total S, $CO_2$-total, C-total, C-organic and elemental geochemistry (54 elements). These analyses are identified in Tables 1 and 2 as “Geochem”.

The core samples were prepared by fusion and then the oxides were analysed by wavelength dispersive X-ray fluorescence spectrometry. Major cations and several minor elements – Al, Ba, Be, Ca, Cu, Fe, K, Li, Mg, Mn, P, Sr, Ti, V and Zn – were analysed by ICP-Optical Emission Spectrometry. Trace elements were analysed by ICP-MS. U, Th, Rb and Gd were measured to determine background radioactivity. These were analysed using a strong acid digestion that was followed by measurement using ICP-MS. The precision of ICP measurements varies with the method detection limit (MDL): at the MDL, the precision is ± 100%; at 10x MDL, it is ± 15-20%; and at 100x MDL, it is ± 5%.

**Table 2 Depths, Formations, Descriptions and Analyses of DGR-6 Core Samples**

| *Intera Sample ID* | *Formation* | *Sample Description* | *Analyses* |
|---|---|---|---|
| DGR6-654.58 | Georgian Bay | Grey calcareous shale and minor siltstone | XRD; SEM/EMPA; Geochem |
| DGR6-664.31 | Georgian Bay | Dark grey shale | XRD; SEM/EMPA; Geochem |
| DGR6-697.67 | Blue Mountain | Dark green-grey shale | XRD; SEM/EMPA; Geochem |
| DGR6-717.97 | Blue Mountain | Dark green-grey shale | XRD; SEM/EMPA; Geochem |
| DGR6-735.40 | Blue Mountain | Dark grey shale | XRD; SEM/EMPA; Geochem |
| DGR6-750.80 | Cobourg – Lower Member | Grey fossiliferous, argillaceous limestone | XRD; SEM/EMPA; Geochem |
| DGR6-761.76 | Cobourg – Lower Member | Grey fossiliferous, argillaceous limestone | XRD; SEM/EMPA; Geochem |
| DGR6-768.58 | Cobourg – Lower Member | Grey fossiliferous, argillaceous limestone | XRD; SEM/EMPA; Geochem |

Combustion with infrared analysis was used to analyse carbon and sulphur directly using an Horiba C,S analyzer with an inductive furnace heated to 1500°C. Organic carbon was then determined indirectly on samples after combustion of the organic material in an oven at 550°C. Wet chemical analysis followed by ion chromatography was used for total chloride, and coulometry was used for carbon dioxide. Loss-on-ignition was determined gravimetrically at 1000°C and is included in the matrix-correction calculations, which are performed by the XRF instrument software.

## 3.3 X-ray Powder Diffraction Analysis

A sub-sample was prepared after selecting a homogeneous part of the core and then grinding a cut slice for XRD from each of the 18 core samples. The slice was pulverized and a pressed mount of the powder was prepared. X-ray diffraction was by a Bruker AXS D8 diffractometer. Manual and computer-assisted search/match identification of minerals used JCPDS-International Centre for Diffraction Data files. The instrument was calibrated using a quartz standard; however the results must be considered semi-quantitative with a detection limit of 0.5-2% for any particular mineral but this is very strongly dependent on its crystallinity.

The precise identification of clay minerals via XRD is difficult due to their extremely fine-grained nature and because the clay minerals illite, montmorillonite (smectites) and vermiculite are structurally related to micas and thus have similar properties (see SGS Report, Testwork Summary, Section 2, in Appendix A). Reliable identification can only be achieved by a combination of geochemical, XRD and differential thermal analyses; only the first two were undertaken thus identification is somewhat constrained. Therefore, where mica alone is reported in SGS summary of analytical results, one or more of muscovite, hydromuscovite, glauconite, illite or biotite may be present. As such, all clay minerals identified by SGS during XRD analysis, these being, mica, muscovite, clinochlore (chlorite), glauconite and palygorskite are grouped together and reported as “sheet silicates” for the purposes of this report. Also, the dioctahedral clay micas including illite, muscovite, hydromuscovite and glauconite are indistinguishable in most conventional XRD analyses and for convenience, if detected within the shale-rich rocks, should likely be considered as illite, the clay mineral predominately reported for these rocks. The detailed reporting of individual clay mineral contents by SGS is provided in Appendix A and B of this technical Report. A detailed examination of clay mineralogy was also conducted by Core Labs in Houston, Texas as part of an organic geochemical analysis program (TR-08-29, Intera Engineering Ltd., 2009c).

### 3.4 SEM/EMPA

A polished section was prepared (dry preparation) for each of the select 18 core samples and was systematically scanned under an SEM with energy dispersive spectra (EDS) for analysis of soluble minerals, e.g., halite, gypsum, anhydrite and celestite, and of grain and pore morphology. Grains were mounted on an adhesive carbon disc on a glass slide and inserted into the SEM, a Tescan Vega II SEM with Oxford Inca EDS/WDS system. The system is not a stand-alone electron microprobe, but rather an SEM with a fitted X-ray spectrometer, which provides the same capability as separate EMPA and SEM instruments (Reed, 2005). The technique employed is hereafter referred to in this report as SEM/EMPA.

## 4 Results

### 4.1 Geochemical Analysis

Tables 3 and 4 present the whole rock analyses of DGR-5 and DGR-6 core samples, respectively. These present the oxides measured by the Whole Rock Analysis, Loss-On-Ignition (LOI), total carbon (C-total) and total organic carbon (C-organic) analyses in weight percent (%). Tables 5 and 6 present the elemental geochemistry in parts per million (ppm) along with total chloride (Cl), $CO_2$ and sulphur (S-total) in weight %. The complete SGS reports, including the laboratory certificates for geochemical analyses, for both boreholes are contained in Appendices A (DGR-5) and B (DGR-6).

### 4.2 Mineralogy by XRD

Tables 7 and 8 present the qualitative mineral identification results for DGR-5 and DGR-6 core samples, respectively, and Tables 9 and 10 present the semi-quantitative mineral identification results for the same samples. Both are reported in weight percent (wt %). Appendices A (DGR-5) and B (DGR-6) contain SGS summary of qualitative and semi-quantitative X-ray diffraction results as well as the diffractograms.

With respect to DGR-5, three samples from each of the Georgian Bay Formation shale and the Blue Mountain Formation shale, three from the Cobourg Formation (including one from the upper Collingwood Member) and one from the Sherman Fall Formation were tested by XRD. The Georgian Bay Formation samples (DGR5-583.40; DGR5-605.55; DGR5-645.16) indicate silicate rocks composed of quartz, sheet silicates and K-feldspar with minor carbonate minerals (calcite and ankerite). Core Labs (TR-08-29, Intera Engineering Ltd., 2009c) identified the sheet silicates as being illite and mica in their analysis of shale samples from DGR-3 and DGR-4. The amount of halite decreased with depth in these three samples from 2.2 (DGR5-583.40) to 0.5 wt %. The Blue Mountain Formation, represented by DGR5-677.25, DGR5-692.35 and DGR5-699.49, contained quartz, sheet silicates, and potassium feldspar in the largest amounts, while pyrite and halite were detectable in trace quantities. The Middle Ordovician limestone samples were predominantly calcite (80-90%) with the remainder being silicates such as quartz, mica, K-feldspar and chlorite.

With respect to DGR-6, the shales and limestone samples were more homogeneous as rock types than the DGR-5 samples. Both Georgian Bay and Blue Mountain shales were predominantly composed of sheet silicates and quartz that together comprise 70 wt%. Minor amounts of K-feldspar, plagioclase and carbonates minerals comprise most of the balance. The only soluble mineral detected was halite at 0.2 – 1.0 wt %. Pyrite was typically 2-3 wt %. The three Cobourg Formation samples (DGR6-750.80, 761.76, 768.58) contained 75 – 80 wt % calcite with the balance comprised of ankerite, dolomite, quartz, sheet silicates and K-feldspar.

**Table 3 DGR-5 Whole Rock Analysis**

| ***Sample Number*** | ***DGR5-583.40*** | ***DGR5-605.55*** | ***DGR5-645.16*** | ***DGR5-677.25*** | ***DGR5-692.35*** | ***DGR5-699.49*** | ***DGR5-704.99*** | ***DGR5-715.40*** | ***DGR5-725.33*** | ***DGR5-764.72*** |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Oxides (%)*** | | | | | | | | | | |
| $SiO_2$ | 60.5 | 54.1 | 57.0 | 56.4 | 53.2 | 55.4 | 4.15 | 9.83 | 6.56 | 6.08 |
| $Al_2O_3$ | 6.69 | 17.0 | 16.6 | 15.5 | 16.1 | 16.6 | 1.16 | 2.72 | 1.70 | 1.78 |
| $Fe_2O_3$ | 3.31 | 6.79 | 6.47 | 6.56 | 6.64 | 6.47 | 0.55 | 0.95 | 0.64 | 0.76 |
| MgO | 3.15 | 3.55 | 3.23 | 3.11 | 2.92 | 2.96 | 0.75 | 2.30 | 1.43 | 1.12 |
| CaO | 8.65 | 1.93 | 1.25 | 2.69 | 4.09 | 2.09 | 51.6 | 44.8 | 48.8 | 49.3 |
| $Na_2O$ | 1.14 | 0.58 | 0.63 | 0.94 | 0.50 | 0.52 | 0.08 | 0.10 | 0.08 | 0.09 |
| $K_2O$ | 3.29 | 5.31 | 4.94 | 4.44 | 4.66 | 4.86 | 0.42 | 1.11 | 0.72 | 0.73 |
| $TiO_2$ | 0.41 | 0.88 | 0.91 | 0.85 | 0.85 | 0.91 | 0.06 | 0.13 | 0.07 | 0.06 |
| $P_20_5$ | 0.13 | 0.20 | 0.23 | 0.14 | 0.33 | 0.31 | 0.18 | 0.07 | 0.05 | 0.04 |
| MnO | 0.10 | 0.06 | 0.04 | 0.05 | 0.05 | 0.04 | < 0.01 | 0.03 | 0.02 | < 0.01 |
| $Cr_2O_3$ | 0.01 | 0.02 | 0.01 | 0.01 | < 0.01 | 0.02 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| $V_2O_5$ | 0.01 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| ***Other Parameters (%)*** | | | | | | | | | | |
| Loss on Ignition | 12.4 | 8.71 | 7.78 | 8.69 | 9.76 | 8.33 | 40.3 | 37.3 | 39.3 | 39.1 |

**Table 4 DGR-6 Whole Rock Analysis**

| ***Sample Number*** | ***DGR6-654.58*** | ***DGR6-664.31*** | ***DGR6-697.67*** | ***DGR6-717.97*** | ***DGR6-735.40*** | ***DGR6-750.80*** | ***DGR6-761.76*** | ***DGR6-768.58*** |
|---|---|---|---|---|---|---|---|---|
| ***Oxides (%)*** | | | | | | | | |
| $SiO_2$ | 52.9 | 53.4 | 55.9 | 55.5 | 53.3 | 6.03 | 9.21 | 7.79 |
| $Al_2O_3$ | 16.0 | 15.6 | 15.8 | 16.2 | 15.9 | 1.48 | 2.62 | 1.97 |
| $Fe_2O_3$ | 6.78 | 6.88 | 6.45 | 6.99 | 6.78 | 0.83 | 0.89 | 0.77 |
| MgO | 3.68 | 3.44 | 3.09 | 3.06 | 3.30 | 2.47 | 1.91 | 1.73 |
| CaO | 3.34 | 3.45 | 2.19 | 2.47 | 4.34 | 47.9 | 45.1 | 47.2 |
| $Na_2O$ | 0.42 | 0.50 | 0.88 | 0.49 | 0.43 | 0.06 | 0.08 | 0.08 |
| $K_2O$ | 4.93 | 4.72 | 4.70 | 4.77 | 4.74 | 0.61 | 1.06 | 0.86 |
| $TiO_2$ | 0.86 | 0.84 | 0.89 | 0.92 | 0.86 | 0.07 | 0.13 | 0.10 |
| $P_20_5$ | 0.21 | 0.28 | 0.16 | 0.21 | 0.36 | 0.06 | 0.08 | 0.05 |
| MnO | 0.10 | 0.10 | 0.07 | 0.08 | 0.08 | 0.06 | 0.03 | 0.03 |
| $Cr_2O_3$ | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | < 0.01 | < 0.01 | < 0.01 |
| $V_2O_5$ | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | < 0.01 | < 0.01 | < 0.01 |
| ***Other Parameters (%)*** | | | | | | | | |
| Loss on Ignition | 9.43 | 9.10 | 8.49 | 8.51 | 9.80 | 40.3 | 38.0 | 39.0 |

**Table 5 DGR-5 Elemental Geochemistry**

| ***Sample Number*** | ***DGR5-583.40*** | ***DGR5-605.55*** | ***DGR5-645.16*** | ***DGR5-677.25*** | ***DGR5-692.35*** | ***DGR5-699.49*** | ***DGR5-704.99*** | ***DGR5-715.40*** | ***DGR5-725.33*** | ***DGR5-764.72*** |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Other Parameters (%)*** | | | | | | | | | | |
| Cl | 1.37 | 0.9 | 0.69 | 0.93 | 0.52 | 0.4 | 0.03 | 0.1 | 0.07 | 0.07 |
| C-total | 2.62 | 0.512 | 0.519 | 0.922 | 1.61 | 1.72 | 10.9 | 9.95 | 10.4 | 10.4 |
| C-organic | 0.123 | 0.111 | 0.28 | 0.335 | 0.812 | 1.38 | 1.98 | 0.502 | 0.142 | 0.308 |
| $CO_2$ | 9.46 | 1.51 | 0.97 | 2.39 | 3.21 | 1.62 | 39.5 | 35.9 | 37.9 | 38 |
| S-total | 0.056 | 0.111 | 0.6 | 0.768 | 1.04 | 0.998 | 0.192 | 0.122 | 0.127 | 0.207 |
| ***Elemental Geochemistry (ppm)*** | | | | | | | | | | |
| Ag | 0.22 | < 0.01 | 0.03 | 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Al | 33000 | 12000 | 86000 | 80000 | 81000 | 85000 | 5800 | 14000 | 8400 | 9100 |
| As | 3 | 5.9 | 5.1 | 4.6 | 5 | 4.5 | 1.8 | 1.4 | 1.8 | 1 |
| Ba | 220 | 400 | 340 | 320 | 570 | 340 | 27 | 63 | 37 | 32 |
| Be | 0.4 | 2.3 | 2 | 1.8 | 2 | 2.1 | 0.2 | 0.3 | 0.2 | 0.2 |
| Bi | < 0.09 | 0.1 | 0.23 | 0.15 | 0.18 | 0.23 | < 0.09 | < 0.09 | < 0.09 | < 0.09 |
| Ca | 55000 | 12000 | 8100 | 18000 | 26000 | 13000 | 300000 | 280000 | 290000 | 290000 |
| Cd | 0.42 | 0.16 | 0.13 | 0.11 | 0.1 | 0.09 | < 0.02 | 0.02 | < 0.02 | < 0.02 |
| Ce | 49 | 33 | 93 | 87 | 92 | 87 | 15 | 20 | 18 | 17 |
| Co | 7.3 | 17 | 17 | 14 | 16 | 16 | 2.8 | 2 | 1.9 | 3.5 |
| Cr | 82 | 78 | 74 | 80 | 71 | 73 | 10 | 19 | 11 | 12 |
| Cu | 27 | 50 | 45 | 130 | 32 | 36 | 1.8 | 4.2 | 0.7 | 9.2 |
| Cs | 1.7 | 9.3 | 11 | 9 | 9.4 | 9.9 | 2.5 | 1.8 | 1.5 | 1.4 |
| Dy | 4.8 | 2.5 | 4.9 | 4.7 | 5.3 | 4.5 | 1.1 | 1 | 0.87 | 0.61 |
| Er | 2.2 | 1.6 | 2.8 | 2.7 | 3 | 2.7 | 0.57 | 0.57 | 0.46 | 0.31 |
| Eu | 1.4 | 0.6 | 1.3 | 1.2 | 1.5 | 1.2 | 0.26 | 0.28 | 0.24 | 0.2 |
| Fe | 22000 | 44000 | 43000 | 43000 | 43000 | 42000 | 4000 | 6600 | 4400 | 5300 |
| Ga | 7.6 | 25 | 24 | 22 | 23 | 24 | 1.6 | 3.6 | 2.2 | 2.4 |
| Gd | 5.8 | 2.4 | 6 | 5.4 | 6.5 | 5.3 | 1.3 | 1.3 | 1.1 | 0.86 |
| Ge | 1.1 | 1.3 | 1.8 | 1.8 | 2 | 1.9 | 0.3 | 0.4 | 0.4 | 0.4 |
| Hf | 3.2 | 3.5 | 4.2 | 3.9 | 3.5 | 3.6 | 0.7 | 0.9 | 0.7 | 0.5 |
| Ho | 1 | 0.62 | 1.1 | 1.1 | 1.2 | 1.1 | 0.25 | 0.23 | 0.2 | 0.13 |
| In | 0.09 | 0.09 | 0.07 | 0.08 | 0.08 | 0.08 | < 0.01 | 0.01 | 0.01 | < 0.01 |
| K | 29000 | 35000 | 44000 | 39000 | 40000 | 42000 | 4200 | 11000 | 7000 | 7300 |
| La | 20 | 13 | 46 | 44 | 46 | 46 | 7.9 | 11 | 9.4 | 7.8 |
| Li | 20 | 40 | 43 | 42 | 40 | 42 | 1.9 | 4.3 | 2.8 | 2.4 |
| Lu | 0.32 | 0.28 | 0.48 | 0.47 | 0.49 | 0.49 | 0.08 | 0.088 | 0.072 | 0.048 |
| Mg | 18000 | 7900 | 19000 | 18000 | 17000 | 17000 | 4900 | 14000 | 8700 | 7100 |
| Mn | 880 | 590 | 450 | 480 | 540 | 420 | 150 | 300 | 230 | 160 |
| Mo | 5.4 | 0.2 | 0.3 | 0.5 | 1 | 1.2 | 0.5 | 1.4 | 0.8 | 2.8 |

**Table 5 cont DGR-5 Elemental Geochemistry**

| ***Sample Number*** | ***DGR5-583.40*** | ***DGR5-605.55*** | ***DGR5-645.16*** | ***DGR5-677.25*** | ***DGR5-692.35*** | ***DGR5-699.49*** | ***DGR5-704.99*** | ***DGR5-715.40*** | ***DGR5-725.33*** | ***DGR5-764.72*** |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Elemental Geochemistry (ppm)*** | | | | | | | | | | |
| Nb | 10 | 15 | 18 | 16 | 15 | 16 | 5 | 6.3 | 5 | 4.1 |
| Nd | 30 | 16 | 40 | 37 | 41 | 37 | 7.3 | 8.2 | 7.6 | 6.6 |
| Ni | 16 | 35 | 35 | 32 | 39 | 40 | 8.6 | 49 | 6.5 | 7.5 |
| P | 560 | 660 | 930 | 560 | 1300 | 1300 | 800 | 320 | 220 | 190 |
| Pb | 4.4 | 4.4 | 11 | 12 | 24 | 24 | 4.7 | 3.2 | 3.3 | 4.4 |
| Pr | 8 | 4.9 | 13 | 12 | 13 | 12 | 2.1 | 2.5 | 2.3 | 2 |
| Rb | 49 | 50 | 150 | 140 | 140 | 150 | 10 | 25 | 15 | 18 |
| Sb | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Sc | 7.2 | 2 | 16 | 15 | 16 | 16 | 2.4 | 3.3 | 2.7 | 2.7 |
| Sm | 6.5 | 3.2 | 7.5 | 6.5 | 7.9 | 6.4 | 1.4 | 1.5 | 1.4 | 1.1 |
| Sr | 80 | 350 | 140 | 160 | 340 | 120 | 480 | 310 | 290 | 570 |
| Ta | 8.1 | 3.9 | 8.4 | 8.3 | 8.6 | 8.2 | 14 | 15 | 17 | 16 |
| Tb | 1 | 0.48 | 1 | 0.93 | 1.1 | 0.88 | 0.22 | 0.2 | 0.19 | 0.12 |
| Th | 6 | 0.81 | 19 | 17 | 17 | 18 | 1.2 | 3.3 | 1.9 | 1.8 |
| Ti | 2300 | 5100 | 5600 | 5100 | 5100 | 5300 | 360 | 800 | 470 | 380 |
| Tl | 0.25 | 0.69 | 0.76 | 0.69 | 0.92 | 0.95 | 0.05 | 0.08 | 0.04 | 0.04 |
| Tm | 0.37 | 0.29 | 0.49 | 0.48 | 0.5 | 0.5 | 0.088 | 0.089 | 0.068 | 0.043 |
| U | 1.4 | 3.3 | 3.7 | 3.5 | 3.7 | 4.2 | 1.1 | 1.3 | 0.88 | 0.4 |
| V | 36 | 130 | 130 | 120 | 120 | 130 | 8.6 | 19 | 12 | 7.2 |
| W | 0.75 | 1.3 | 1.6 | 1.4 | 1.5 | 1.6 | 0.15 | 0.3 | 0.19 | 0.1 |
| Yb | 1.9 | 1.7 | 2.8 | 2.7 | 2.9 | 2.9 | 0.48 | 0.53 | 0.42 | 0.28 |
| Y | 23 | 4.3 | 22 | 21 | 25 | 22 | 7.7 | 6.5 | 5.3 | 3.4 |
| Zn | 47 | 82 | 69 | 65 | 67 | 62 | 6 | 12 | 13 | 6.5 |
| Zr | 92 | 97 | 120 | 110 | 95 | 100 | 12 | 24 | 16 | 13 |

**Table 6 DGR-6 Elemental Geochemistry**

| ***Sample Number*** | ***DGR6-654.58*** | ***DGR6-664.31*** | ***DGR6-697.67*** | ***DGR6-717.97*** | ***DGR6-735.40*** | ***DGR6-750.80*** | ***DGR6-761.76*** | ***DGR6-768.58*** |
|---|---|---|---|---|---|---|---|---|
| ***Other Parameters (%)*** | | | | | | | | |
| Cl | 0.61 | 0.58 | 0.9 | 0.51 | 0.43 | 0.06 | 0.09 | 0.08 |
| C-total | 1.05 | 1.17 | 0.872 | 1.04 | 1.84 | 10.4 | 9.7 | 9.86 |
| C-organic | 0.211 | 0.333 | 0.426 | 0.565 | 0.791 | 0.612 | 0.192 | 0.351 |
| $CO_2$ | 3.15 | 3.15 | 1.69 | 1.92 | 3.61 | 37.8 | 35.1 | 35.8 |
| S-total | 0.314 | 0.75 | 0.669 | 1.08 | 1.12 | 0.066 | 0.095 | 0.113 |
| ***Elemental Geochemistry (ppm)*** | | | | | | | | |
| Ag | 0.47 | 0.22 | 0.29 | 0.24 | 0.2 | < 0.01 | 0.02 | < 0.01 |
| Al | 77000 | 7700 | 74000 | 77000 | 78000 | 7300 | 13000 | 9800 |
| As | 5.3 | 4.8 | 3.1 | 4.4 | 4.8 | 1.3 | 1.5 | 1.7 |
| Ba | 310 | 300 | 320 | 320 | 320 | 36 | 57 | 48 |
| Be | 2 | 1.9 | 1.8 | 1.9 | 2 | 0.2 | 0.4 | 0.2 |
| Bi | 0.19 | 0.22 | 0.2 | 0.21 | 0.19 | < 0.09 | < 0.09 | < 0.09 |
| Ca | 21000 | 20000 | 13000 | 15000 | 26000 | 270000 | 270000 | 270000 |
| Cd | 0.14 | 0.13 | 0.1 | 0.11 | 0.09 | < 0.02 | < 0.02 | < 0.02 |
| Ce | 77 | 38 | 77 | 82 | 79 | 16 | 19 | 17 |
| Co | 16 | 15 | 15 | 15 | 14 | 1.6 | 2.2 | 1.8 |
| Cr | 70 | 77 | 71 | 71 | 69 | 13 | 18 | 14 |
| Cu | 29 | 21 | 60 | 40 | 26 | 1.5 | 2.5 | 0.7 |
| Cs | 8.7 | 5.9 | 8.7 | 8.8 | 8.8 | 1 | 1.9 | 1.4 |
| Dy | 4.5 | 2.7 | 4.4 | 4.5 | 4.8 | 0.95 | 1 | 0.84 |
| Er | 2.8 | 1.7 | 2.7 | 2.8 | 3 | 0.55 | 0.63 | 0.47 |
| Eu | 1.3 | 0.8 | 1.3 | 1.3 | 1.4 | 0.27 | 0.31 | 0.27 |
| Fe | 43000 | 44000 | 41000 | 44000 | 43000 | 5200 | 5800 | 4900 |
| Ga | 23 | 22 | 22 | 23 | 22 | 1.8 | 3.4 | 2.5 |
| Gd | 5.5 | 3 | 5.2 | 5.3 | 5.8 | 1.2 | 1.3 | 1.1 |
| Ge | 1.1 | 0.8 | 1 | 1.1 | 1.2 | 0.3 | < 0.3 | 0.3 |
| Hf | 3.6 | 3.3 | 3.7 | 3.5 | 3.2 | 0.5 | 0.7 | 0.5 |
| Ho | 1 | 0.61 | 0.98 | 1 | 1.1 | 0.21 | 0.23 | 0.18 |
| In | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| K | 42000 | 32000 | 40000 | 41000 | 40000 | 8800 | 14000 | 12000 |
| La | 38 | 15 | 37 | 42 | 41 | 8.3 | 10 | 8.1 |
| Li | 42 | 32 | 41 | 41 | 37 | 4.4 | 8.2 | 6.8 |
| Lu | 0.42 | 0.23 | 0.42 | 0.44 | 0.46 | 0.072 | 0.09 | 0.064 |
| Mg | 16000 | 7300 | 17000 | 17000 | 18000 | 14000 | 11000 | 10000 |
| Mn | 700 | 670 | 470 | 490 | 570 | 410 | 260 | 250 |
| Mo | 0.2 | 0.3 | 0.4 | 0.8 | 1.3 | 0.2 | 0.3 | 0.2 |
| Nb | 16 | 13 | 15 | 15 | 14 | 3.8 | 5.1 | 4.1 |
| Nd | 33 | 19 | 32 | 34 | 35 | 6.8 | 7.7 | 6.7 |
| Ni | 33 | 34 | 34 | 36 | 37 | 6.2 | 8.6 | 5.9 |
| P | 860 | 960 | 640 | 830 | 1400 | 290 | 340 | 220 |
| Pb | 6.7 | 14 | 18 | 23 | 24 | 2.2 | 2.5 | 2.7 |
| Pr | 9.7 | 5.1 | 9.5 | 10 | 10 | 1.9 | 2.2 | 1.9 |
| Rb | 160 | 42 | 150 | 160 | 160 | 17 | 31 | 23 |

**Table 6 cont. DGR-6 Elemental Geochemistry**

| ***Sample Number*** | ***DGR6-654.58*** | ***DGR6-664.31*** | ***DGR6-697.67*** | ***DGR6-717.97*** | ***DGR6-735.40*** | ***DGR6-750.80*** | ***DGR6-761.76*** | ***DGR6-768.58*** |
|---|---|---|---|---|---|---|---|---|
| ***Elemental Geochemistry (ppm)*** | | | | | | | | |
| Sb | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Sc | 18 | 1 | 18 | 18 | 18 | 2.8 | 4 | 2.9 |
| Sm | 6.2 | 3.7 | 5.9 | 6.1 | 6.5 | 1.3 | 1.4 | 1.2 |
| Sr | 140 | 130 | 180 | 130 | 140 | 330 | 320 | 310 |
| Ta | 3.4 | 1.3 | 2.8 | 2.8 | 2.6 | 3.1 | 2.8 | 2.5 |
| Tb | 0.75 | 0.39 | 0.72 | 0.75 | 0.8 | 0.061 | 0.085 | 0.046 |
| Th | 11 | 0.05 | 11 | 11 | 10 | 1.1 | 2.2 | 1.6 |
| Ti | 5200 | 4700 | 5200 | 5300 | 4900 | 450 | 800 | 610 |
| Tl | 0.68 | 0.67 | 0.68 | 0.81 | 0.88 | 0.07 | 0.08 | 0.05 |
| Tm | 0.33 | 0.14 | 0.31 | 0.33 | 0.34 | < 0.001 | < 0.001 | < 0.001 |
| U | 3.1 | 3.1 | 3.3 | 3.5 | 3.4 | 1.4 | 1.2 | 1 |
| V | 120 | 120 | 110 | 120 | 120 | 11 | 19 | 15 |
| W | 1.5 | 1.4 | 1.4 | 1.4 | 1.5 | 0.26 | 0.32 | 0.25 |
| Yb | 2.6 | 1.5 | 2.6 | 2.8 | 2.8 | 0.45 | 0.57 | 0.42 |
| Y | 21 | 4 | 20 | 21 | 24 | 6.4 | 6.7 | 4.9 |
| Zn | 71 | 73 | 63 | 62 | 58 | 4.5 | 7.1 | 5.2 |
| Zr | 110 | 110 | 110 | 100 | 98 | 14 | 24 | 19 |

**Table 7 Summary of XRD Qualitative Analysis, Mineral Identification for DGR-5 Core Samples**

| Sample Number | Major (>30 wt %) | Moderate (10% - 30 wt %) | Minor (2% -10 wt %) | Trace (<2% wt %) |
|---|---|---|---|---|
| ***DGR5-583.40*** | quartz | potassium-feldspar, ankerite | calcite, chlorite, mica, halite | *anatase |
| ***DGR5-605.55*** | mica, quartz | potassium-feldspar, chlorite | ankerite, calcite | *halite, *anatase |
| ***DGR5-645.16*** | quartz, mica | chlorite | potassium-feldspar, plagioclase, ankerite, pyrite | *apatite, *anatase, *halite |
| ***DGR5-677.25*** | quartz, mica | chlorite | potassium-feldspar, calcite, plagioclase | *pyrite, *ankerite, *halite, *anatase, *apatite |
| ***DGR5-692.35*** | mica, quartz | chlorite | potassium-feldspar, calcite, plagioclase, pyrite | *ankerite, *anatase, *halite, *apatite |
| ***DGR5-699.49*** | mica, quartz | chlorite | pyrite, calcite, plagioclase, potassium-feldspar | *ankerite, *anatase, *halite |
| ***DGR5-704.99*** | calcite | | chlorite, Quartz | *potassium-feldspar, *ankerite, *mica |
| ***DGR5-715.40*** | calcite | | potassium-feldspar, quartz, chlorite, ankerite | *mica |
| ***DGR5-725.33*** | calcite | | potassium-feldspar, quartz, chlorite | *ankerite, *mica |
| ***DGR5-764.72*** | calcite | | potassium-feldspar, quartz, chlorite | *ankerite, *mica |

* tentative identification due to low concentrations, diffraction line overlap or poor crystallinity

**Table 8 Summary of XRD Qualitative Analysis, Mineral Identification for DGR-6 Core Samples**

| Sample Number | Major (>30 wt %) | Moderate (10% -30 wt %) | Minor (2% -10 wt %) | Trace (<2% wt %) |
|---|---|---|---|---|
| ***DRG6-654.58*** | mica, quartz | | potassium feldspar, chlorite, ankerite, calcite, plagioclase, dolomite, pyrite | *palygorskite, *anatase, *apatite, *halite |
| ***DGR6-664.31*** | mica, quartz | | potassium feldspar, chlorite, calcite, ankerite, pyrite, plagioclase | *dolomite, *palygorskite, *anatase, *apatite, *halite |
| ***DRG6-697-67*** | mica, quartz | | potassium feldspar, chlorite, calcite, pyrite, plagioclase, palygorskite | *ankerite, *halite, *dolomite, *anatase, *apatite |
| ***DRG6-717.97*** | mica, quartz | | potassium feldspar, chlorite, calcite, pyrite, palygorskite, plagioclase | *ankerite, *anatase, *dolomite, *apatite, *halite |
| ***DRG6-735.40*** | mica, quartz | | chlorite, calcite, potassium feldspar, pyrite, ankerite, dolomite, plagioclase | *palygorskite, *anatase, *halite, *apatite |
| ***DRG6-750.80*** | calcite | | dolomite, ankerite, quartz, mica, potassium feldspar | *plagioclase, *pyrite, *halite |
| ***DRG6-761.76*** | calcite | | ankerite, quartz, dolomite, mica, potassium feldspar | *chlorite, *plagioclase, *pyrite, *halite |
| ***DRG6-768.58*** | calcite | | ankerite, mica, quartz, dolomite, potassium feldspar | *chlorite, *plagioclase, *pyrite, *halite |

* tentative identification due to low concentrations, diffraction line overlap or poor crystallinity

**Table 9 Summary of XRD Semi-Quantitative Analysis - Mineral Identification for DGR-5 Core Samples**

| *Sample Number* | *Minerals Present* | *Semi-Quantitative (wt %)* | *Formation* |
|---|---|---|---|
| ***DGR5-583.40*** | Quartz | 48 | Georgian Bay |
| | Orthoclase | 18.3 | |
| | Ankerite | 12.3 | |
| | Calcite | 9.6 | |
| | Sheet Silicates | 9.3 | |
| | Halite | 2.2 | |
| | Anatase | 0.3 | |
| ***DGR5-605.55*** | Sheet Silicates | 47.3 | Georgian Bay |
| | Quartz | 30.3 | |
| | Orthoclase | 14 | |
| | Ankerite | 3.2 | |
| | Calcite | 2.8 | |
| | Halite | 1.5 | |
| | Anatase | 1 | |
| ***DGR5-645.16*** | Sheet Silicates | 45.7 | Georgian Bay |
| | Quartz | 35.2 | |
| | Orthoclase | 7.9 | |
| | Anorthite | 4.7 | |
| | Ankerite | 2.6 | |
| | Pyrite | 2 | |
| | Hydroxylapatite | 0.8 | |
| | Anatase | 0.7 | |
| | Halite | 0.5 | |
| ***DGR5-677.25*** | Sheet Silicates | 43.9 | Blue Mountain |
| | Quartz | 36.7 | |
| | Orthoclase | 6.3 | |
| | Calcite | 4.1 | |
| | Anorthite | 3.7 | |
| | Pyrite | 1.9 | |
| | Ankerite | 1.1 | |
| | Halite | 1.1 | |
| | Anatase | 0.6 | |
| | Hydroxylapatite | 0.6 | |
| ***DGR5-692.35*** | Sheet Silicates | 47.3 | Blue Mountain |
| | Quartz | 30.1 | |
| | Orthoclase | 7 | |
| | Calcite | 5.5 | |
| | Anorthite | 4.1 | |
| | Pyrite | 2.6 | |
| | Ankerite | 1.2 | |
| | Anatase | 0.9 | |
| | Halite | 0.7 | |
| | Hydroxylapatite | 0.7 | |

**Table 9 cont** **Summary of XRD Semi-Quantitative Analysis - Mineral Identification for DGR-5 Core Samples**

| *Sample Number* | *Minerals Present* | *Semi-Quantitative (wt %)* | *Formation* |
|---|---|---|---|
| ***DGR5-699.49*** | Sheet Silicates | 52.6 | Blue Mountain |
| | Quartz | 32.9 | |
| | Pyrite | 3.7 | |
| | Calcite | 3.5 | |
| | Albite | 2.6 | |
| | Orthoclase | 2 | |
| | Ankerite | 1.3 | |
| | Anatase | 1 | |
| | Halite | 0.4 | |
| ***DGR5-704.99*** | Calcite | 92.8 | Cobourg – Collingwood Member |
| | Sheet Silicates | 3.4 | |
| | Quartz | 2.2 | |
| | Orthoclase | 1 | |
| | Ankerite | 0.6 | |
| ***DGR5-715.40*** | Calcite | 79.8 | Cobourg – Lower Member |
| | Sheet Silicates | 6.5 | |
| | Orthoclase | 5.5 | |
| | Quartz | 4.6 | |
| | Ankerite | 3.6 | |
| ***DGR5-725.33*** | Calcite | 87.7 | Cobourg – Lower Member |
| | Orthoclase | 4.1 | |
| | Sheet Silicates | 3.5 | |
| | Quartz | 2.9 | |
| | Ankerite | 1.8 | |
| ***DGR5-764.72*** | Calcite | 88.7 | Sherman Fall |
| | Orthoclase | 4.2 | |
| | Sheet Silicates | 3.3 | |
| | Quartz | 2.9 | |
| | Ankerite | 1 | |

**Table 10** **Summary of XRD Semi-Quantitative Analysis - Mineral Identification for DGR-6 Core Samples**

| *Sample Number* | *Minerals Present* | *Semi-Quantitative (wt %)* | *Formation* |
|---|---|---|---|
| ***DRG6-654.58*** | Sheet Silicates | 47.1 | Georgian Bay |
| | Quartz | 30.3 | |
| | Orthoclase | 4.9 | |
| | Ankerite | 3.5 | |
| | Calcite | 3.3 | |
| | Albite | 3.2 | |
| | Dolomite | 2.8 | |
| | Pyrite | 2.6 | |
| | Anatase | 1 | |
| | Hydroxylapatite | 0.7 | |
| | Halite | 0.5 | |
| ***DGR6-664.31*** | Sheet Silicates | 48.1 | Georgian Bay |
| | Quartz | 31 | |
| | Orthoclase | 5 | |
| | Calcite | 3.4 | |
| | Ankerite | 3.3 | |
| | Pyrite | 2.7 | |
| | Albite | 2.6 | |
| | Dolomite | 1.7 | |
| | Anatase | 1 | |
| | Hydroxylapatite | 0.8 | |
| | Halite | 0.2 | |
| ***DGR6-697.67*** | Sheet Silicates | 47.2 | Blue Mountain |
| | Quartz | 35.8 | |
| | Orthoclase | 4.5 | |
| | Calcite | 2.9 | |
| | Albite | 2.4 | |
| | Pyrite | 2.4 | |
| | Ankerite | 1.2 | |
| | Halite | 1 | |
| | Dolomite | 0.9 | |
| | Anatase | 0.9 | |
| | Hydroxylapatite | 0.7 | |
| ***DGR6-717.97*** | Sheet Silicates | 49 | Blue Mountain |
| | Quartz | 33.9 | |
| | Orthoclase | 4.6 | |
| | Calcite | 4.2 | |
| | Pyrite | 2.5 | |
| | Albite | 2.4 | |
| | Ankerite | 1 | |
| | Anatase | 1 | |
| | Dolomite | 0.5 | |
| | Hydroxylapatite | 0.5 | |
| | Halite | 0.4 | |

**Table 10 cont. Summary of XRD Semi-Quantitative Analysis - Mineral Identification for DGR-6 Core Samples**

| *Sample Number* | *Minerals Present* | *Semi-Quantitative (wt %)* | *Formation* |
|---|---|---|---|
| ***DGR6-735.40*** | Sheet Silicates | 46.4 | Blue Mountain |
| | Quartz | 32.6 | |
| | Calcite | 5.3 | |
| | Orthoclase | 4.1 | |
| | Pyrite | 3.7 | |
| | Ankerite | 2.3 | |
| | Dolomite | 2.3 | |
| | Albite | 2.2 | |
| | Anatase | 0.9 | |
| | Halite | 0.3 | |
| | Hydroxylapatite | 0.1 | |
| ***DGR6-750.80*** | Calcite | 74.7 | Cobourg – Lower Member |
| | Dolomite | 7.7 | |
| | Ankerite | 6.9 | |
| | Quartz | 3.6 | |
| | Sheet Silicates | 3.4 | |
| | Orthoclase | 2.3 | |
| | Albite | 0.5 | |
| | Pyrite | 0.5 | |
| | Halite | 0.3 | |
| ***DGR6-761.76*** | Calcite | 77.2 | Cobourg – Lower Member |
| | Ankerite | 5.5 | |
| | Sheet Silicates | 5 | |
| | Quartz | 4.5 | |
| | Dolomite | 3.4 | |
| | Orthoclase | 3.1 | |
| | Albite | 0.5 | |
| | Pyrite | 0.5 | |
| | Halite | 0.3 | |
| ***DGR6-768.58*** | Calcite | 79.6 | Cobourg – Lower Member |
| | Sheet Silicates | 5.1 | |
| | Ankerite | 5 | |
| | Quartz | 3.3 | |
| | Orthoclase | 3.2 | |
| | Dolomite | 2.5 | |
| | Clinochlore | 1.7 | |
| | Albite | 0.5 | |
| | Pyrite | 0.5 | |
| | Halite | 0.3 | |

## 4.3 SEM/EMPA

Tables 11 and 12 present the results of the SEM/EMPA analysis of DGR-5 and DGR-6 core samples, respectively. Appendices A (DGR-5) and B (DGR-6) contain the SGS reports for the two boreholes, including a description of SEM/EMPA analytical results, summary tables of semi-quantitative spot analyses, photographic plates of back-scattered scanning electron photographs, and selected EMPA spectra.

**Table 11 Summary of SEM/EMPA Observations of DGR-5 Core Samples**

| ***Sample ID*** | ***Formation*** | ***SEM/EMPA Observations*** |
|---|---|---|
| DGR5-583.40 | Georgian Bay | Irregular quartz and mica with overgrown zones of pyrite and some large rutile, dolomite and apatite grains. No NaCl (halite) observed. |
| DGR5-605.55 | Georgian Bay | Irregular bands/veins of halite along fracture of void spaces in silicates, as irregular rims at the boundary of silicates and as wide disseminated patches |
| DGR5-645.16 | Georgian Bay | Extensive interstitial cavity fillings zones and wide disseminated patches of halite |
| DGR5-677.25 | Blue Mountain | Irregular veins/stringers and disseminated grains of halite |
| DGR5-692.35 | Blue Mountain | Extensive broad interconnected cavity fillings zones of halite, irregular veins/stringers and rimmed halite |
| DGR5-699.49 | Blue Mountain | Irregular disseminated grains, veins or rimmed cavity fillings of halite within silicates |
| DGR5-704.99 | Cobourg - Collingwood Member | Irregular elongated grains/veins of halite along fracture planes, disseminated grains of halite within silicates |
| DGR5-715.40 | Cobourg – Lower Member | Disseminated irregular grains/veins of halite along fractures in silicates and carbonate groundmass |
| DGR5-725.33 | Cobourg – Lower Member | Disseminated irregular grains/veins of halite along fractures in silicates and carbonate groundmass |
| DGR5-764.72 | Sherman Fall | Calcite matrix with quartz with some feldspar and apatite grains. No NaCl (halite) |

Irregular veins of halite in the DGR5–605.55 (Georgian Bay) sample were noted along the fracture or void spaces within silicates (Plate 4, Appendix A) and as irregular rims at the boundary of silicates (Plate 5). Some NaCl crystallites appear as widely disseminated patches within silicates (Plates 6 and 7). These are suspected (Herwegh and Mazurek, 2008) of being vacuum-induced artefacts produced during desiccation by the SEM that causes the subsequent precipitation of salts such as halite on the sample surface. The differentiation between such original and artefact minerals is an area of uncertainty that requires further work. However, it should be noted that an entirely independent method – XRD – identified trace amounts of halite in all samples of the DGR-5 shales (see Table 9). Therefore, all occurrences of both Na and Cl as veins and rims shown in Plates 4 and 5 of Appendix A and as patches in Plates 6 and 7 will be considered evidence of the presence of halite with the different textures and forms due to various stages of diagenesis and halite precipitation. Therefore, because the instrument detects Na and Cl atoms and not halite minerals, we refer to the identification by SEM/EMPA as NaCl (halite) so as to distinguish this identification from that made by XRD.

Other examples of halite were identified in the five other shale samples. Extensive interstitial cavity fillings zones of NaCl (halite) and wide disseminated patches of halite were commonly noted in DGR5–645.16. Irregular veins/stringers and disseminated grains of NaCl (halite) were noted in the DGR5–677.25 sample (Plates 10-12).

Extensive broad interconnected cavity fillings zones of NaCl (halite), irregular veins/stringers and rimmed halite were commonly noted in the DGR5–692.35 sample (Plates 13-15). In the DGR5–699.49 sample, NaCl (halite) commonly occurred as irregular disseminated grains, veins or as rimmed cavity filling materials along the boundary of the silicates (Plates 16-18).

**Table 12 Summary of SEM/EMPA Observations of DGR-6 Core Samples**

| *Sample ID* | *Formation* | *SEM/EMPA Observations* |
|---|---|---|
| DGR6-654.58 | Georgian Bay | Irregular interconnected halite bands along fracture/void spaces in silicates and carbonates |
| DGR6-664.31 | Georgian Bay | Extensive interstitial cavity fillings and wide disseminated patches of halite |
| DGR6-697.67 | Blue Mountain | Irregular rims of halite at boundary of silicates and veins/disseminated patches of halite in silicates |
| DGR6-717.97 | Blue Mountain | Extensive interconnected bands and wide patches of halite in silicate groundmass |
| DGR6-735.40 | Blue Mountain | Extensive interstitial cavity fillings of halite and wide disseminated patches of halite |
| DGR6-750.80 | Cobourg – Lower Member | Extensive interstitial cavity fillings of halite and wide disseminated patches of halite |
| DGR6-761.76 | Cobourg – Lower Member | Extensive interstitial cavity fillings of halite and wide disseminated patches of halite |
| DGR6-768.58 | Cobourg – Lower Member | Extensive interstitial cavity fillings of halite and wide disseminated patches of halite |

In the Middle Ordovician carbonates, XRD failed to detect halite. In the DGR5–704.99 (Cobourg) sample, NaCl (halite) was commonly noted as irregular elongated grains/veins along the fracture plane or as disseminated grains within silicates (Plates 19-21). Disseminated irregular grains/veins of NaCl (halite) were noted mostly along the fractures within silicates and carbonate groundmass in DGR5–715.40 and DGR5–725.33 samples (Plates 22-27). Most of the SEM-EDS analyses were carried out on silicates, carbonates and sulphides in the Sherman Fall sample DGR5–764.72 (Plates 28- 30), in which there was no evidence of NaCl (halite).

With respect to DGR-6 cores (see Appendix B), XRD results indicate that halite is present in all eight samples irrespective of whether they are shales (0.2 – 1.0 wt %) or from the Cobourg limestone (0.3 wt%). Irregular interconnected bands and veins of NaCl (halite) were noted along the fracture or void spaces within silicates and carbonates (Plates 1-4, Appendix B) in the DGR6-654.58 (Georgian Bay) sample. Extensive interstitial cavity-filling zones of NaCl (halite) and widely disseminated patches of NaCl (halite) were commonly noted in DGR6-664.31 (Georgian Bay, Plates 5 - 8). With respect to the three cores from the Blue Mountain Formation, DGR6-697.67 exhibited irregular rims of NaCl (halite) at the boundary of silicates and veins and disseminated patches of NaCl (halite) within silicates were noted (Plates 9-12). DGR6-717.97 showed extensive interconnected bands and wide patches of NaCl (halite) within silicates groundmass (see Tables & Plates 13 – 16). Extensive interstitial cavity fillings and widely disseminated patches of NaCl (halite) were commonly noted in DGR6-735.40, DGR6-750.80, DGR6-761.76 and DGR6-768.58 samples; the SEM-EDS results are presented in Appendix B (Tables and Plates 17 – 32).

# 5 Data Quality and Use

The data presented in this TR are consistent with previous studies of the mineralogy and geochemistry of DGR cores, e.g., TR-08-01 (Intera Engineering Ltd., 2009d), TR-08-02 (Intera Engineering Ltd., 2009e), TR-08-22 (Intera Engineering Ltd. 2010d), TR-08-23 (Intera Engineering Ltd., 2010c) and TR-08-29 (Intera Engineering Ltd., 2009c). In order to provide representative geochemical and mineralogical analyses, samples were collected from rock that was considered representative of the formation being sampled using previous experience from logging DGR-1, DGR-2, DGR-3 and DGR-4. Such point sampling cannot capture the full mineralogical or geochemical ranges of sampled formations, however, that was not the objective of this investigation. In some instances involving limestone and dolostone samples from the DGR boreholes, it has been observed that the geochemical analyses do not correspond to the logged lithology of the rock interval from which the sample was collected.

Core samples were collected that were considered representative of the general formation lithology in order that analytical results could be taken as representative of the general formation mineralogy. However, sampling by its nature is subjective, and as the formations are not entirely homogeneous, it is not possible to capture their full mineralogical and geochemical range. The mineralogy of most samples is consistent with the general lithology of the parent formation as identified during field logging, and is also consistent with the literature. Where the mineralogy of certain samples is not entirely consistent with their general formation lithology or their logged sample lithology, such samples are considered to represent subordinate facies within a formation. Discrepancies between analytical results and logged sample lithologies may arise as field logging and sample selection is an expedited process due to sample preservation requirements and thus some geological information may be overlooked. Differences between field and laboratory results also arise due to the fact that identification of rock type in the field is constrained by the tools and time available prior to preservation (i.e. visual identification, hardness, reaction with acid) and distinguishing/identifying some minerals and proportions can be difficult.

# 6 Conclusions

Ten core samples collected from DGR-5 core and eight core samples from DGR-6 core were submitted to SGS of Lakefield, Ontario, for geochemical and XRD analysis and inspection by SEM/EMPA. Geochemical analysis consisted of the measurement of 12 oxides and 54 elements as well as other parameters including loss-on-ignition, total carbon, organic carbon, total sulphur, $CO_2$, and total chloride.

Few differences were observed between the formations sampled in these two inclined boreholes that sampled the Upper Ordovician shales and Middle Ordovician limestones beneath the Bruce nuclear site despite their dissimilar azimuths leading to cores being sampled in-situ approximately 2 km apart. The shales were predominantly composed of sheet silicates and quartz with minor amounts of K-feldspar, pyrite and plagioclase. Within the shales, calcite and ankerite were detected in DGR-5 and dolomite, calcite and ankerite in DGR-6. Halite, which was inferred from detection of Na and Cl atoms, was present as veins, rims and patches that appeared to represent different periods of diagenesis. There was no SEM/EMPA evidence of other soluble minerals such as gypsum, anhydrite or celestite and only halite was detected by XRD.

The seven core samples of limestone included five from the Cobourg (Lower Member) Formation, one from the Collingwood Member (Cobourg Formation) and one from the Sherman Fall Formation. All were predominantly composed of calcite (> 70 wt %) with minor amounts of chlorite, quartz, K-feldspar, ankerite and, in the case of DGR-6 only, dolomite. NaCl (halite) was evident in several limestone cores by SEM/EMPA but only in DGR-6 was it detected by XRD at 0.3 wt %.

In general both the shales and the limestones that were sampled during drilling and coring of DGR-5 and DGR-6 appeared similar to other samples collected from the DGR boreholes. The identification of halite by the

presence of Na and Cl atoms in the SEM/EMPA analyses of many of these samples is supported by the detection of halite by XRD.

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# APPENDIX A

## SGS Report on SEM-EDS and XRD Mineralogy of DGR-5 Samples

# SEM-EDS and XRD Mineralogy of

# DGR5 SAMPLES

**prepared for**

## Intera Engineering Limited

**February 01, 2010**



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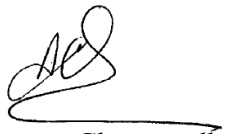
# *Introduction*

Ten samples from the DGR5, identified as DGR5–583.40, DGR5–605.55, DGR5–645.16, DGR5–677.25, DGR5–692.35, DGR5–699.49, DGR5–704.99, DGR5–715.40, DGR5–725.33 and DGR5–764.72 were submitted by Intera Engineering Limited for semi-quantitative XRD, whole rock analysis and SEM-EDS analysis. The objectives of the investigation were the estimation of different phases by XRD and SEM-EDS analysis of pore fabric and soluble minerals for the samples.

One polished section, prepared (Dry Preparation) from the cut slice of the above ten drill core samples was systematically scanned under scanning electron microscope with energy dispersive spectra for analysis of soluble minerals. X-ray powder diffraction analysis and whole rock analysis were carried out on the split grind samples

**SGS LAKEFIELD RESEARCH LIMITED**



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Senior Mineralogist

Roch Marion, B.Sc., C.Chem.
Manager, Process Mineralogy

*Experimental Work by:* Elaine Glover – Sample Logging
Amie Brock – Polished Section Preparation
Kim Gibbs – SEM-EDS

*Report Preparation by: A*parup Chattopadhyay

# *Testwork Summary*

## 1. Sample Preparation

One polished section, prepared (Dry Preparation) from the cut slice of the above ten drill core samples. Representative sub-samples were split after grinding a cut slice for X-ray diffraction and chemical analysis from all the drill core samples (DGR5).

## 2. X-ray Powder Diffraction Analysis

XRD analysis results, listed in Appendix 1, showed that DGR5–583.40 sample was mainly composed of quartz with moderate amounts of potassium-feldspar and ankerite, minor amounts calcite, chlorite and mica and traces of anatase; DGR5–605.55 sample was mainly composed of mica and quartz, with moderate amounts of potassium-feldspar and chlorite, minor amounts ankerite and calcite, and traces of halite and anatase; DGR5–645.16 sample was mainly composed of quartz and mica, with a moderate amount of chlorite, minor amounts potassium-feldspar, plagioclase, ankerite and pyrite, and traces of apatite, halite and anatase; DGR5–677.25 sample was mainly composed of quartz and mica, with a moderate amount of chlorite, minor amounts potassium-feldspar, calcite and plagioclase, and traces of pyrite, ankerite, halite, anatase and apatite; DGR5–692.35 sample was mainly composed of mica and quartz, with a moderate amount of chlorite, minor amounts potassium-feldspar, calcite, plagioclase and pyrite, and traces of ankerite, halite, anatase and apatite; DGR5–699.49 sample was mainly composed of mica and quartz, with a moderate amount of chlorite, minor amounts pyrite, potassium-feldspar, calcite and plagioclase, and traces of ankerite, anatase and halite; DGR5–704.99 sample was dominantly composed of calcite, with minor amounts of chlorite and quartz, and traces of potassium-feldspar, ankerite and mica; DGR5–715.40 sample was dominantly composed of calcite, with

minor amounts of potassium-feldspar, quartz, chlorite and ankerite, and traces of mica; DGR5–725.33 sample was dominantly composed of calcite, with minor amounts of potassium-feldspar, quartz and chlorite, and traces of ankerite and mica; DGR5–764.72 sample was dominantly composed of calcite, with minor amounts of potassium-feldspar, quartz and chlorite, and traces of ankerite and mica.

## 3. Scanning Electron Microscopy

The analysis of pore fabric and soluble minerals by SEM-EDS for the ten DGR5 core samples were carried out by Tescan Vega II SEM with Oxford Inca EDS/WDS system. The carbon coated polished sections (dry preparation) from DGR3 were scanned under the SEM-EDS system for semi-quantitative spot analysis for the study of the pore fabric and soluble minerals and the results were presented in Tables 1-30 and the back scattered scanning electron photographs in plates 1-30. Selected EDS spectra were tabulated in Appendix-2.

Irregular bands/veins of Na-Chloride (halite) were noted along the fracture or void spaces within silicates (Plate 4), as irregular rims at the boundary of silicates (Plate 5) and as wide disseminated patches within silicates (Plate 6) in DGR5–605.55 sample. In DGR5–645.16 sample, most of the SEM-EDS analyses were carried out in Na-Chloride (halite) and the results of the analysis were presented in Tables/Plates 7-9. Extensive interstitial cavity fillings zones of Na-Chloride (halite) and wide disseminated patches of halite were commonly noted in DGR5–645.16. Irregular veins/stringers and disseminated grains of Na-Chloride (halite) were noted in DGR5–677.25 sample (Plates 10-12). Extensive broad interconnected cavity fillings zones of Na-Chloride (halite), irregular veins/stringers and rimmed halite were commonly noted in

DGR5–692.35 sample (Plates 13-15). In DGR5–699.49 sample, halite commonly occurred as irregular disseminated grains, veins or as rimmed cavity filling materials along the boundary of the silicates (Plates 16-18). In DGR5–704.99 sample, halite was commonly noted as irregular elongated grains/veins along the fracture plane or as disseminated grains within silicates (Plates 19-21). Disseminated irregular grains/veins of halite were noted mostly along the fractures within silicates and carbonate groundmass in DGR5–715.40 and DGR5–725.33 samples (Plates 22-27). Most of the SEM-EDS analyses were carried out on silicates, carbonates and sulfides in DGR5–764.72 sample (Plates 28- 30).

Table 1: Results of Semi-Quantitative Spot Analysis in Quartz, Mica, Chlorite Rutile and Calcite

| **Sample:** DGR5 – 583.40 | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Mg | Al | Si | K | Ca | Ti | Mn | Fe |
| 1-1 | 45.67 | | 9.90 | 31.45 | 12.98 | | | | |
| 1-2 | 51.78 | | | 48.22 | | | | | |
| 1-3 | 45.88 | 1.37 | 2.09 | 3.58 | | | 43.85 | | 3.23 |
| 1-4 | 45.20 | 4.98 | 12.90 | 13.33 | 1.03 | | | 1.14 | 21.42 |
| 1-5 | 63.64 | 0.72 | | | | 35.64 | | | |

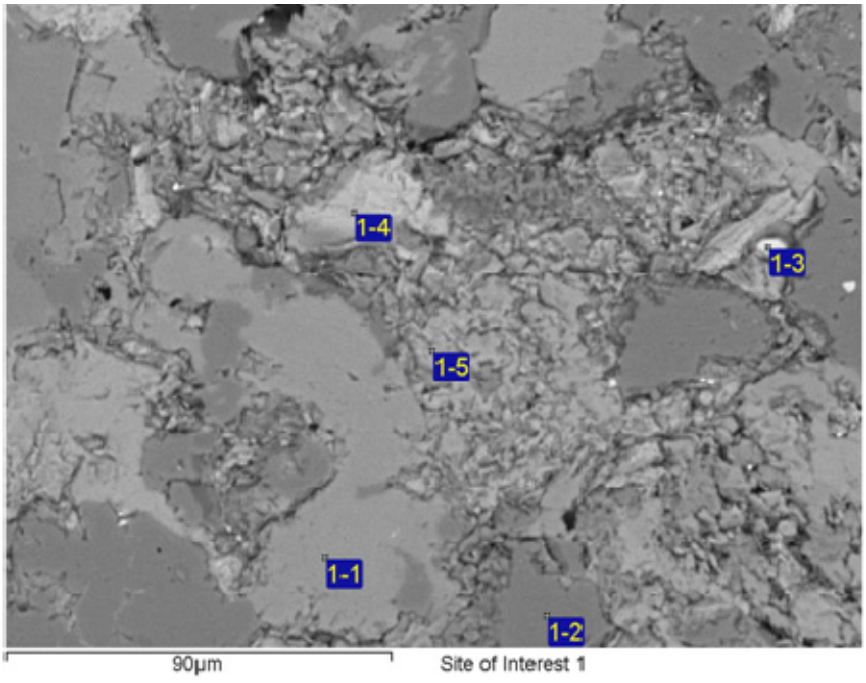


**Plate 1:** Back scattered scanning electron photographs indicating position of spots analysis in DGR5 – 583.40

Table 2: Results of Semi-Quantitative Spot Analysis in Quartz, Mica, Apatite, Calcite, Dolomite, Rutile and Pyrite

| **Sample:** DGR5 – 583.40 | Elements (in Wt.%) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | F | Mg | Al | Si | P | S | K | Ca | Ti | Fe |
| 2-1 | 43.23 | | | | | | | | | 56.77 | |
| 2-2 | 45.83 | | | 9.34 | 31.56 | | | 13.26 | | | |
| 2-3 | 56.36 | | 13.35 | | | | | | 27.73 | | 2.56 |
| 2-4 | 46.55 | | | 9.53 | 31.81 | | | 12.11 | | | |
| 2-5 | 34.90 | 5.99 | | | | 19.24 | | | 39.86 | | |
| 2-6 | 52.47 | | | | 47.53 | | | | | | |
| 2-7 | | | | | 0.76 | | 50.10 | | | | 49.14 |

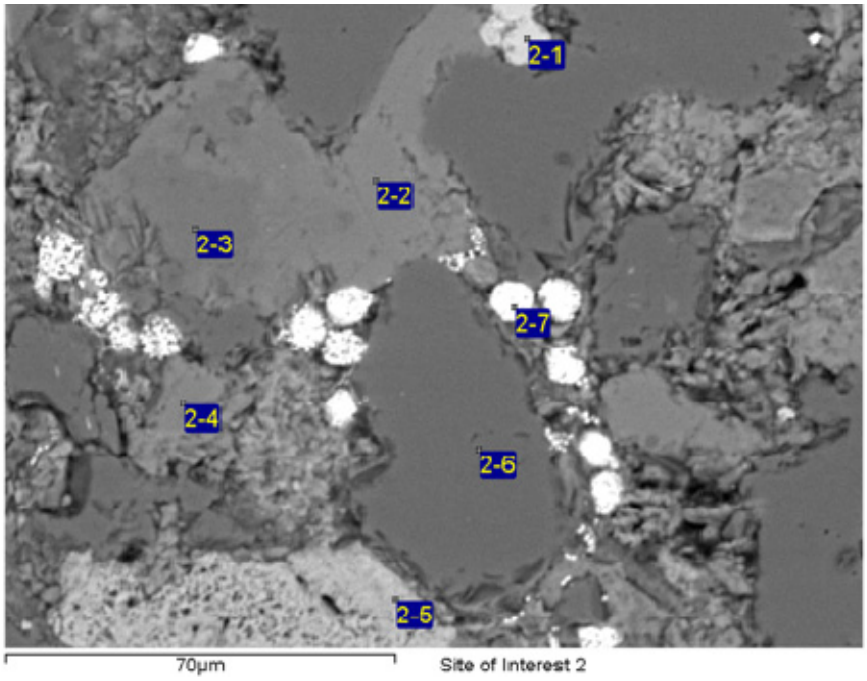


**Plate 2:** Back scattered scanning electron photograph indicating position of spots analysis in DGR5 – 583.40

Table 3: Results of Semi-Quantitative Spot Analysis in Quartz, Chlorite, Mica, Rutile and Zircon

| **Sample:** DGR5 – 583.40 | Elements (in Wt.%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Spots | O | Mg | Al | Si | K | Ti | Fe | Zr |
| 6-1 | 45.70 | | 9.58 | 32.10 | 12.62 | | | |
| 6-2 | 41.93 | | | | | 58.07 | | |
| 6-3 | 32.94 | | | 15.74 | | | | 51.32 |
| 6-4 | 51.83 | | | 48.17 | | | | |
| 6-5 | 43.45 | 6.52 | 11.56 | 15.20 | | | 23.27 | |

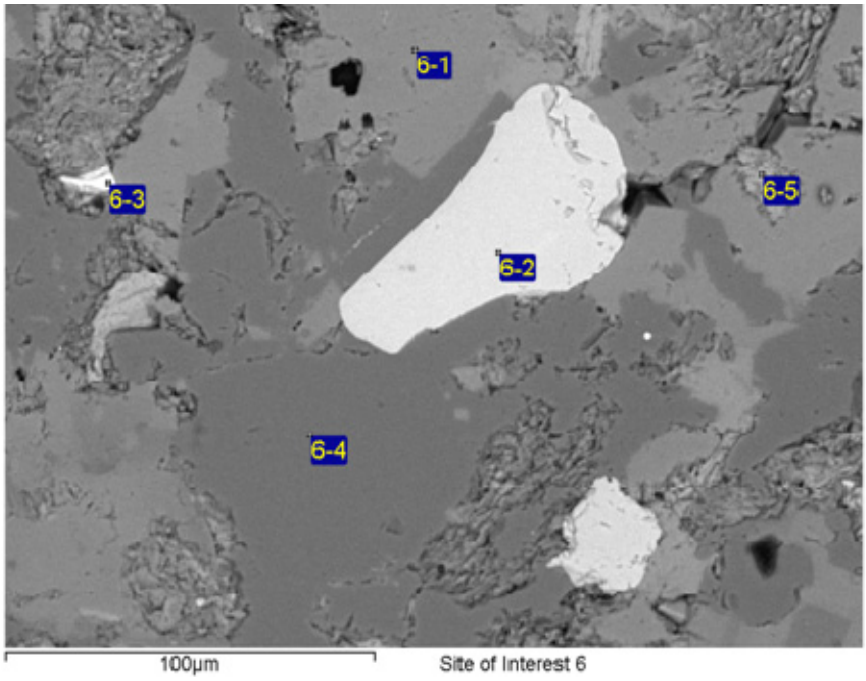


**Plate 3:** Back scattered scanning electron photograph indicating position of spots analysis in DGR5 – 583.40

Table 4: Results of Semi-Quantitative Spot Analysis in Na-Chloride and Chlorite

| **Sample: DGR5-605.55** | **Elements (in Wt.%)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | K | Fe |
| 2-1 | 5.48 | 29.62 | 0.90 | 4.57 | 11.18 | 43.99 | 2.41 | 1.84 |
| 2-2 | 7.56 | 33.37 | | 3.03 | 5.71 | 49.11 | 1.22 | |
| 2-3 | 7.36 | 33.23 | | 3.01 | 8.77 | 44.86 | 1.53 | 1.24 |
| 2-4 | 2.84 | 37.47 | | 0.84 | 3.02 | 55.83 | | |
| 2-5 | 45.29 | | 5.74 | 10.09 | 18.24 | | 2.17 | 18.46 |

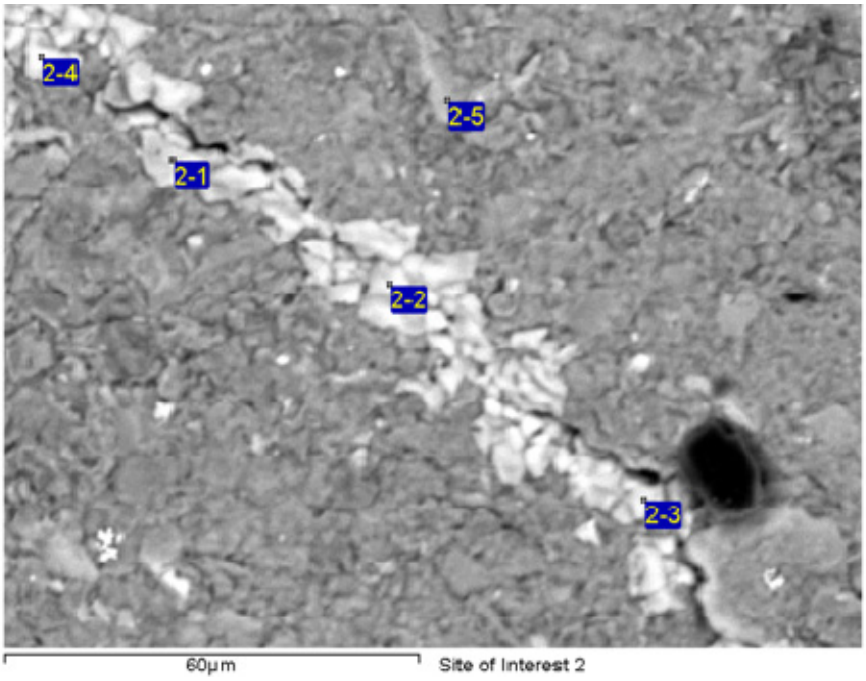


**Plate 4:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5-605.55**

Table 5: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Feldspar and chlorite

| **Sample: DGR5-605.55** | Elements (in Wt.%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | K | Fe |
| 3-1 | 45.66 | | 0.86 | 17.51 | 25.30 | | 8.85 | 1.82 |
| 3-2 | 5.09 | 36.80 | | 1.55 | 3.05 | 52.95 | 0.56 | |
| 3-3 | 13.48 | 29.28 | 1.01 | 3.65 | 4.92 | 42.07 | | 5.60 |
| 3-4 | 12.95 | 30.71 | 0.64 | 3.84 | 8.33 | 40.83 | 1.66 | 1.04 |
| 3-5 | 4.26 | 30.16 | | 2.70 | 7.35 | 52.61 | 1.37 | 1.56 |
| 3-6 | 10.51 | 32.27 | 0.54 | 3.54 | 7.20 | 43.26 | 1.67 | 1.00 |
| 3-7 | 15.90 | 26.13 | 1.02 | 5.85 | 11.73 | 34.52 | 2.70 | 2.15 |
| 3-8 | 45.11 | 1.44 | 7.31 | 9.55 | 13.21 | 5.77 | | 17.62 |

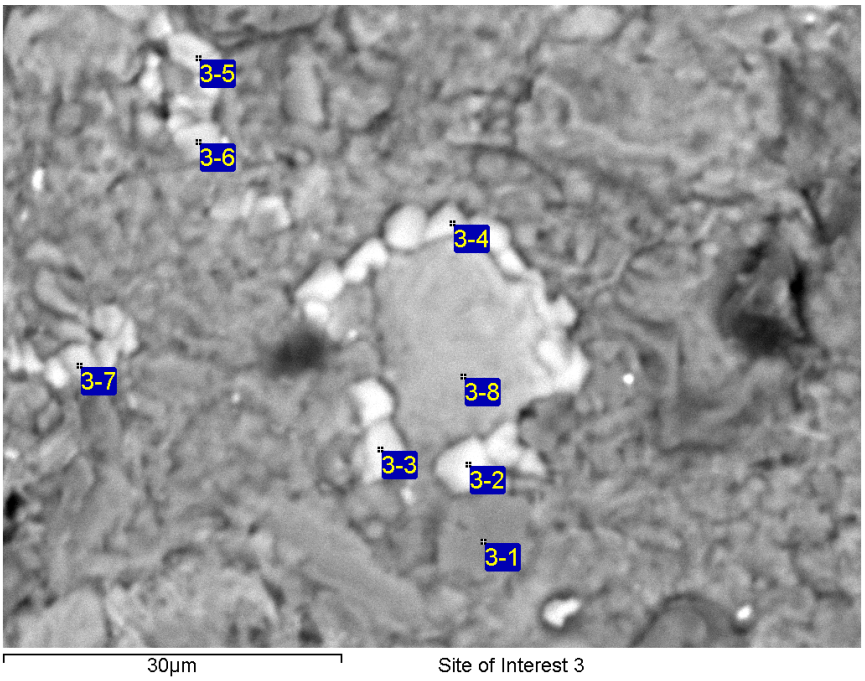


**Plate 5:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5-605.55**

Table 6: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz and Chlorite

| **Sample: DGR5-605.55** | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | K | Ti | Fe |
| 6-1 | | 39.31 | | 0.78 | 1.58 | 58.33 | | | |
| 6-2 | | 34.54 | | 1.50 | 3.52 | 59.47 | 0.98 | | |
| 6-3 | | 36.43 | | 0.82 | 2.09 | 60.12 | 0.54 | | |
| 6-4 | | 34.64 | | 1.06 | 8.19 | 56.10 | | | |
| 6-5 | | 36.35 | | 0.49 | 1.74 | 61.42 | | | |
| 6-6 | | 38.83 | | 0.72 | 2.00 | 58.45 | | | |
| 6-7 | 47.58 | | | | 52.42 | | | | |
| 6-8 | 48.00 | | 8.93 | 9.41 | 16.52 | 0.56 | 2.52 | 1.25 | 12.81 |

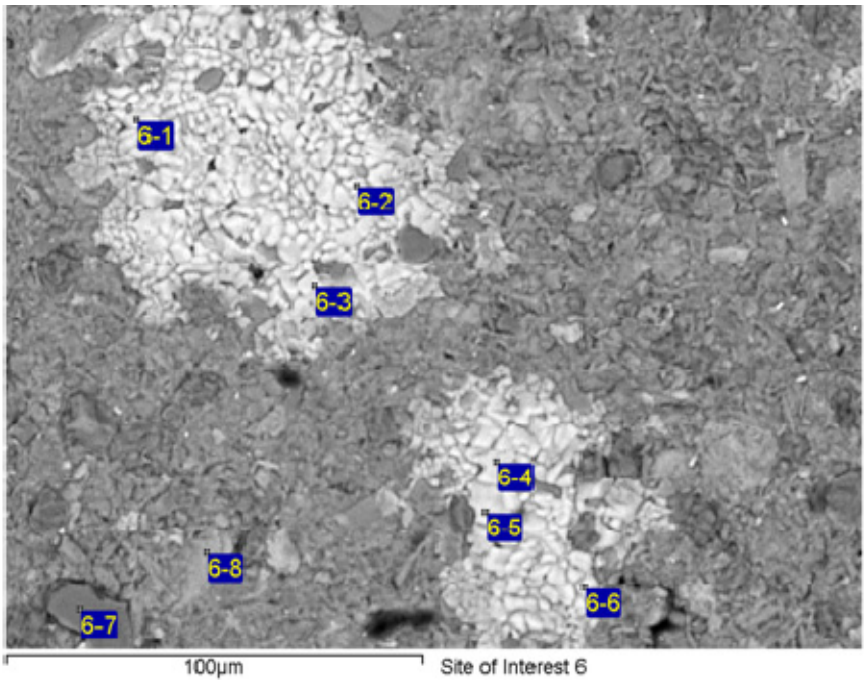


**Plate 6:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5-605.55**

Table 7: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Feldspar and Pyrite

| **Sample:** DGR5 – 645.16 | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Fe |
| 1-1 | | | | | | 54.60 | | | 45.40 |
| 1-2 | 47.87 | | 0.49 | 17.83 | 23.78 | | | 8.67 | 1.36 |
| 1-3 | 2.74 | 36.99 | | 1.30 | 1.79 | | 57.18 | | |
| 1-4 | | 40.31 | | | 1.11 | | 58.58 | | |
| 1-5 | 3.80 | 36.70 | | 1.69 | 3.12 | | 54.03 | 0.66 | |
| 1-6 | 4.06 | 30.09 | | 3.26 | 7.94 | | 50.87 | 2.03 | 1.74 |
| 1-7 | | 36.92 | | 0.97 | 3.23 | | 58.88 | | |

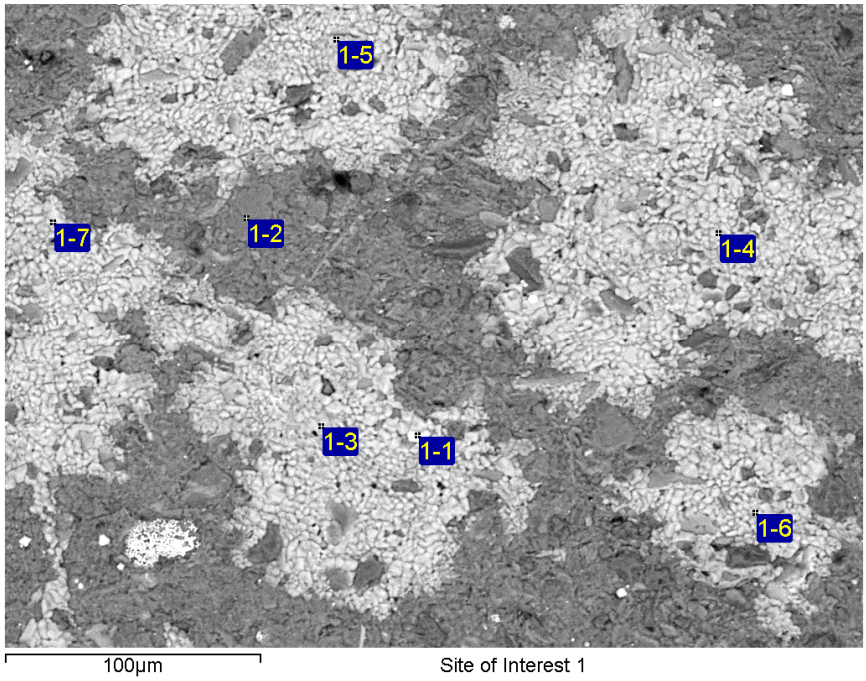


**Plate 7:** Back scattered scanning electron photograph indicating position of spots analysis in DGR5 – 645.16

Table 8: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz, Mica, Chlorite, Rutile and Pyrite

| **Sample:** DGR5 – 645.16 | Elements (in Wt.%) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | P | S | Cl | K | Ca | Ti | Fe |
| 2-1 | 44.77 | | | | 54.71 | | | 0.53 | | | | |
| 2-2 | 39.97 | | 9.48 | 12.51 | 13.76 | | | | | | | 24.27 |
| 2-3 | | | | | | | 56.48 | | | | | 43.52 |
| 2-4 | 8.21 | 32.16 | | 3.57 | 7.55 | | | 45.63 | 1.66 | | | 1.22 |
| 2-5 | 39.06 | | | 0.79 | 2.20 | | | | | | 57.95 | |
| 2-6 | | 37.00 | | 1.16 | 2.66 | | | 58.61 | 0.58 | | | |
| 2-7 | 2.67 | 38.78 | | 0.70 | 1.41 | | | 56.44 | | | | |
| 2-8 | 43.35 | | 2.50 | 17.79 | 26.10 | | | | 10.25 | | | |
| 2-9 | 6.71 | 30.97 | | 1.81 | 5.00 | 1.56 | | 48.88 | 1.68 | 3.39 | | |

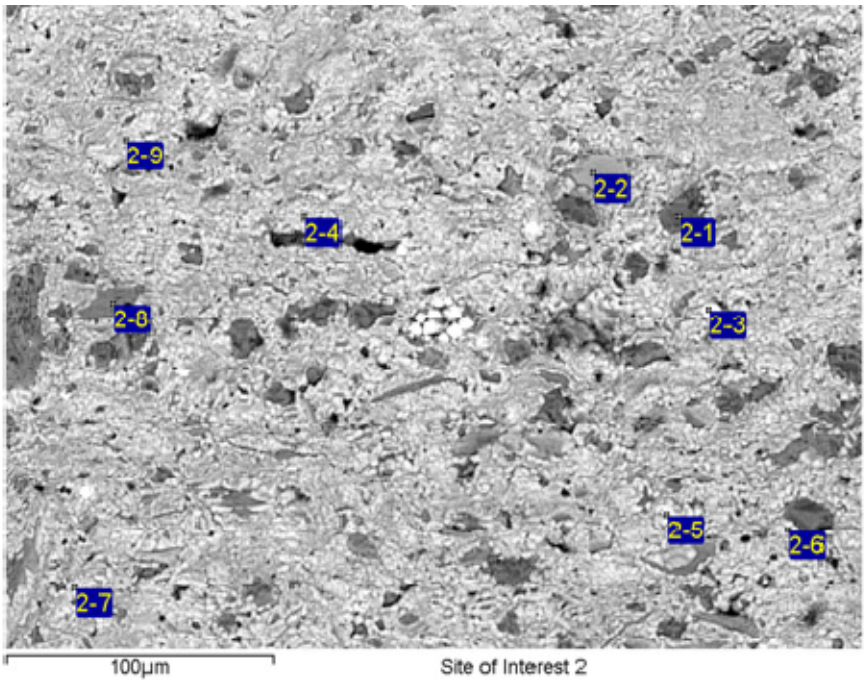


**Plate 8:** Back scattered scanning electron photograph indicating position of spots analysis in DGR5 – 645.16

Table 9: Results of Semi-Quantitative Spot Analysis in Na-Chloride, and Mica

| **Sample:** DGR5 – 645.16 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | P | Cl | K | Ti | Fe |
| 5-1 | 44.33 | | 4.28 | 10.77 | 18.52 | | 0.55 | 3.86 | 4.07 | 13.62 |
| 5-2 | 8.57 | 30.47 | | 5.14 | 10.07 | | 43.29 | 2.46 | | |
| 5-3 | 10.93 | 30.81 | 1.11 | 3.95 | 6.44 | | 43.35 | 1.60 | | 1.81 |
| 5-4 | 4.03 | 31.07 | | 2.59 | 6.51 | 1.10 | 53.91 | 0.80 | | |
| 5-5 | 5.95 | 27.94 | 1.11 | 4.81 | 10.56 | | 43.97 | 2.19 | | 3.48 |

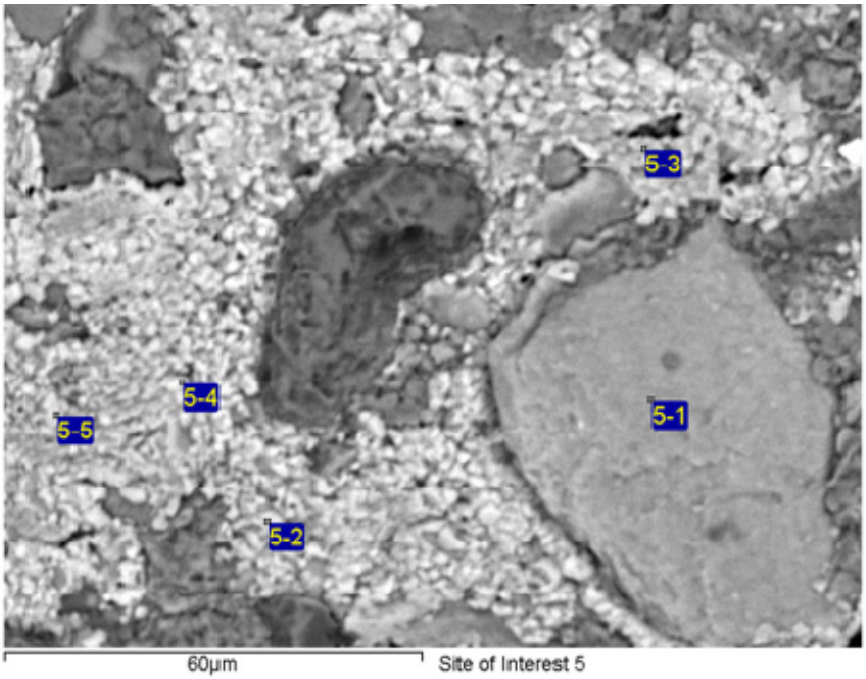


**Plate 9:** Back scattered scanning electron photograph indicating position of spots analysis in DGR5 – 645.16

Table 10: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite, Dolomite, Apatite, Quartz and Pyrite

| **Sample:** DGR5 – 677.25 | Elements (in Wt.%) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | F | Na | Mg | Al | Si | P | S | Cl | K | Ca | Fe |
| 4-1 | | | | | | | | 54.28 | | | | 45.72 |
| 4-2 | 55.14 | | | 10.92 | | | | | | | 28.09 | 5.86 |
| 4-3 | 50.63 | | | | | 49.37 | | | | | | |
| 4-4 | 55.74 | | | 0.73 | | | | | | | 43.54 | |
| 4-5 | 37.13 | 7.75 | | | | 0.67 | 17.83 | | | | 36.62 | |
| 4-6 | 11.16 | | 35.58 | | 1.39 | 2.99 | | | 48.41 | 0.46 | | |
| 4-7 | 6.18 | | | | | 1.46 | | 50.28 | | | | 42.09 |
| 4-8 | 23.81 | | 22.46 | 1.39 | 3.32 | 6.00 | | | 39.49 | 1.32 | | 2.20 |

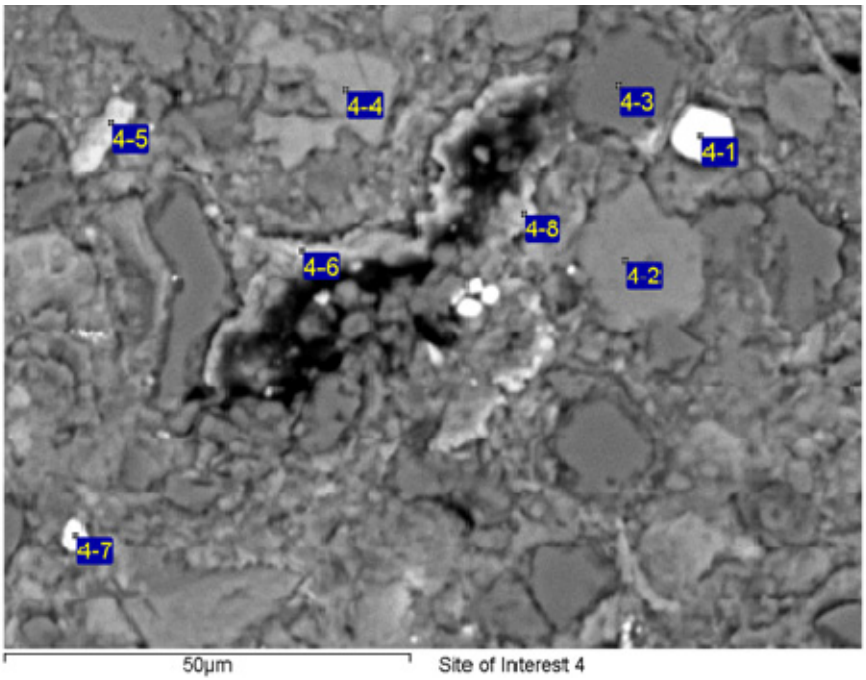


**Plate 10:** Back scattered scanning electron photograph indicating position of spots analysis in DGR5 – 677.25

Table 11: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Apatite, Mica and chlorite

| **Sample:** DGR5 – 677.25 | Elements (in Wt.%) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | F | Na | Mg | Al | Si | P | Cl | K | Ca | Fe |
| 5-1 | 35.75 | 5.94 | | | | | 19.66 | | | 38.65 | |
| 5-2 | 46.73 | | | 12.68 | 9.95 | 15.61 | | 1.43 | | | 13.61 |
| 5-3 | 45.83 | | | 5.73 | 12.59 | 15.67 | | | 2.13 | | 18.05 |
| 5-4 | 18.70 | | 26.16 | 1.11 | 2.52 | 4.88 | | 43.77 | 1.16 | | 1.69 |
| 5-5 | 11.92 | | 29.50 | 1.00 | 4.97 | 9.13 | | 40.19 | 2.04 | | 1.25 |
| 5-6 | 15.10 | | 30.05 | 0.80 | 2.70 | 5.71 | | 42.86 | 0.88 | | 1.90 |
| 5-7 | 12.78 | | 29.32 | 1.28 | 3.62 | 10.06 | | 38.97 | 0.97 | | 3.00 |

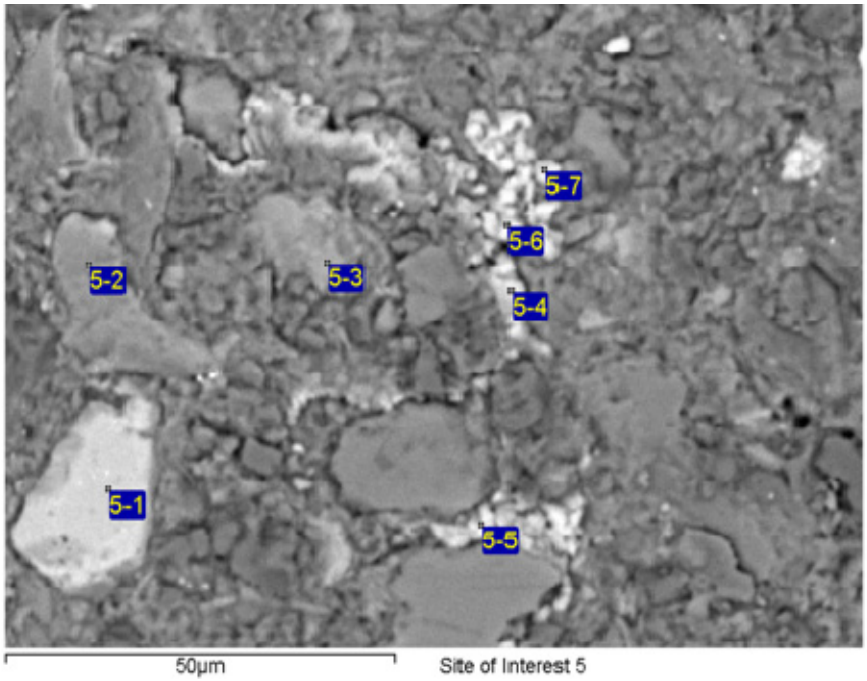


**Plate 11:** Back scattered scanning electron photograph indicating position of spots analysis in DGR5 – 677.25

Table 12: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite, Quartz and Pyrite

| **Sample:** DGR5 – 677.25 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ca | Fe |
| 7-1 | 13.98 | 27.24 | 0.98 | 4.45 | 10.61 | | 38.67 | 1.23 | | 2.86 |
| 7-2 | 16.51 | 30.31 | 0.69 | 1.70 | 7.74 | | 43.06 | | | |
| 7-3 | 51.37 | | | | 48.63 | | | | | |
| 7-4 | 54.15 | | 1.39 | 0.81 | 2.13 | | | 0.65 | 40.87 | |
| 7-5 | | | | | | 55.52 | | | | 44.48 |

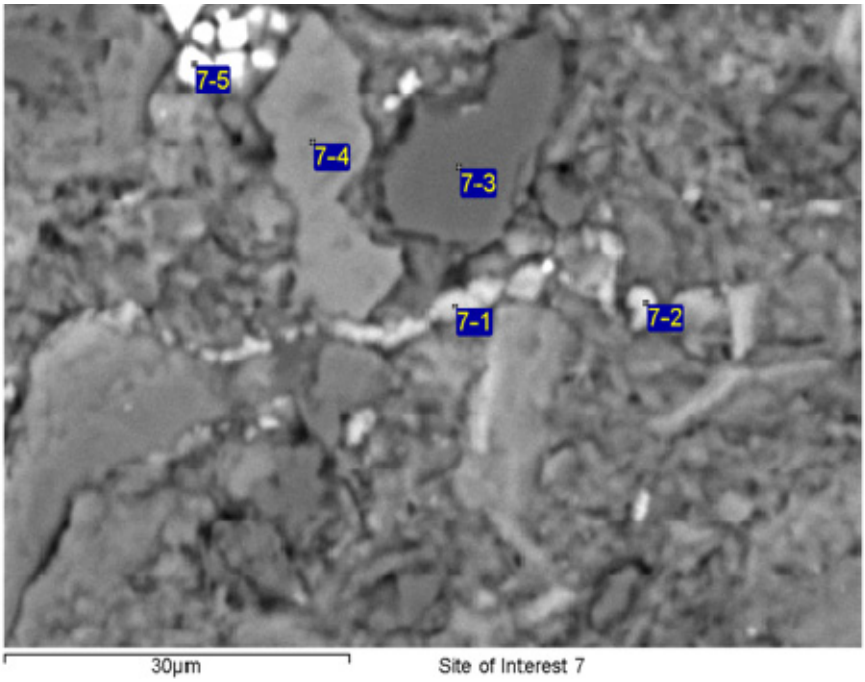


**Plate 12:** Back scattered scanning electron photograph indicating position of spots analysis in DGR5 – 677.25

Table 13: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz and Pyrite

| **Sample:** DGR5 – 692.35 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ca | Fe |
| 1-1 | | 1.00 | | | 0.73 | 55.15 | | | | 43.12 |
| 1-2 | 52.98 | | | | 47.02 | | | | | |
| 1-3 | 24.77 | 25.13 | 1.76 | 3.40 | 4.47 | | 35.55 | 0.56 | | 4.35 |
| 1-4 | | 38.94 | | 1.50 | 2.61 | | 56.95 | | | |
| 1-5 | 5.66 | 33.77 | | 1.50 | 4.83 | | 53.45 | 0.79 | | |
| 1-6 | 4.65 | 33.82 | | 3.23 | 6.99 | | 48.18 | 1.67 | 1.45 | |
| 1-7 | 3.91 | 34.63 | | 2.87 | 6.57 | | 50.68 | 1.35 | | |

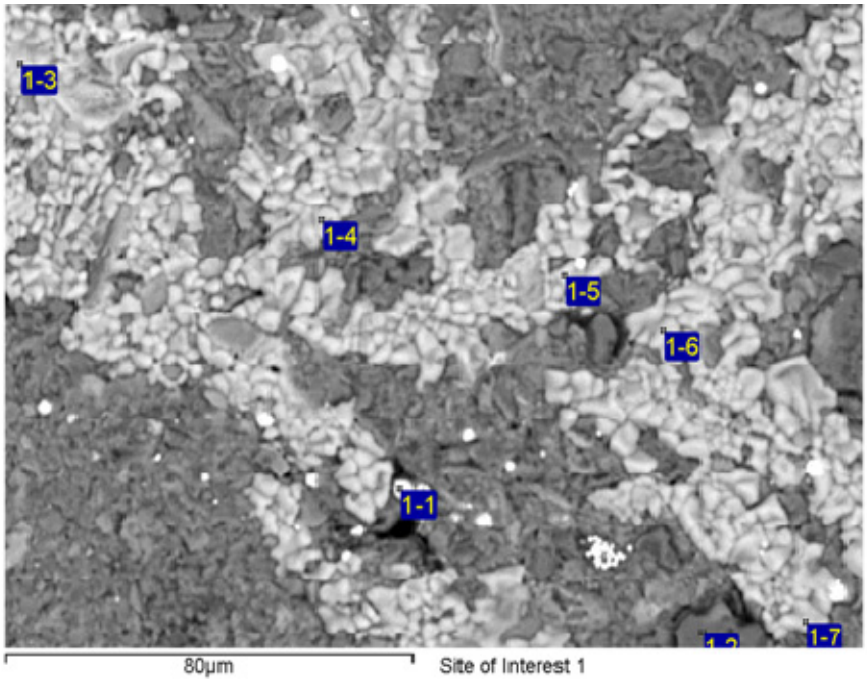


**Plate 13:** Back scattered scanning electron photograph indicating position of spots analysis in DGR5 – 692.35

Table 14: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite, Mica and Pyrite

| **Sample:** DGR5 – 692.35 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ca | Fe |
| 2-1 | 53.44 | | 1.67 | | | | | | 44.89 | |
| 2-2 | 39.43 | 1.81 | 1.30 | 15.43 | 23.94 | | 4.90 | 9.42 | | 3.77 |
| 2-3 | 9.71 | 32.63 | 0.83 | 2.81 | 6.92 | | 44.45 | 0.83 | | 1.81 |
| 2-4 | 8.27 | | | 0.61 | 2.11 | 48.02 | | | | 40.99 |
| 2-5 | | 39.47 | | 0.49 | 0.78 | | 59.26 | | | |
| 2-6 | 3.64 | 37.81 | | 1.12 | 3.23 | | 54.19 | | | |
| 2-7 | | 35.24 | | 1.22 | 2.10 | | 61.44 | | | |

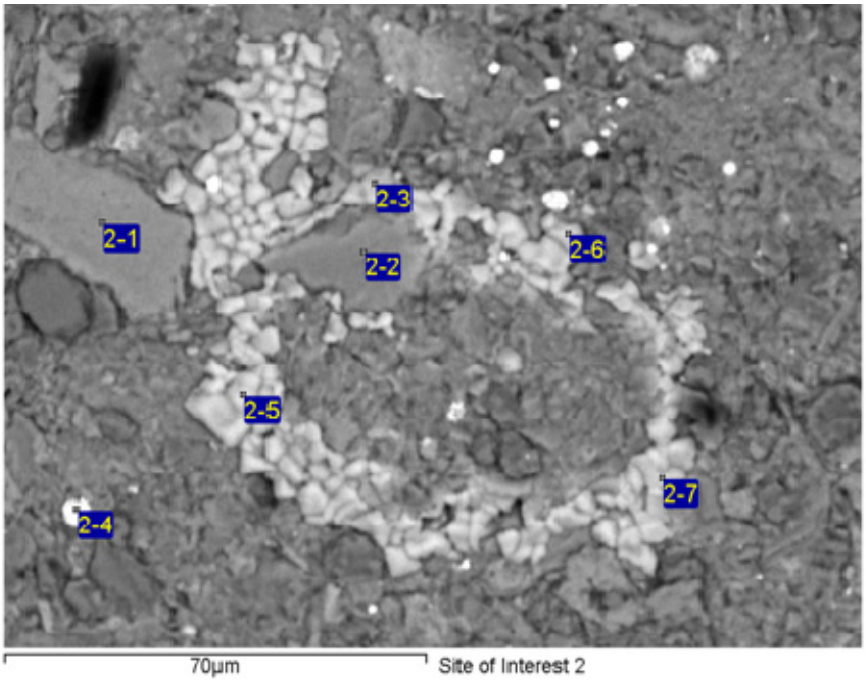


**Plate 14:** Back scattered scanning electron photograph indicating position of spots analysis in DGR5 – 692.35

Table 15: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Mica and Pyrite

| **Sample:** DGR5 – 692.35 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ca | Fe |
| 5-1 | | | | 0.64 | 1.51 | 54.45 | | | | 43.40 |
| 5-2 | 46.56 | | 1.43 | 14.55 | 24.94 | | | 8.77 | | 3.74 |
| 5-3 | 2.95 | 35.70 | | 1.47 | 3.58 | | 56.30 | | | |
| 5-4 | 4.48 | 33.31 | | 1.37 | 4.16 | | 54.72 | 0.77 | 1.19 | |
| 5-5 | 5.32 | 37.63 | | 1.40 | 3.14 | | 51.91 | 0.61 | | |
| 5-6 | 2.30 | 32.92 | | 1.29 | 3.05 | | 59.02 | | | 1.41 |
| 5-7 | 2.72 | 35.34 | | 0.57 | 4.68 | | 56.68 | | | |
| 5-8 | 5.48 | 37.28 | | 1.60 | 3.80 | | 51.84 | | | |

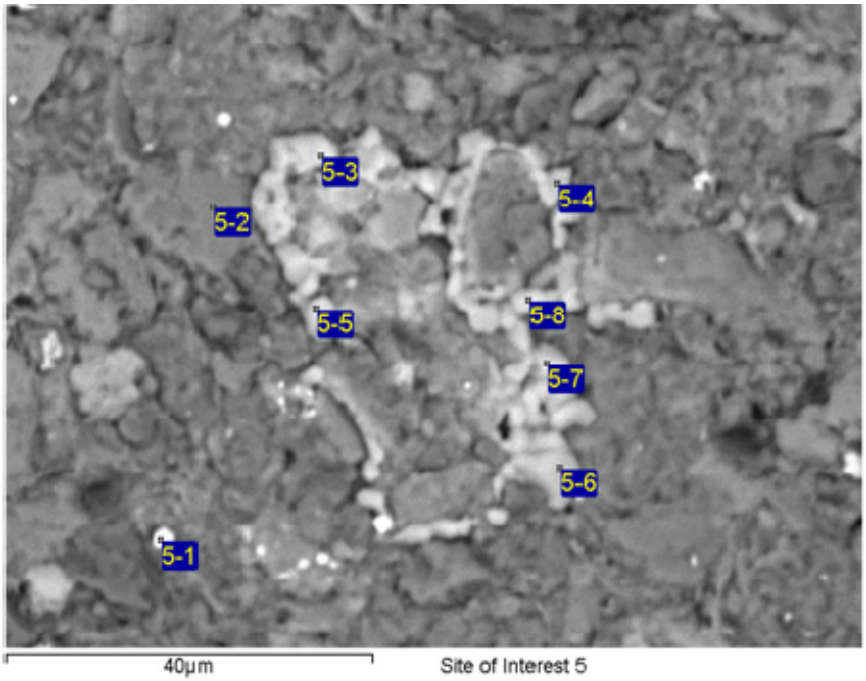


**Plate 15:** Back scattered scanning electron photograph indicating position of spots analysis in DGR5 – 692.35

Table 16: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Feldspar, Mica and Pyrite

| **Sample: DGR5 – 699.49** | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Fe |
| 1-1 | | 0.88 | | | | 54.52 | | | 44.60 |
| 1-2 | 44.45 | | 1.97 | 14.27 | 26.61 | | | 9.55 | 3.15 |
| 1-3 | 46.20 | | 8.19 | 11.09 | 15.96 | | | 0.75 | 17.82 |
| 1-4 | 7.82 | 30.52 | 1.21 | 5.71 | 8.57 | | 40.31 | 1.41 | 4.44 |
| 1-5 | 8.10 | 32.33 | | 2.50 | 7.90 | | 48.03 | 1.14 | |
| 1-6 | 4.73 | 35.74 | | 1.60 | 3.70 | | 53.60 | 0.64 | |
| 1-7 | 7.81 | 30.60 | 0.65 | 3.66 | 6.33 | | 49.55 | 1.40 | |
| 1-8 | | 37.62 | | 0.87 | 2.74 | | 58.78 | | |

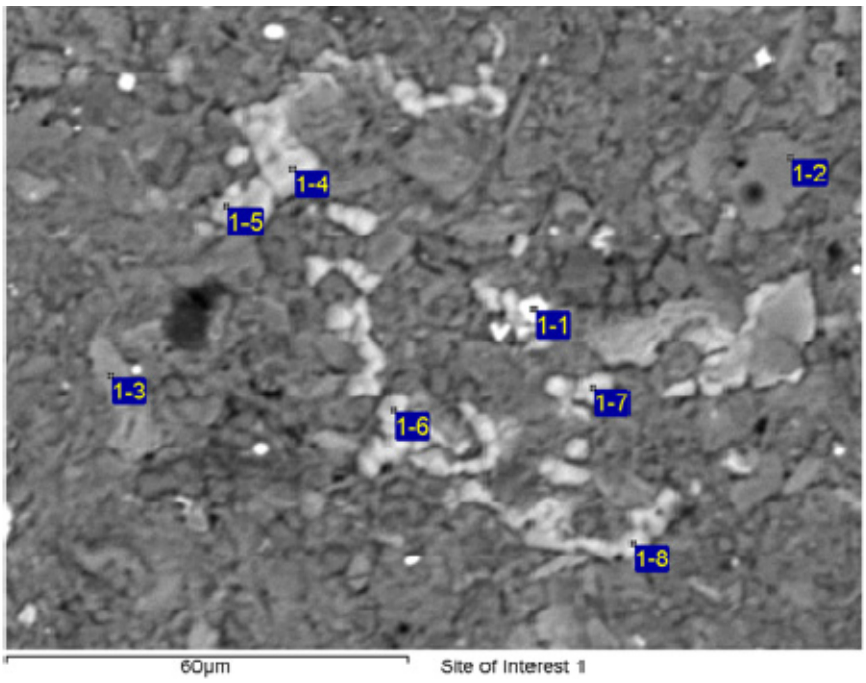


**Plate 16:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5 – 699.49**

Table 17: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Pyrite and Chlorite

| **Sample: DGR5 – 699.49** | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Fe |
| 5-1 | 8.52 | 34.01 | | 1.91 | 6.16 | | 47.47 | 0.75 | 1.18 |
| 5-2 | | 0.91 | | | 0.61 | 54.18 | | | 44.30 |
| 5-3 | 7.47 | 35.93 | | 1.34 | 5.75 | | 49.51 | | |
| 5-4 | 13.40 | 32.17 | | 2.14 | 4.39 | | 46.92 | 0.98 | |
| 5-5 | 5.74 | 28.25 | | 0.97 | 4.58 | | 59.69 | 0.77 | |
| 5-6 | 9.96 | 32.98 | 1.04 | 2.73 | 4.61 | | 46.79 | 0.80 | 1.09 |
| 5-7 | 13.44 | 32.04 | 0.54 | 2.48 | 6.31 | | 44.41 | 0.77 | |
| 5-8 | 45.95 | | 7.84 | 10.71 | 14.74 | | | | 20.77 |

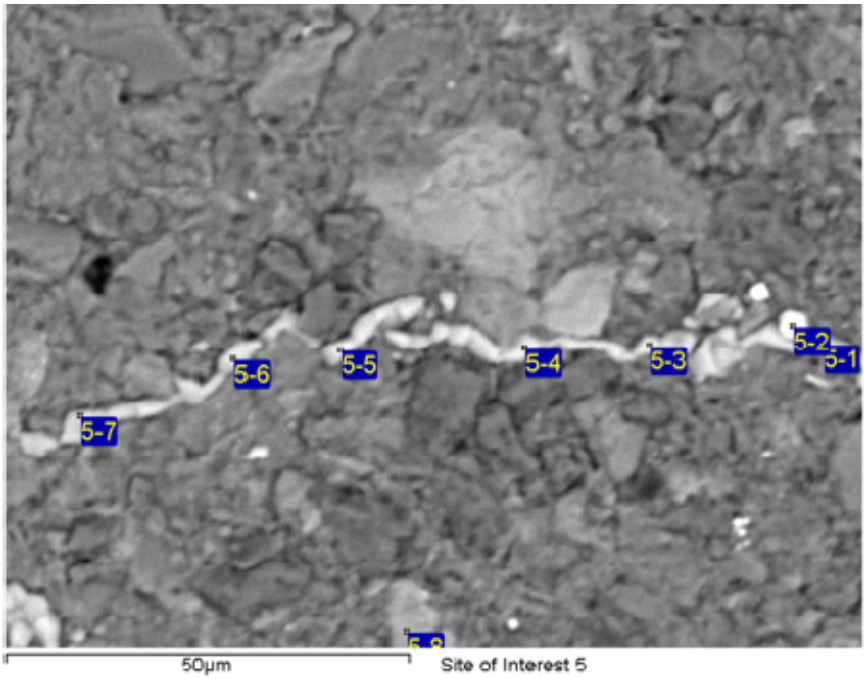


**Plate 17:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5 – 699.49**

Table 18: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz, Mica, Chlorite and Pyrite

| **Sample: DGR5 – 699.49** | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Fe |
| 6-1 | 45.32 | | 1.64 | 15.19 | 26.14 | | | 9.59 | 2.11 |
| 6-2 | | | | | 0.89 | 54.37 | | | 44.74 |
| 6-3 | 44.92 | | | | 55.08 | | | | |
| 6-4 | 44.83 | | 1.27 | 16.06 | 26.31 | | | 9.26 | 2.27 |
| 6-5 | 3.18 | 36.19 | | 2.21 | 4.43 | | 52.90 | 1.09 | |
| 6-6 | 3.19 | 33.49 | | 1.74 | 5.09 | | 54.21 | 1.04 | 1.25 |
| 6-7 | | 38.12 | | | 0.55 | | 61.33 | | |
| 6-8 | 5.04 | 38.64 | | | 3.03 | | 53.29 | | |
| 6-9 | 2.43 | 33.61 | | 3.12 | 7.24 | | 51.87 | 1.74 | |

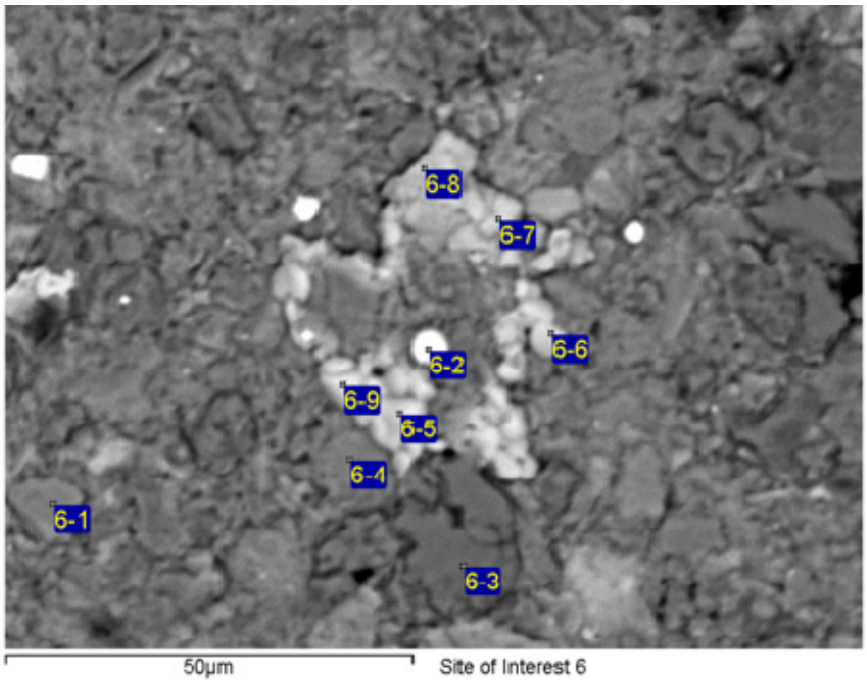


**Plate 18:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5 – 699.49**

Table 19: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite and Quartz

| **Sample: DGR5 -704.99** | Elements (in Wt.%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | K | Ca |
| 3-1 | 25.20 | 23.61 | 0.66 | 2.46 | 6.18 | 27.43 | 1.63 | 12.83 |
| 3-2 | 10.94 | 29.98 | | 2.94 | 8.61 | 40.07 | 2.89 | 4.57 |
| 3-3 | 13.21 | 30.59 | 0.65 | 2.39 | 6.00 | 40.98 | 1.24 | 4.93 |
| 3-4 | 12.97 | 29.45 | | 1.94 | 5.60 | 40.31 | 1.77 | 7.96 |
| 3-5 | 53.40 | | | | | | | 46.60 |
| 3-6 | 55.09 | | | | 40.42 | | | 4.49 |

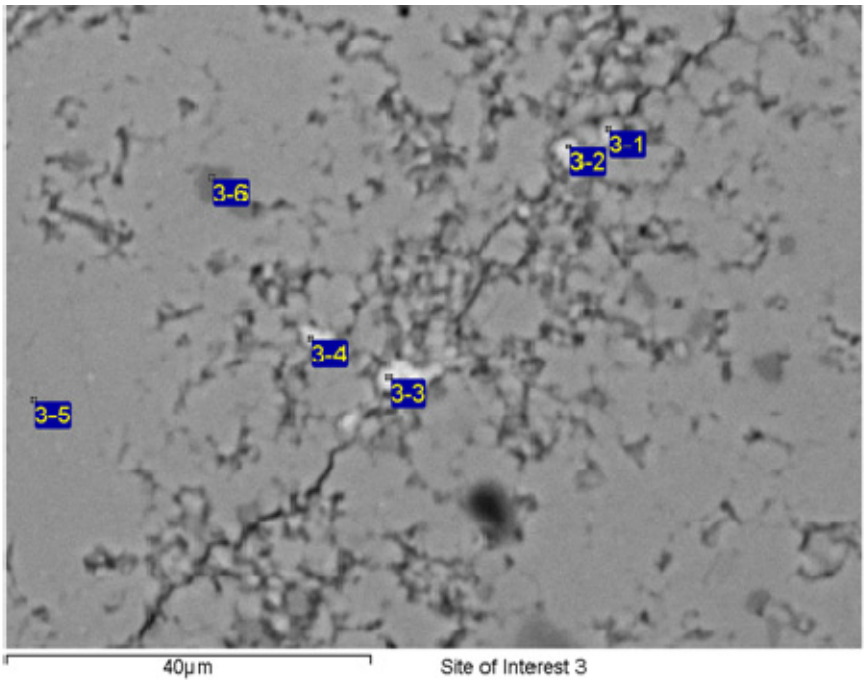


**Plate 19:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5 -704.99**

Table 20: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz, Calcite and Apatite

| **Sample: DGR5 -704.99** | Elements (in Wt.%) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | F | Na | Mg | Al | Si | P | S | Cl | K | Ca |
| 5-1 | 52.36 | | | | | 47.64 | | | | | |
| 5-2 | 9.04 | | 32.66 | | 2.40 | 5.36 | | | 45.45 | 1.04 | 4.05 |
| 5-3 | 2.82 | | 17.39 | | 1.40 | 3.60 | | | 71.91 | 1.61 | 1.27 |
| 5-4 | 11.02 | | 31.35 | 0.64 | 2.83 | 6.34 | | | 42.17 | 1.54 | 4.13 |
| 5-5 | 41.14 | 9.26 | 0.86 | | 0.67 | 1.09 | 14.07 | 0.44 | 0.69 | | 31.78 |
| 5-6 | 49.99 | | | | | 1.22 | | | | | 48.78 |

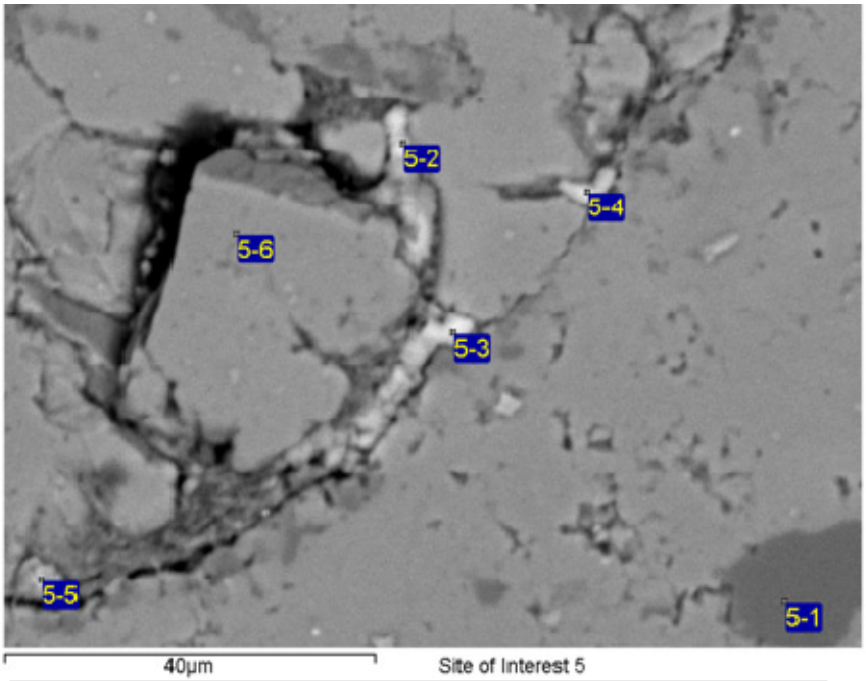


**Plate 20:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5 -704.99**

Table 21: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite and Dolomite

| **Sample: DGR5 -704.99** | Elements (in Wt.%) | | | | | |
|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Cl | Ca | Fe |
| 8-1 | 56.48 | | 16.48 | | 27.04 | |
| 8-2 | 56.01 | | 11.87 | | 27.70 | 4.42 |
| 8-3 | 54.84 | | 0.64 | | 44.52 | |
| 8-4 | | 39.92 | | 60.08 | | |

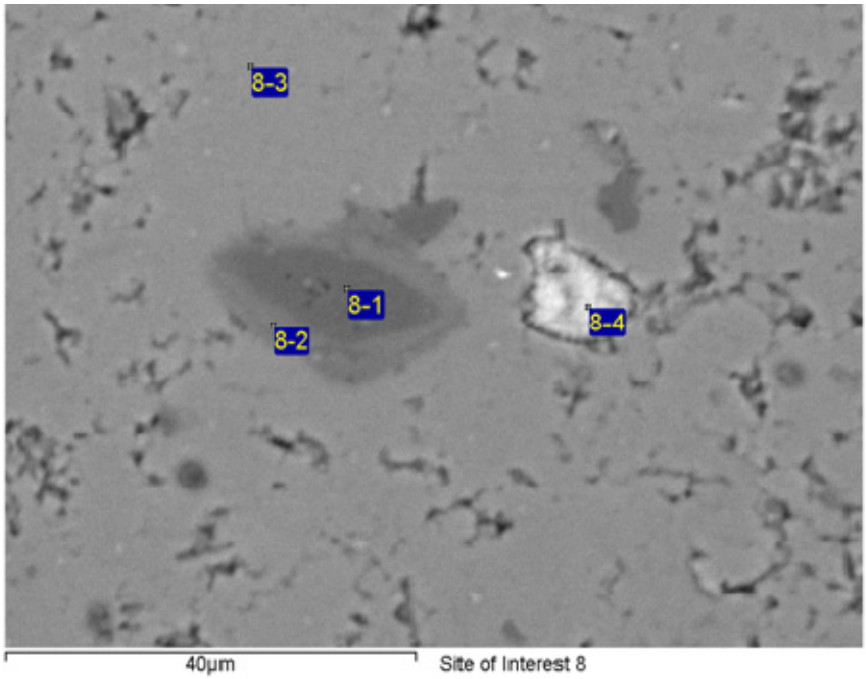


**Plate 21:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5 -704.99**

Table 22: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite and Dolomite

| **Sample: DGR5 – 715.40** | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | Ca | Fe | Br |
| 1-1 | | 40.87 | | | | 59.13 | | | |
| 1-2 | 56.49 | | 13.35 | | | | 28.40 | 1.76 | |
| 1-3 | 56.73 | | 14.90 | | 0.77 | | 26.35 | | 1.25 |
| 1-4 | 52.48 | | 0.86 | 1.12 | 2.08 | | 43.45 | | |
| 1-5 | | 34.68 | | | 0.53 | 64.20 | 0.59 | | |
| 1-6 | 2.73 | 39.03 | | | 0.66 | 57.57 | | | |

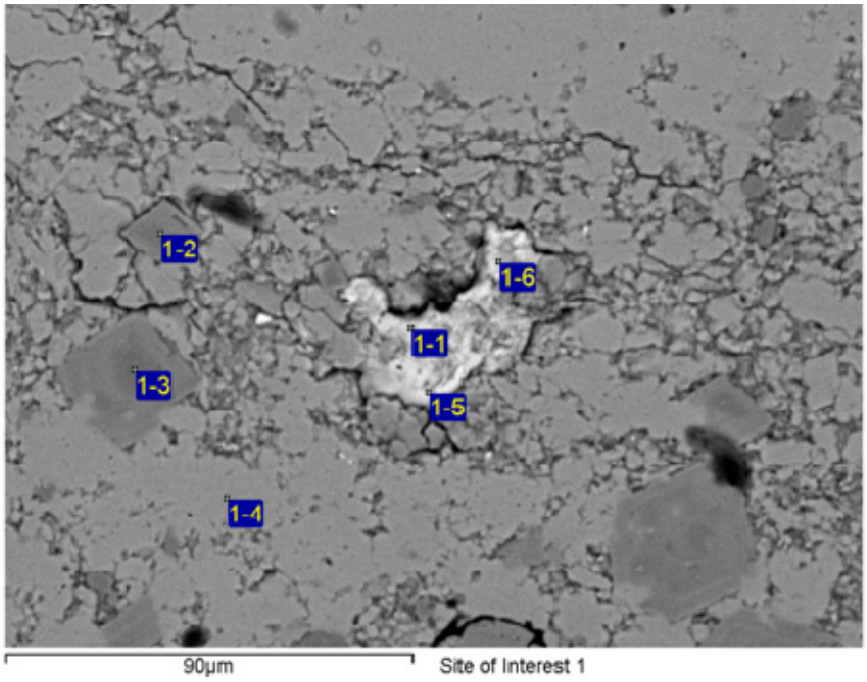


**Plate 22:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5 – 715.40**

Table 23: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite and Dolomite

| **Sample: DGR5 – 715.40** | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | K | Ca | Fe |
| 5-1 | 13.67 | 29.87 | | 1.51 | 2.86 | 43.54 | 0.80 | 7.74 | |
| 5-2 | 5.72 | 33.78 | | 0.47 | 0.84 | 57.70 | | 1.50 | |
| 5-3 | 56.38 | | 13.89 | | | | | 26.45 | 3.28 |
| 5-4 | 53.78 | | 0.74 | | | | | 45.47 | |

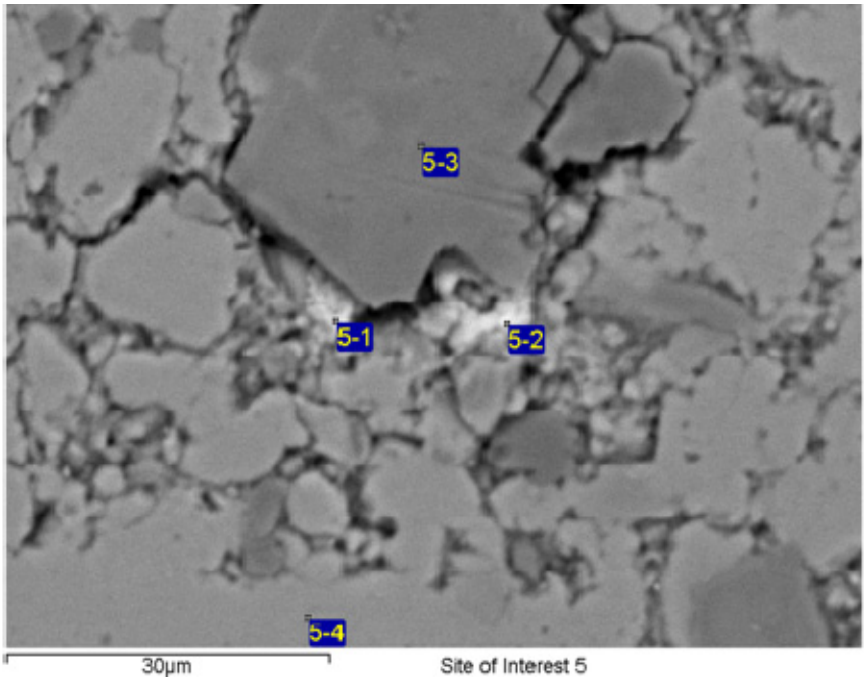


**Plate 23:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5 – 715.40**

Table 24: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite and Dolomite

| **Sample: DGR5 – 715.40** | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | K | Ca | Fe |
| 7-1 | 6.07 | 33.26 | | 0.56 | 1.86 | 49.59 | | 8.67 | |
| 7-2 | 10.24 | 21.10 | | 2.05 | 6.95 | 52.70 | 1.50 | 5.47 | |
| 7-3 | 6.25 | 36.65 | | 0.78 | 1.37 | 53.77 | | 1.18 | |
| 7-4 | 2.73 | 36.08 | | 0.60 | 1.48 | 57.24 | | 1.87 | |
| 7-5 | 5.13 | 33.10 | | 0.76 | 1.89 | 54.38 | | 4.73 | |
| 7-6 | 55.57 | | 0.60 | | | | | 43.83 | |
| 7-7 | 54.96 | | 13.25 | | 3.29 | | | 26.73 | 1.76 |

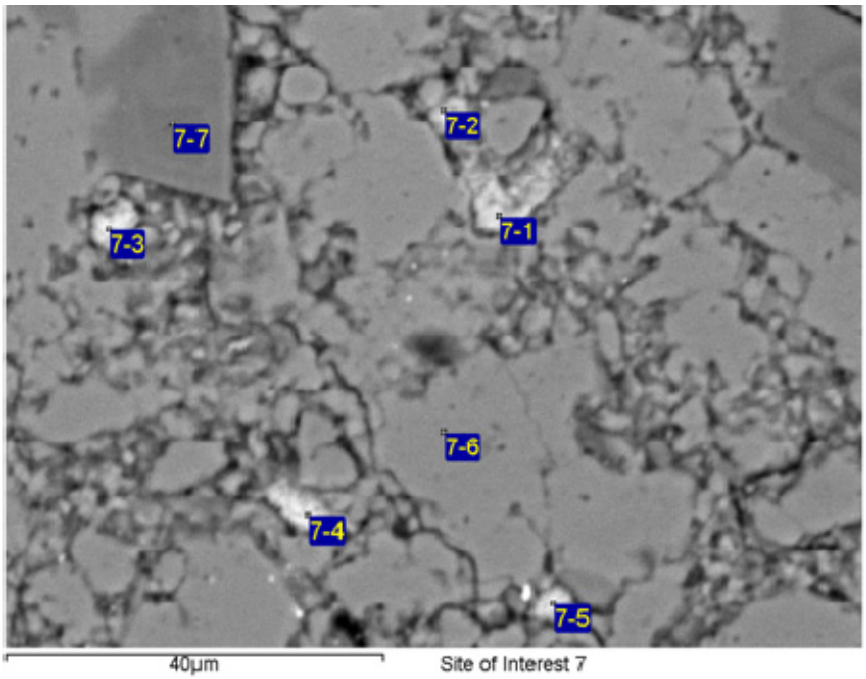


**Plate 24:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5 – 715.40**

Table 25: Results of Semi-Quantitative Spot Analysis in Na-Chloride and Pyrite

| **Sample:** DGR5 – 725.33 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ca | Fe |
| 1-1 | 3.20 | 40.67 | | | | | 55.32 | 0.33 | 0.48 | |
| 1-2 | 4.60 | 32.64 | 0.44 | 1.20 | 2.40 | | 43.58 | 0.86 | 14.29 | |
| 1-3 | | | | | | 55.04 | | | 0.95 | 44.02 |
| 1-4 | 8.56 | 32.34 | 0.35 | 1.69 | 7.92 | | 44.10 | 1.15 | 3.90 | |
| 1-5 | 1.30 | 34.23 | | | | | 62.86 | 0.78 | 0.83 | |

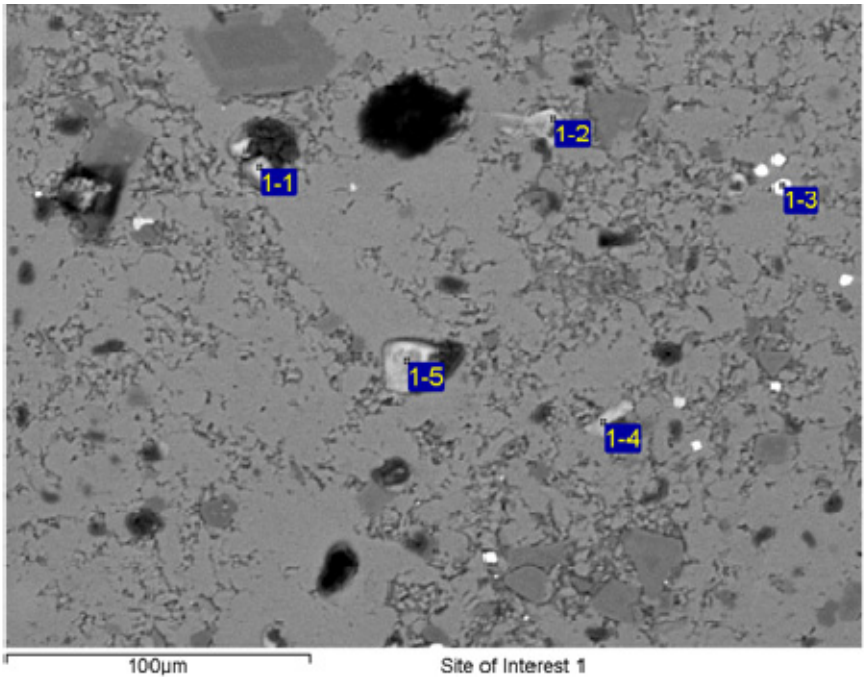


**Plate 25:** Back scattered scanning electron photograph indicating position of spots analysis in DGR5 – 725.33

Table 26: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite and Dolomite

| **Sample:** DGR5 – 725.33 | Elements (in Wt.%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | K | Ca |
| 3-1 | 14.03 | 20.65 | | 1.91 | 5.42 | 52.46 | 1.42 | 4.10 |
| 3-2 | 57.03 | | 16.33 | | | | | 26.65 |
| 3-3 | 52.01 | | 0.98 | | | | | 47.01 |

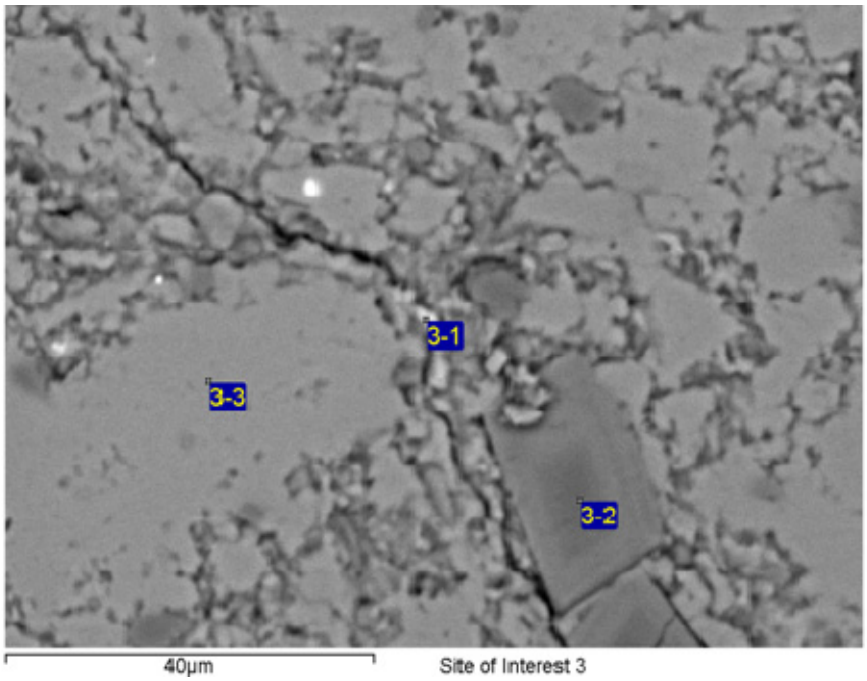


**Plate 26:** Back scattered scanning electron photograph indicating position of spots analysis in DGR5 – 725.33

Table 27: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz and Calcite

| **Sample:** DGR5 – 725.33 | Elements (in Wt.%) | | | | | |
|---|---|---|---|---|---|---|
| Spots | O | Na | Al | Si | Cl | Ca |
| 6-1 | 26.73 | 28.61 | 0.49 | 2.24 | 32.62 | 9.30 |
| 6-2 | 54.39 | | | | | 45.61 |
| 6-3 | 53.75 | | | 44.60 | | 1.65 |

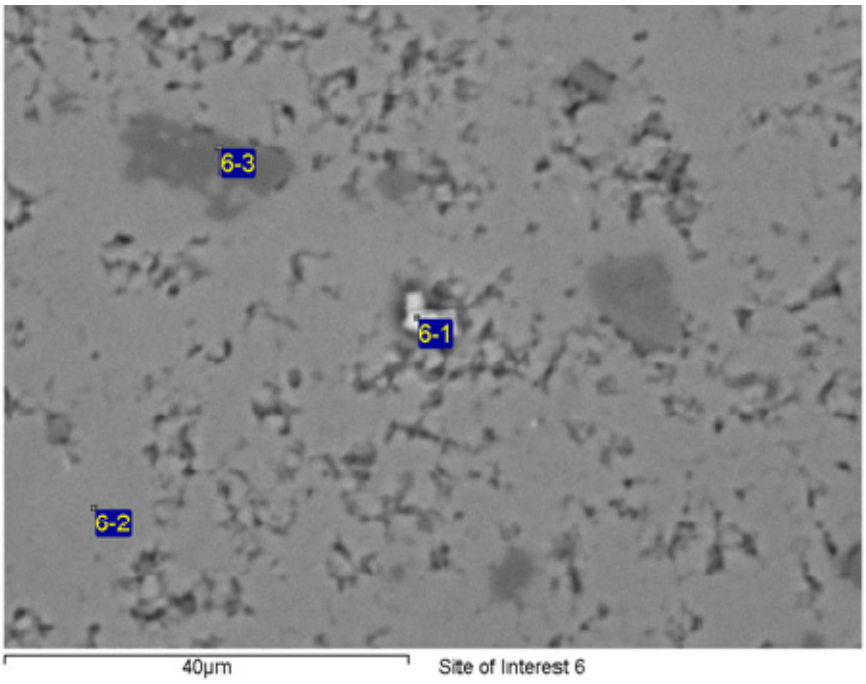


**Plate 27:** Back scattered scanning electron photograph indicating position of spots analysis in DGR5 – 725.33

Table 28: Results of Semi-Quantitative Spot Analysis in Quartz, Apatite and Calcite

| **Sample: DGR5 – 764.72** | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | F | Na | Mg | Al | Si | P | S | Cl | Ca |
| 2-1 | 39.07 | 7.98 | 0.62 | | 0.50 | 0.68 | 15.03 | 0.61 | 0.66 | 34.85 |
| 2-2 | 52.20 | | | | | 46.83 | | | | 0.98 |
| 2-3 | 53.16 | | | 0.54 | 0.52 | 1.01 | | | | 44.77 |

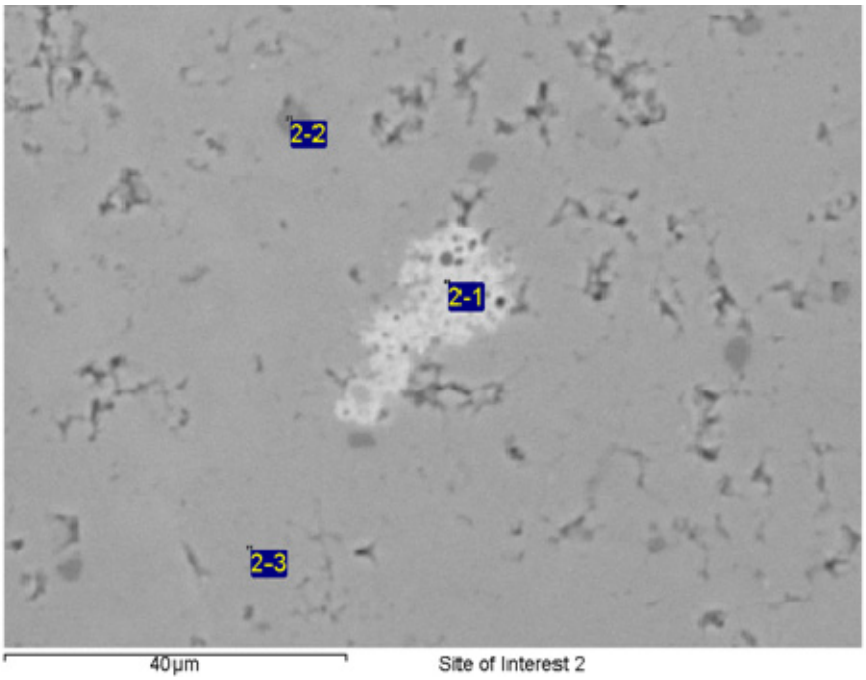


**Plate 28:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5 – 764.72**

Table 29: Results of Semi-Quantitative Spot Analysis in Feldspar, Quartz, Calcite and Pyrite

| **Sample: DGR5 – 764.72** | Elements (in Wt.%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Spots | O | Mg | Al | Si | S | K | Ca | Fe |
| 4-1 | 45.85 | | 9.10 | 31.82 | | 13.22 | | |
| 4-2 | 52.70 | | | 47.30 | | | | |
| 4-3 | | | | 0.51 | 50.98 | | 2.89 | 45.62 |
| 4-4 | 53.26 | | | 46.74 | | | | |
| 4-5 | 53.82 | 0.62 | | | | | 45.55 | |

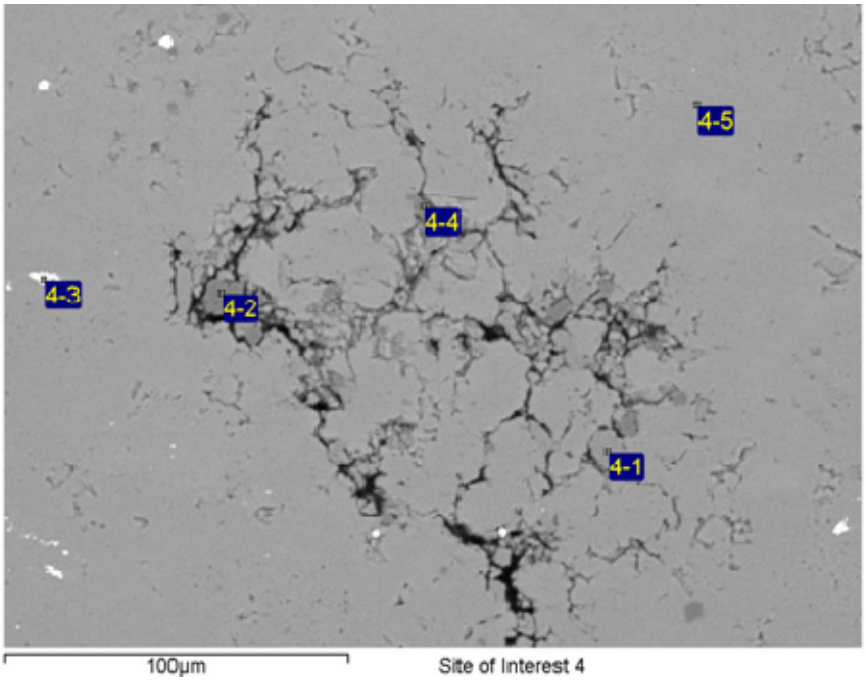


**Plate 29:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5 – 764.72**

Table 30: Results of Semi-Quantitative Spot Analysis in Calcite, Quartz and Pyrite

| **Sample: DGR5 – 764.72** | Elements (in Wt.%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Spots | O | Mg | Al | Si | S | K | Ca | Fe |
| 5-1 | 53.73 | 0.87 | | | | | 45.40 | |
| 5-2 | 52.07 | | | 47.24 | | | 0.69 | |
| 5-3 | 11.48 | | 0.98 | 2.48 | 45.61 | 0.47 | 1.28 | 37.71 |
| 5-4 | 24.38 | | | | 24.56 | | 28.35 | 22.71 |

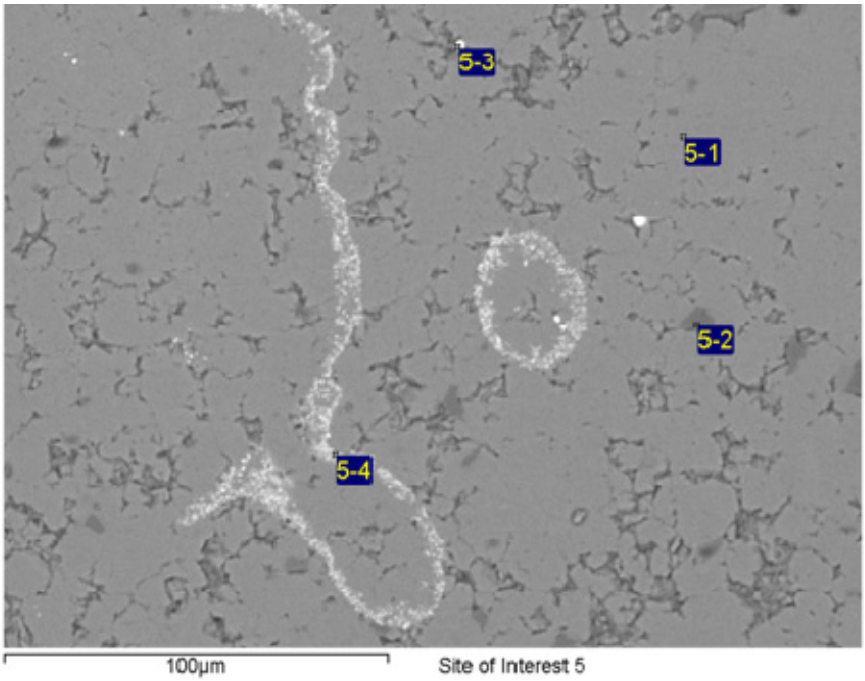


**Plate 30:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR5 – 764.72**

## 4. Comments

1. General Mineralogy by semi-quantitative XRD analysis and analysis of pore fabric and soluble minerals by SEM-EDS was carried out for all the ten DGR5 samples.
2. In general, the samples were mainly composed of quartz, mica and calcite with minor to moderate amounts of potassium feldspar, chlorite, plagioclase and ankerite, and traces of halite, pyrite and anatase.
3. SEM-EDS study indicated presence of Na-Chloride (halite) in most of these samples.
4. Na-Chloride (halite) mostly occurred as voids/cavity fillings interstitial materials mainly within silicates groundmass in the form of irregular bands, veins/stringers and disseminated grains.
5. Irregular discontinuous rimmed halite along the boundary of silicates was commonly noted.
6. Broadly interconnected bands/veins of halite were also noted within silicates and carbonates groundmass.
7. The irregular or sub-rounded grains and stringers of pyrite were commonly noted within silicates and carbonates matrix in most of the samples.

# *Appendix – 1: XRD Results*

# Summary of Semi-Quantitative X-ray Diffraction Results

***Crystalline Mineral Assemblage (relative proportions based on peak height)***

| Sample | Major (>30% Wt) | Moderate (10% -30% Wt) | Minor (2% -10% Wt) | Trace (<2% Wt) |
|---|---|---|---|---|
| *DGR5-583.40* | quartz | potassium-feldspar, ankerite | calcite, chlorite, mica, halite | *anatase |
| *DGR5-605.55* | mica, quartz | potassium-feldspar, chlorite | ankerite, calcite | *halite, *anatase |
| *DGR5-645.16* | quartz, mica | chlorite | potassium-feldspar, plagioclase, ankerite, pyrite | *apatite, *anatase, *halite |
| *DGR5-677.25* | quartz, mica | chlorite | potassium-feldspar, calcite, plagioclase | *pyrite, *ankerite, *halite, *anatase, *apatite |
| *DGR5-692.35* | mica, quartz | chlorite | potassium-feldspar, calcite, plagioclase, pyrite | *ankerite, *anatase, *halite, *apatite |
| *DGR5-699.49* | mica, quartz | chlorite | pyrite, calcite, plagioclase, potassium-feldspar | *ankerite, *anatase, *halite |
| *DGR5-704.99* | calcite | - | chlorite, Quartz | *potassium-feldspar, *ankerite, *mica |
| *DGR5-715.40* | calcite | - | potassium-feldspar, quartz, chlorite, ankerite | *mica |
| *DGR5-725.33* | calcite | - | potassium-feldspar, quartz, chlorite | *ankerite, *mica |
| *DGR5-764.72* | calcite | - | potassium-feldspar, quartz, chlorite | *ankerite, *mica |

** tentative identification due to low concentrations, diffraction line overlap or poor crystallinity*

| Mineral | Composition |
|---|---|
| Anatase | $TiO_2$ |
| Ankerite | $CaFe(CO_3)_2$ |
| Apatite | $Ca_5(PO_4)_3(F,Cl,OH)$ |
| Calcite | $CaCO_3$ |
| Chlorite | $(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$ |
| Halite | NaCl |
| Mica | $K(Mg,Fe)Al_2Si_3AlO_{10}(OH)_2$ |
| Plagioclase | $(NaSi,CaAl)AlSi_2O_8$ |
| Potassium Feldsp | $KAlSi_3O_8$ |
| Pyrite | $FeS_2$ |
| Quartz | $SiO_2$ |

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Technologist, XRD

Aparup Chattopadhyay, Ph.D., P.Geo
Senior Mineralogist

## Method Summary

| | |
|---|---|
| ***Instrument:*** | BRUKER AXS D8 Advance Diffractometer |
| ***Test Conditions:*** | Co radiation, 40 kV, 35 mA<br>Regular Scanning: Step: 0.02°, Step time:0.2s, 2θ range: 3-70° |
| ***Detection Limit*** : | 0.5-2%. Strongly dependent on crystallinity. |

***Mineral Identification and Interpretation:***

Mineral identification and interpretation involve matching the diffraction pattern of an unknown material to patterns of single-phase reference materials. The reference patterns are compiled by the JCPDS-ICDD database and released on software as Powder Diffraction File (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds. Mineral proportions are based on relative peak heights and may be strongly influenced by crystallinity, structural group or preferred orientations. Interpretations and relative proportions should be accompanied by supporting petrographic and geochemical data (WRA, ICP-OES).

***Semi-Quantitative Analysis:***

The Semi-Quantitative analysis (RIR method) is performed based on each mineral's relative peak heights and of their respective I/Icor values, which are available from the PDF database. Mineral abundances for the bulk sample (in weight %) are generated by Bruker-EVA Software. These data are reconciled with a bulk chemistry (e.g. whole rock analysis including $SiO_2$, $Al_2O_3$, $Na_2O$, $K_2O$, CaO, MgO, $Fe_2O_3$, $Cr_2O_3$, MnO, $TiO_2$, $P_2O_5$, $V_2O_5$ or other chemical data).

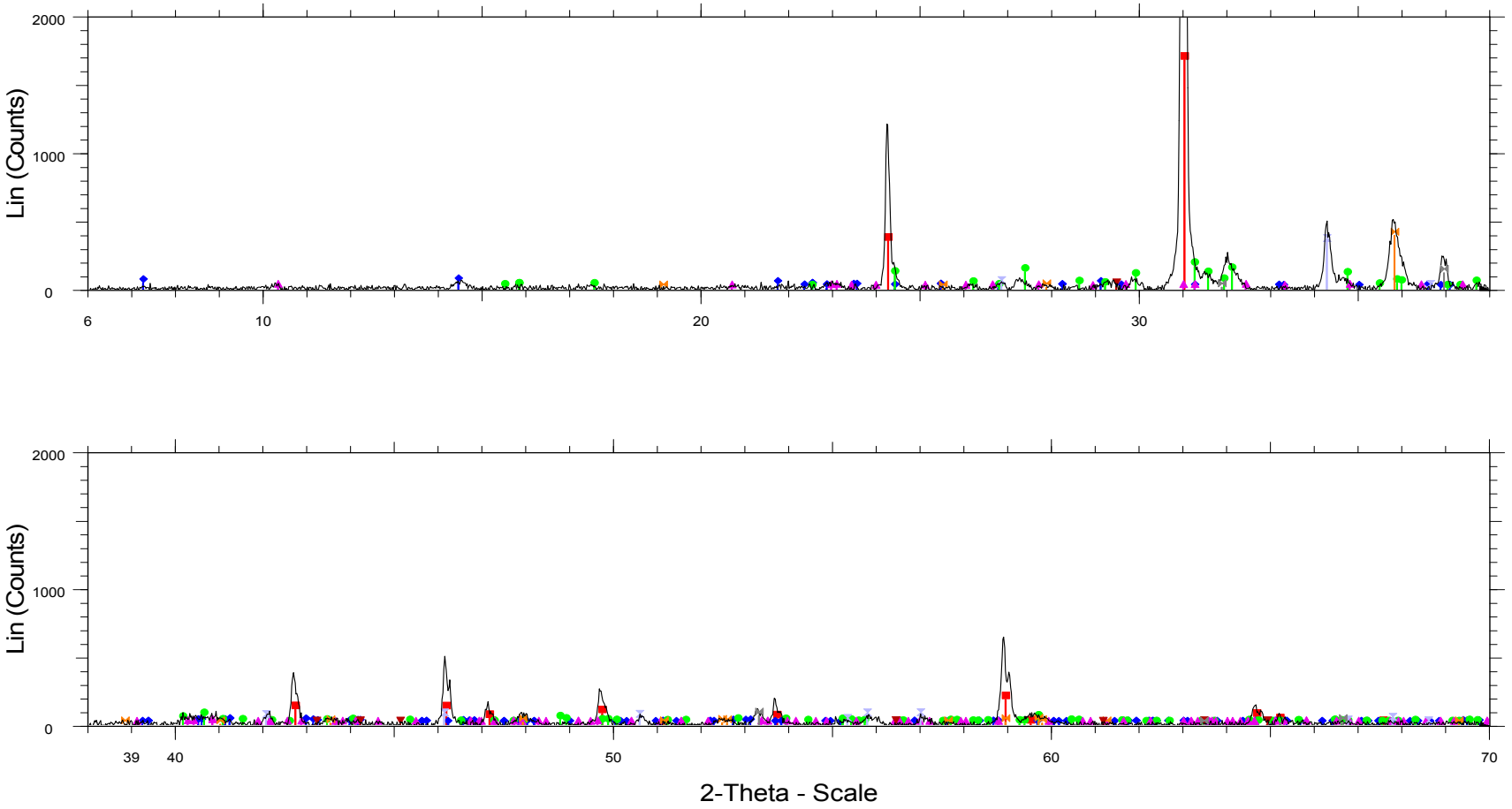
# Semi-Quantitative X-ray Diffraction Results

| Mineral | DGR5-583.40 | DGR5-605.55 | DGR5-645.16 | DGR5-677.25 | DGR5-692.35 |
|---|---|---|---|---|---|
| | (wt %) | (wt %) | (wt %) | (wt %) | (wt %) |
| Quartz | 48.0 | 30.3 | 35.2 | 36.7 | 30.1 |
| Clinochlore | 6.4 | 12.1 | 10.7 | 10.9 | 13.2 |
| Orthoclase | 18.3 | 14.0 | 7.9 | 6.3 | 7.0 |
| Muscovite | 2.9 | 24.9 | 28.1 | 27.1 | 27.7 |
| Glauconite | - | 10.3 | 6.9 | 5.9 | 6.4 |
| Anorthite | - | - | 4.7 | 3.7 | 4.1 |
| Calcite | 9.6 | 2.8 | - | 4.1 | 5.5 |
| Ankerite | 12.3 | 3.2 | 2.6 | 1.1 | 1.2 |
| Anatase | 0.3 | 1.0 | 0.7 | 0.6 | 0.9 |
| Halite | 2.2 | 1.5 | 0.5 | 1.1 | 0.7 |
| Pyrite | - | - | 2.0 | 1.9 | 2.6 |
| Hydroxlyapatite | - | - | 0.8 | 0.6 | 0.7 |
| TOTAL | 100.0 | 100.1 | 100.1 | 100.0 | 100.1 |

## Semi-Quantitative X-ray Diffraction Results

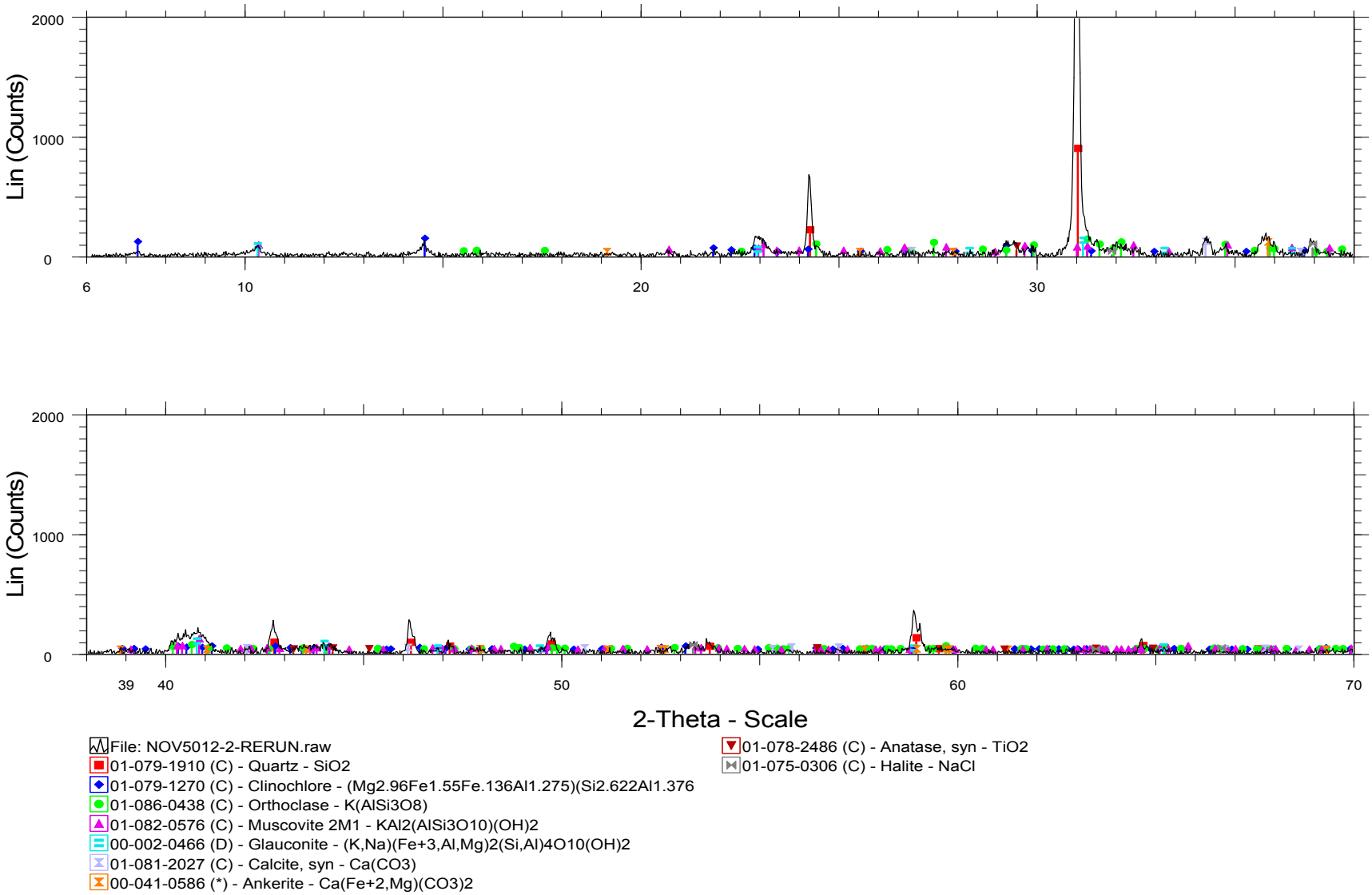
| Mineral | DGR5-699.49 (wt %) | DGR5-704.99 (wt %) | DGR5-715.40 (wt %) | DGR5-725.33 (wt %) | DGR5-764.72 (wt %) |
|---|---|---|---|---|---|
| Quartz | 32.9 | 2.2 | 4.6 | 2.9 | 2.9 |
| Clinochlore | 12.3 | 3.0 | 4.6 | 2.8 | 2.9 |
| Orthoclase | 2.0 | 1.0 | 5.5 | 4.1 | 4.2 |
| Muscovite | 40.3 | 0.4 | 1.9 | 0.7 | 0.4 |
| Albite | 2.6 | - | - | - | - |
| Calcite | 3.5 | 92.8 | 79.8 | 87.7 | 88.7 |
| Ankerite | 1.3 | 0.6 | 3.6 | 1.8 | 1.0 |
| Anatase | 1.0 | - | - | - | - |
| Halite | 0.4 | - | - | - | - |
| Pyrite | 3.7 | - | - | - | - |
| TOTAL | 100.0 | 100.0 | 100.0 | 100.0 | 100.1 |

DGR5-583.40



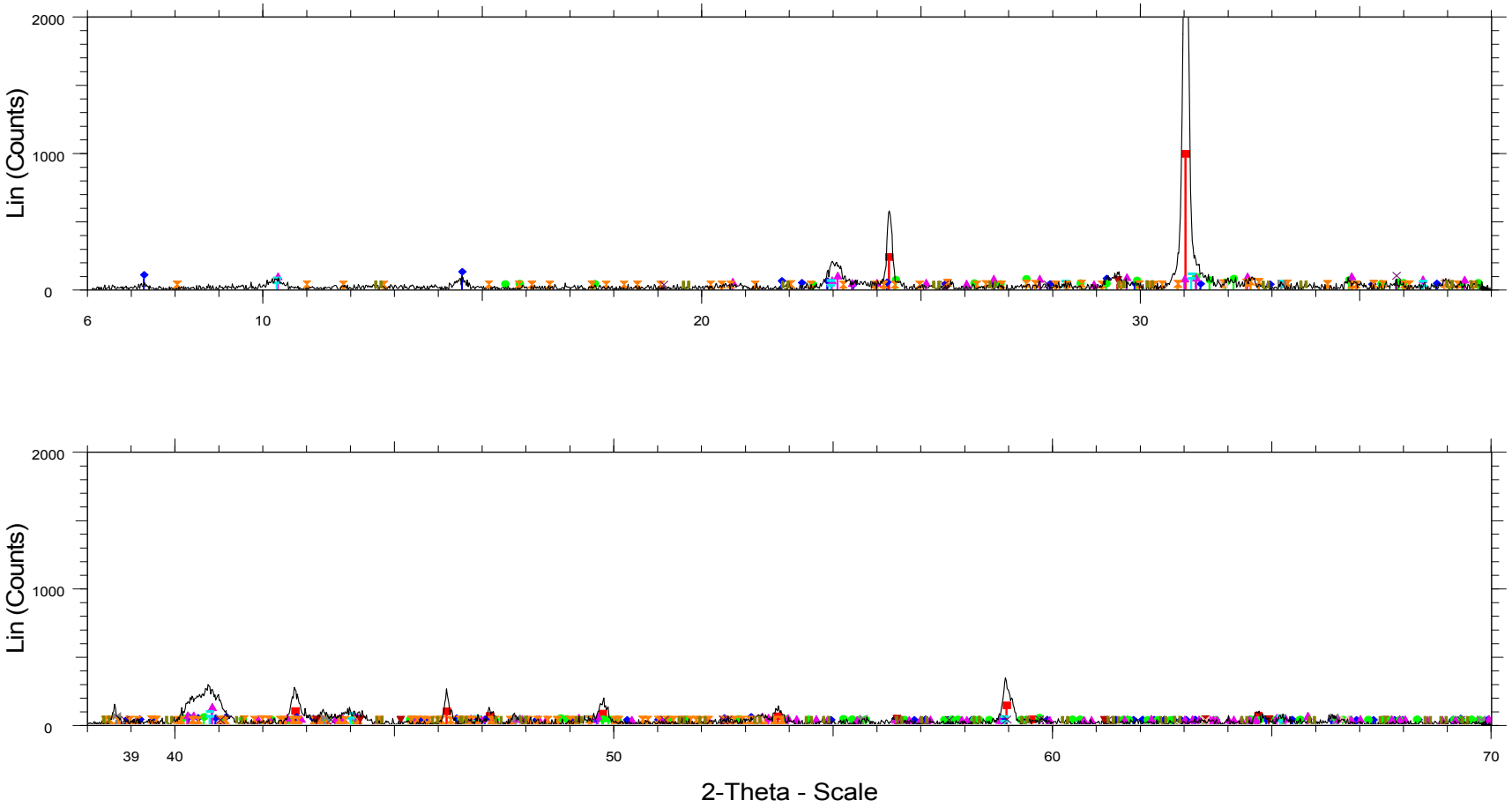

SGS Minerals Services

# DGR5-605.55



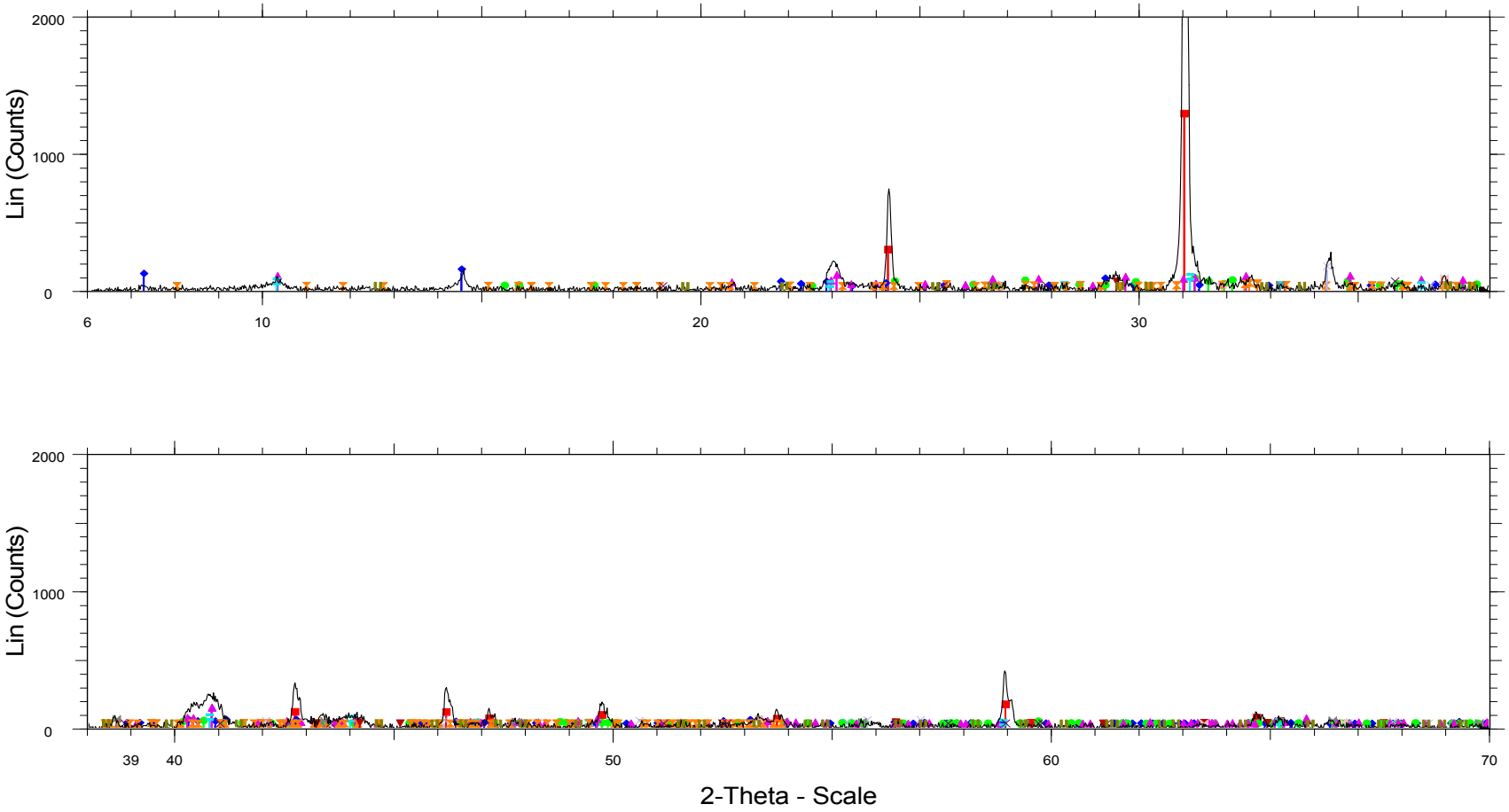

SGS Minerals Services

DGR5-645.16



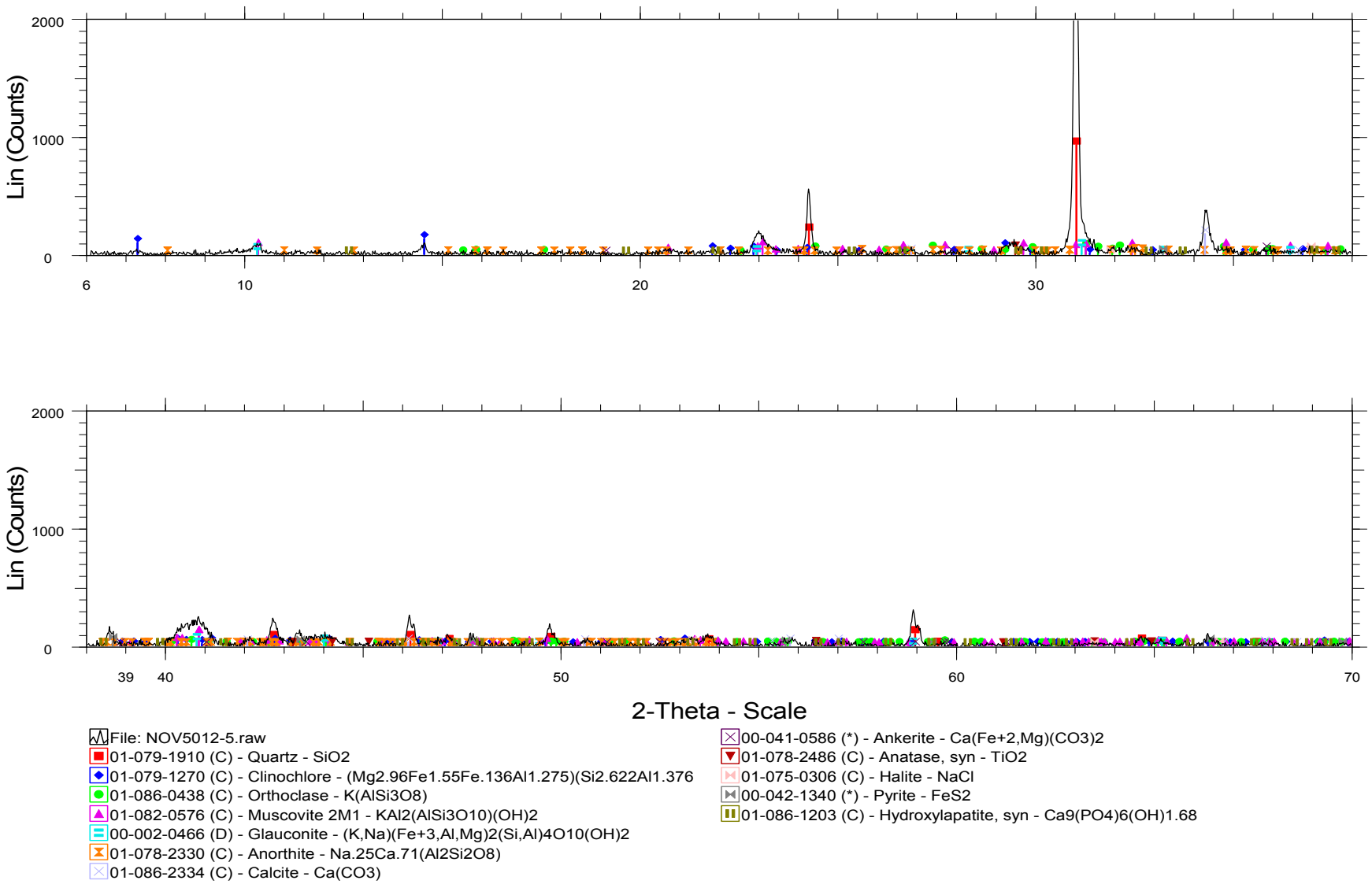

SGS Minerals Services

DGR5-677.25



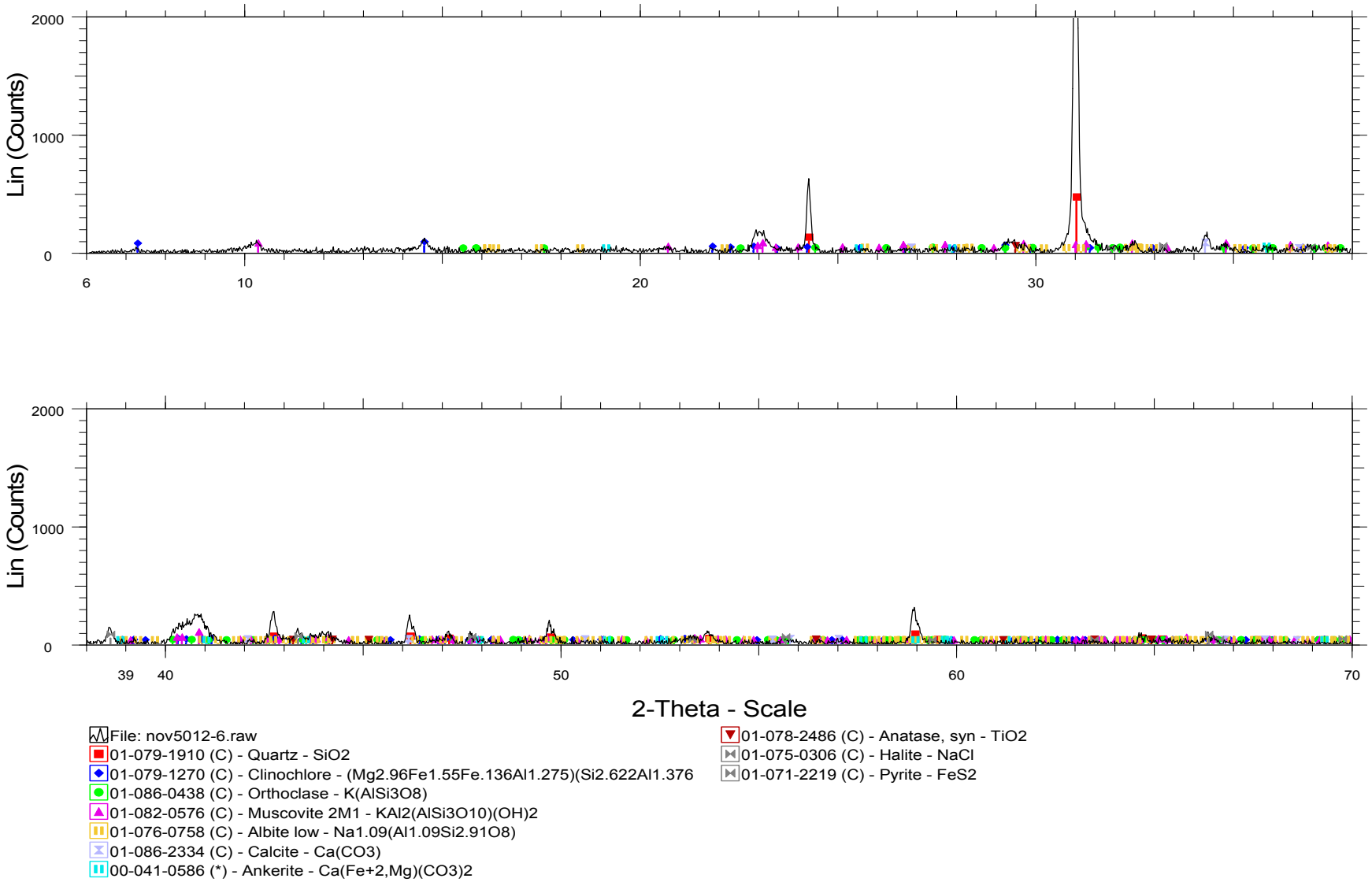

SGS Minerals Services

# DGR5-692.35




SGS Minerals Services

# DGR5-699.49




SGS Minerals Services

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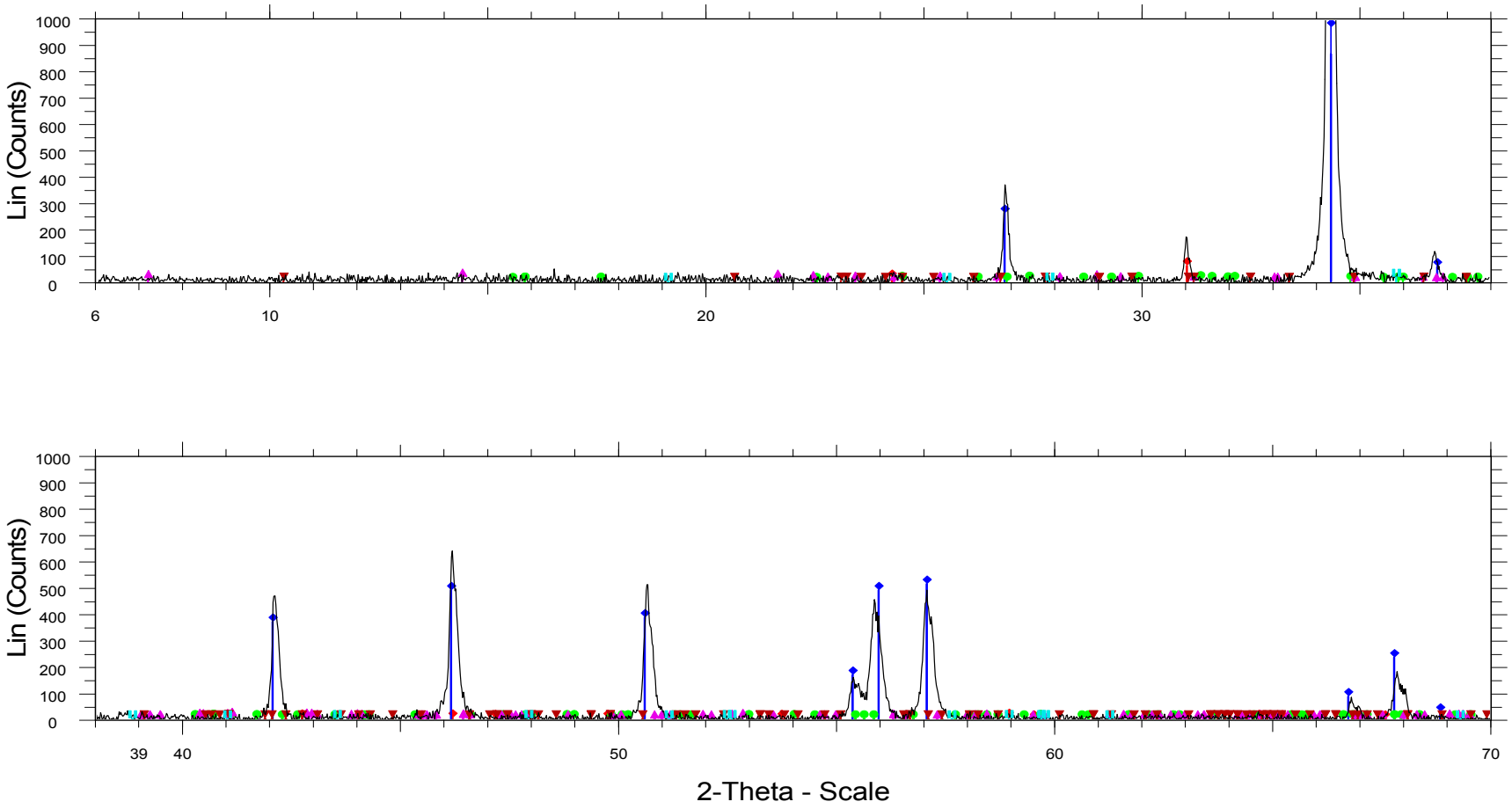
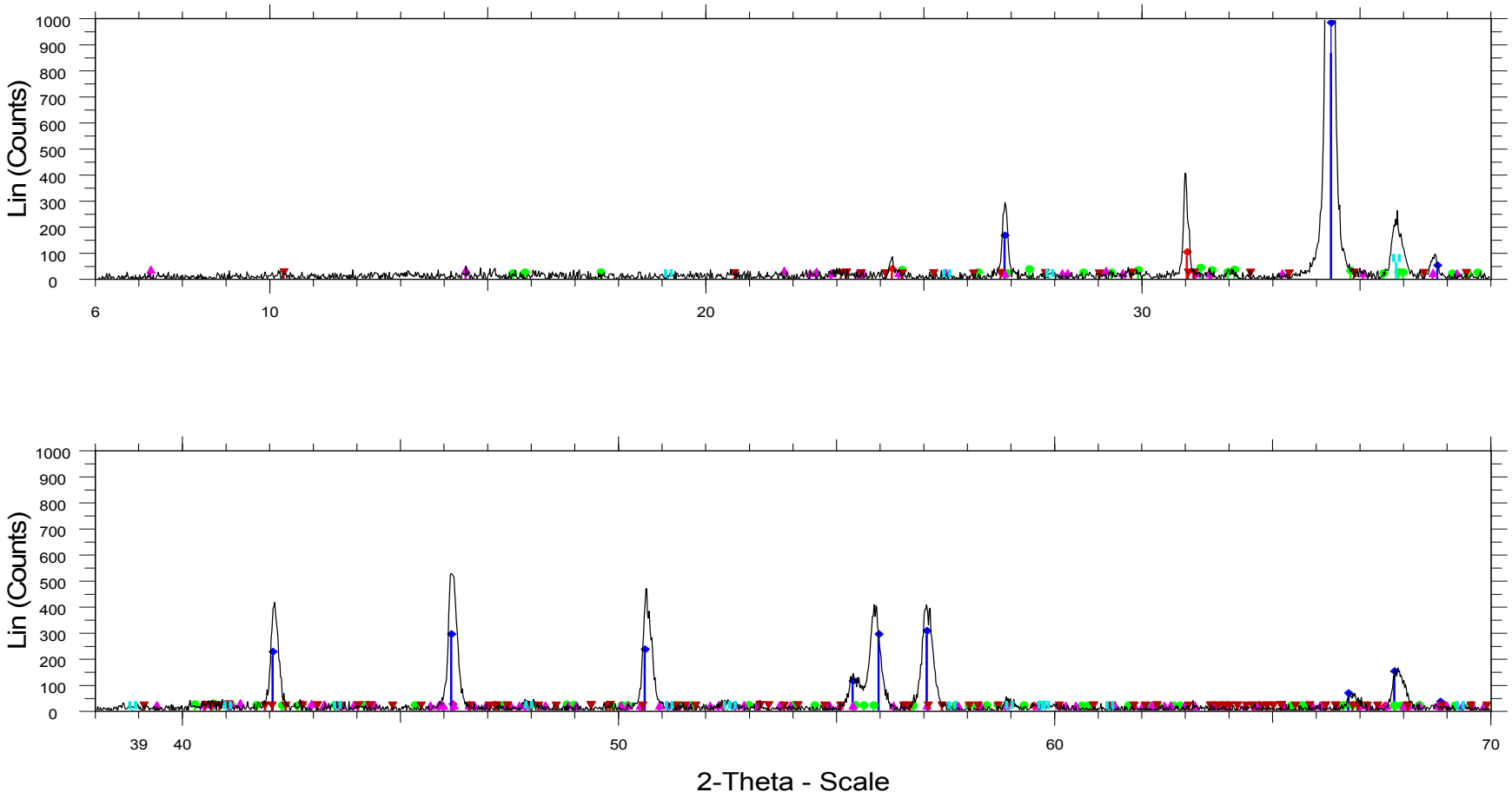


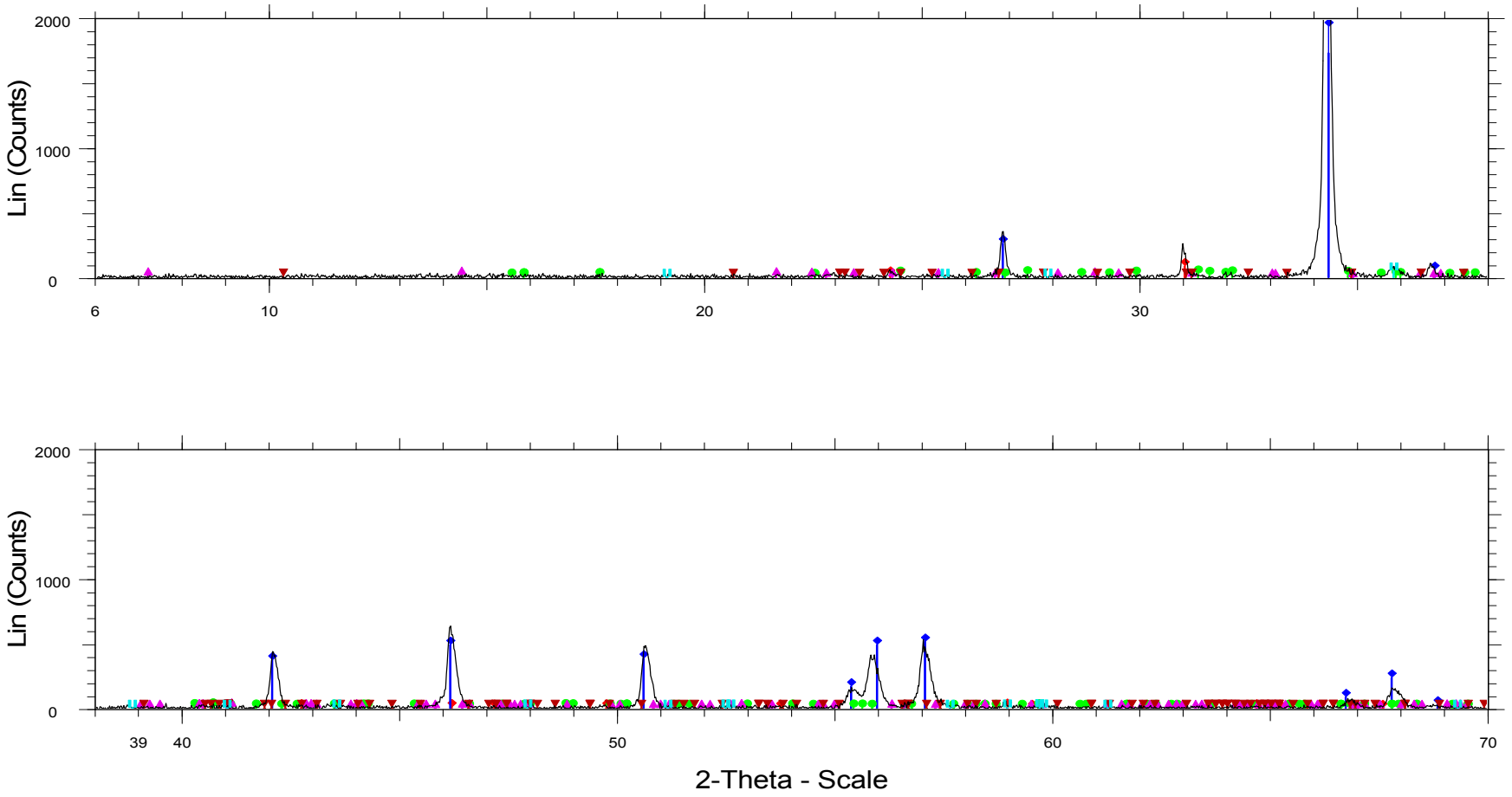

SGS Minerals Services

# DGR5-715.40



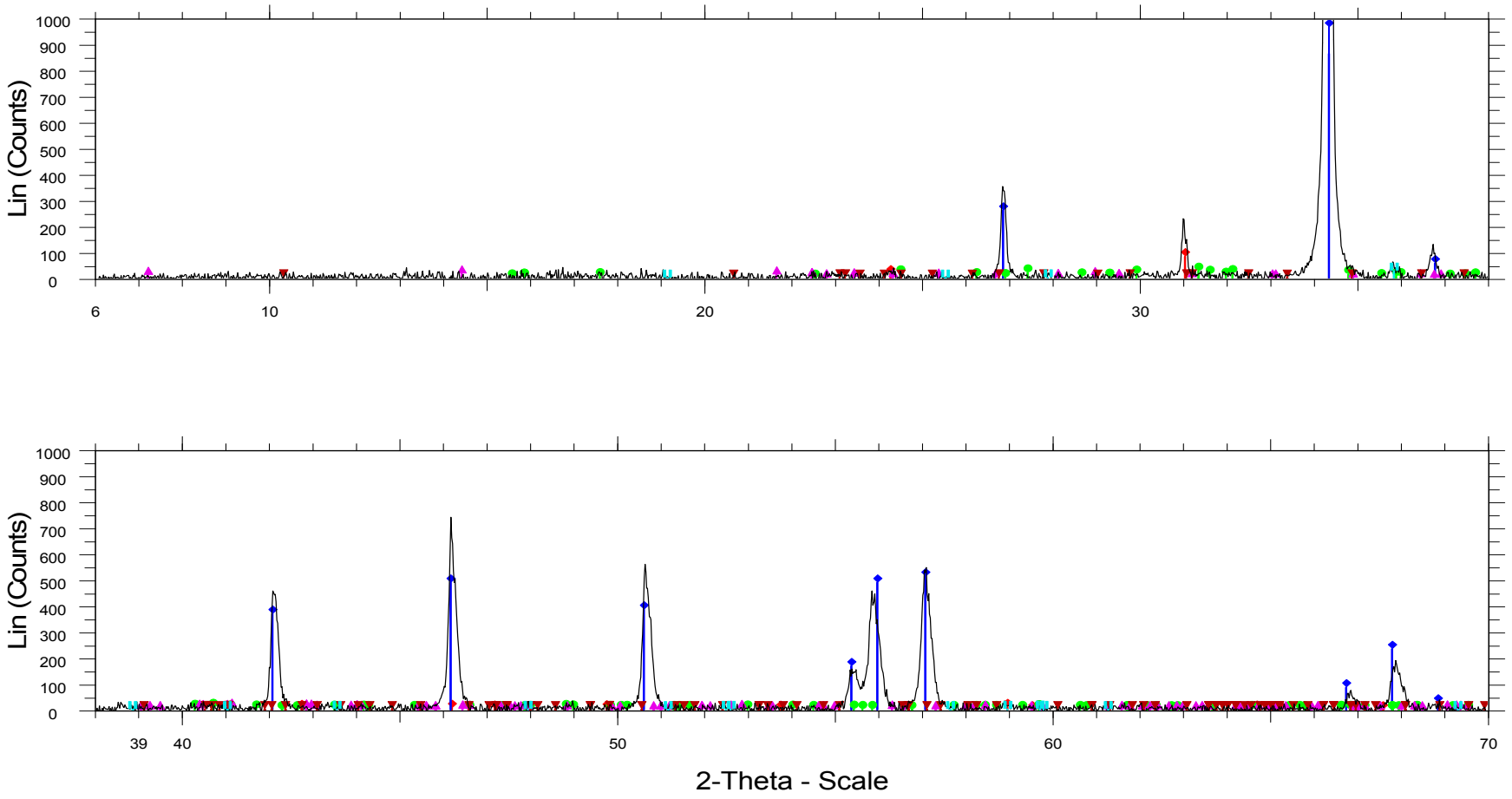

SGS Minerals Services

# DGR5-725.33




SGS Minerals Services

# DGR5-764.72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800
700
600
500
400
300
200
100
0
6
10
20
30
Lin (Counts)
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900
800
700
600
500
400
300
200
100
0
39
40
50
60
70
2-Theta - Scale
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01-079-1910 (C) - Quartz - SiO2
01-072-1652 (C) - Calcite - CaCO3
01-075-1190 (C) - Orthoclase - K(AlSi3)O8
01-082-0038 (C) - Clinochlore IIb-4 (Cr-, Mg-rich) - (Mg0.99Al0.01)5(Al0.67Fe0.33)(Si3.02Al0.98)O10(OH)8
01-086-1384 (C) - Muscovite 2M1 - K0.894Al1.93(Al0.943Si2.829O10)((OH)1.744F0.256)
00-041-0586 (*) - Ankerite - Ca(Fe+2,Mg)(CO3)2

# *Appendix – 2: EDS Spectra*

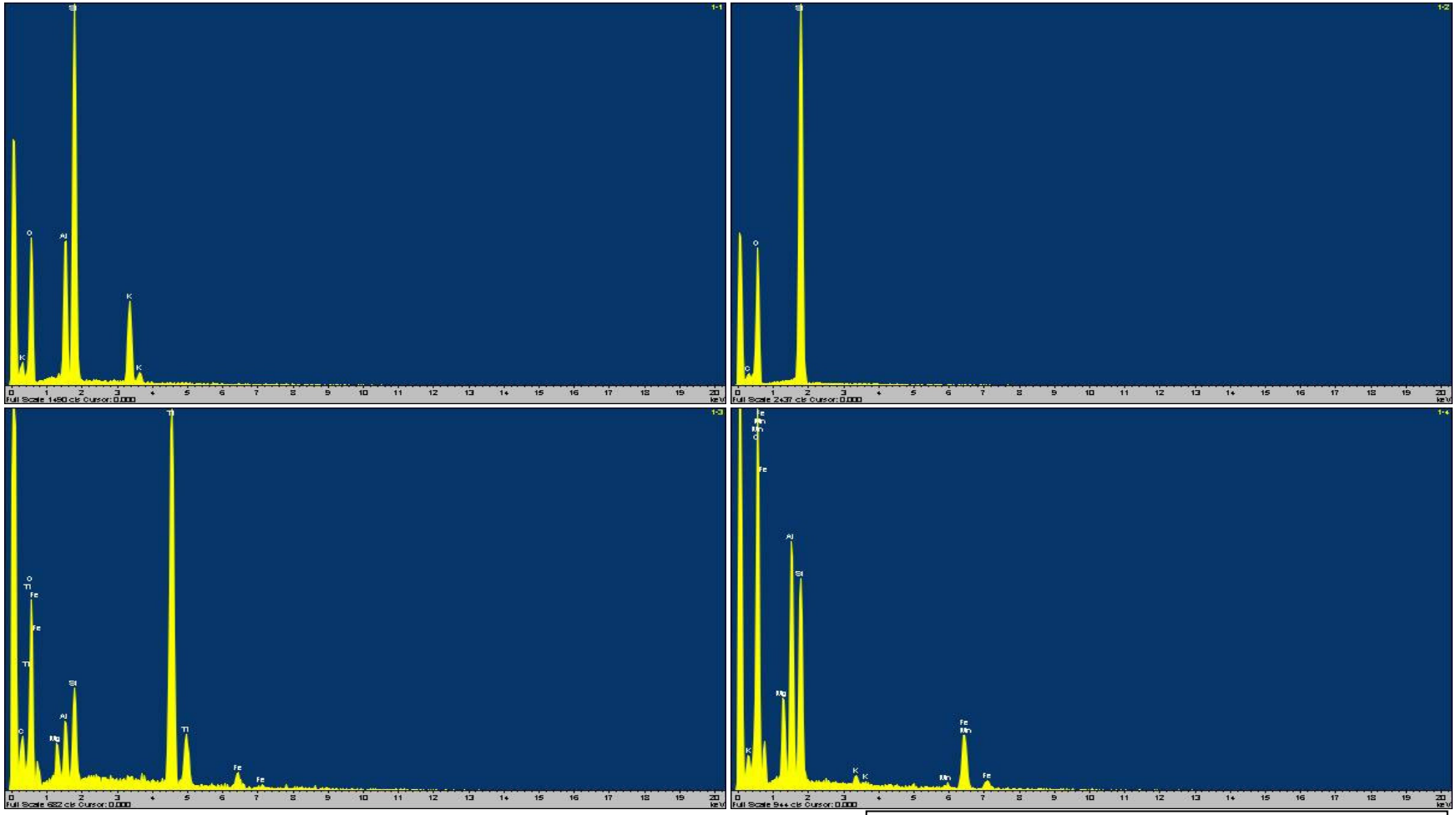

Fig 1: EDS Spectra for DGR5-583.40 (Spots 1-1 to 1-4)

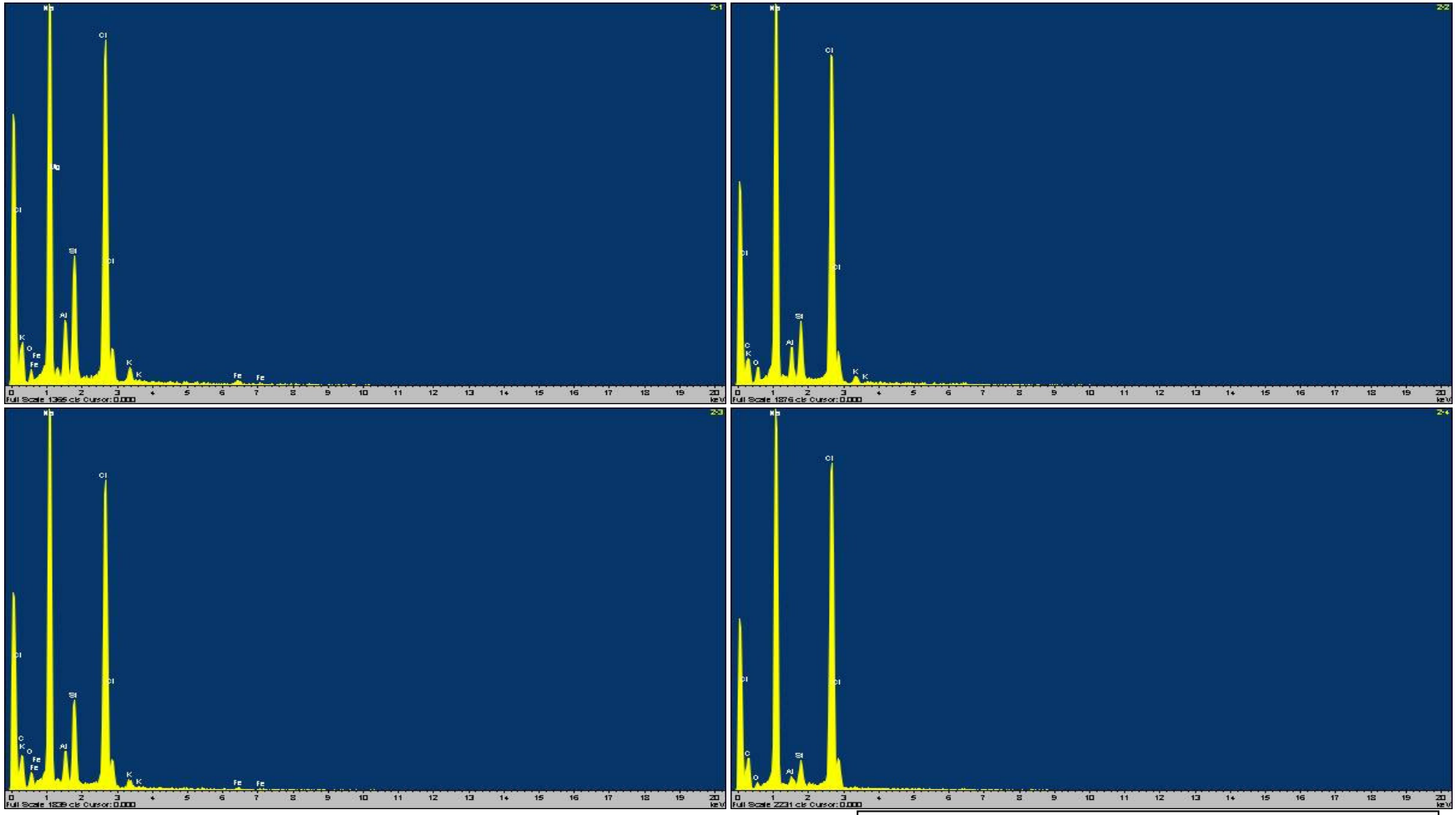

Fig 2: EDS Spectra for DGR5-605.55 (Spots 2-1 to 2-4)

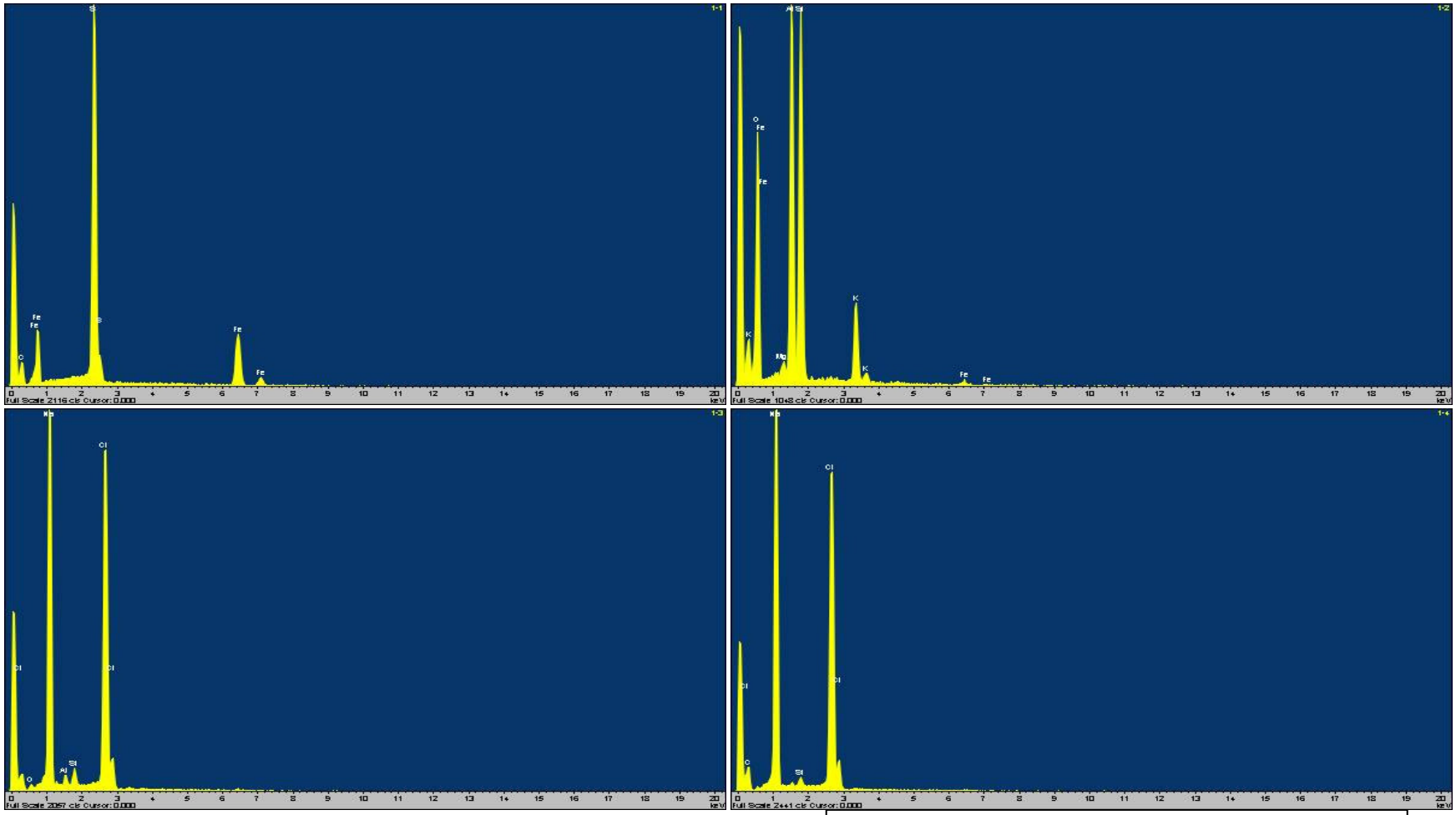


Fig 3: EDS Spectra for DGR5-645.16 (Spots 1-1 to 1-4)

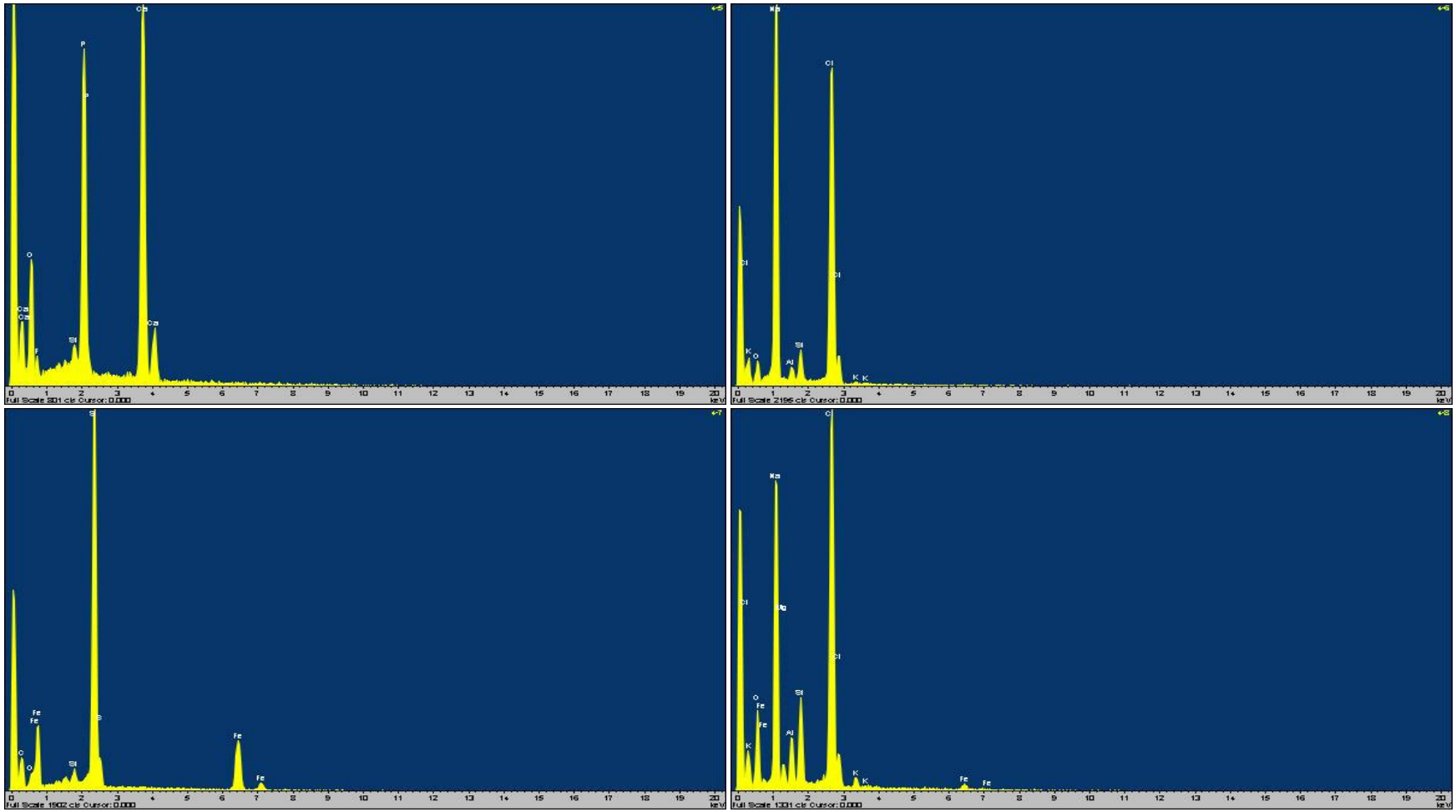

Fig 4: EDS Spectra for DGR5-677.25 (Spots 4-5 to 4-8)

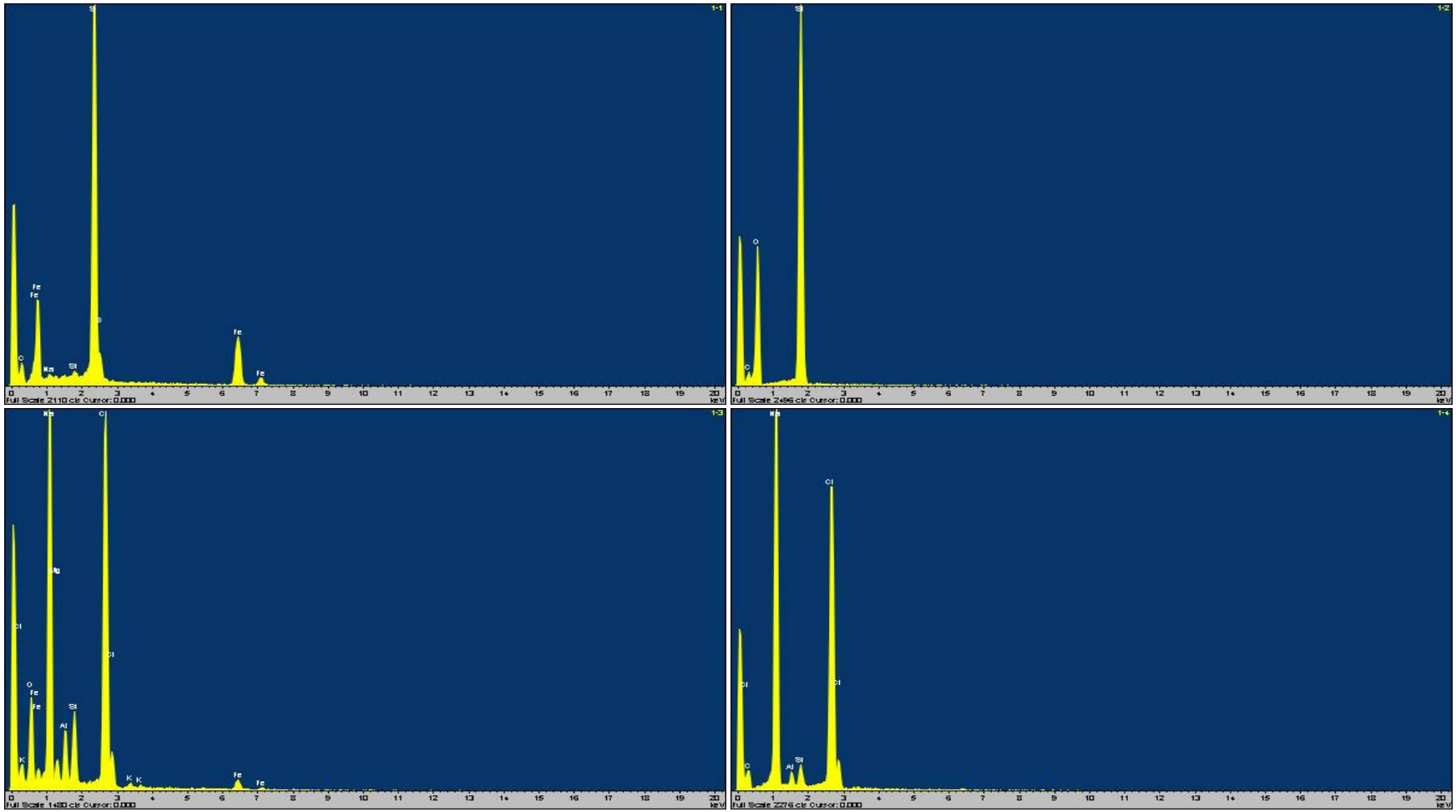

Fig 5: EDS Spectra for DGR5-692.35 (Spots 1-1 to 1-4)

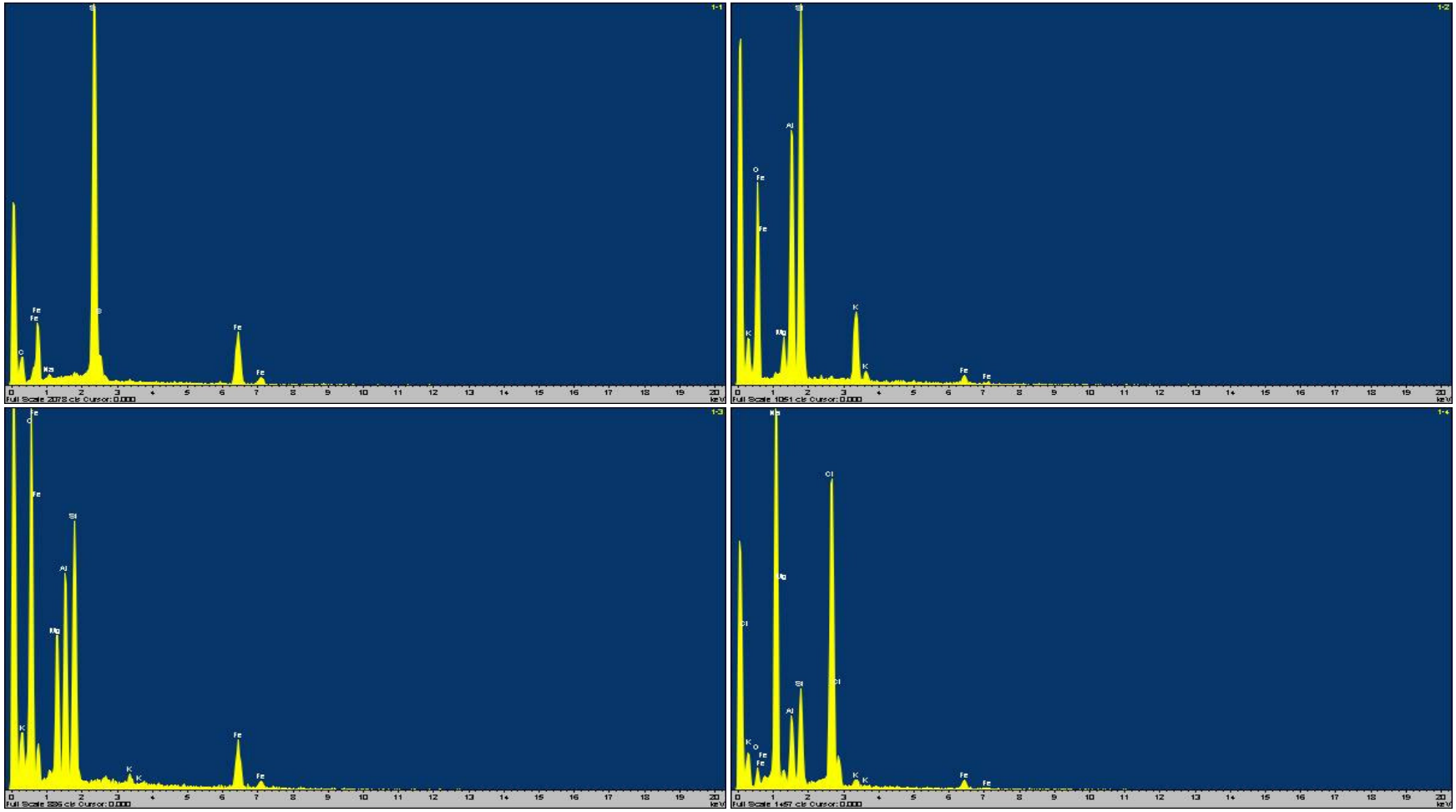

Fig 6: EDS Spectra for DGR5-699.49 (Spots 1-1 to 1-4)

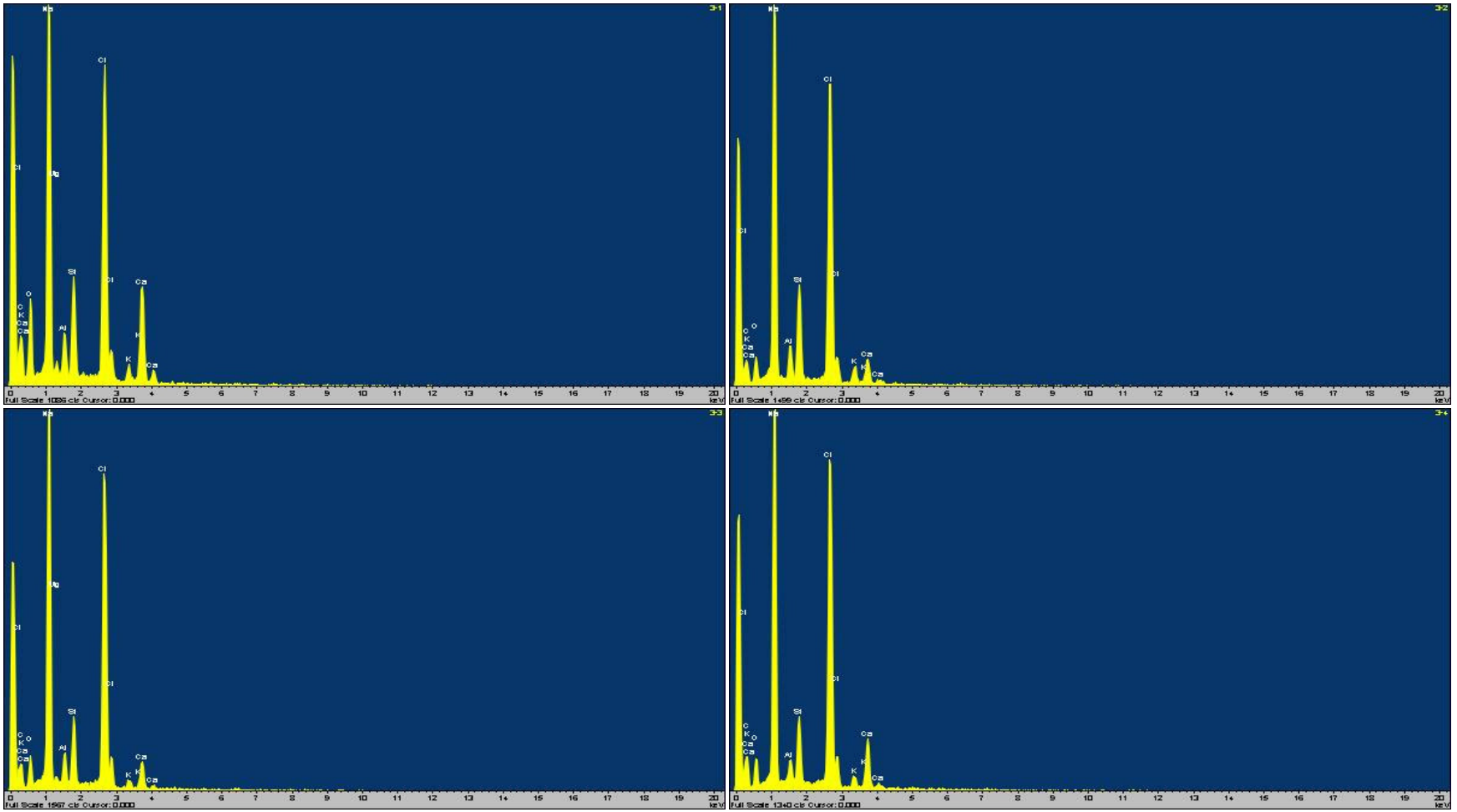

Fig 7: EDS Spectra for DGR5-704.99 (Spots 3-1 to 3-4)

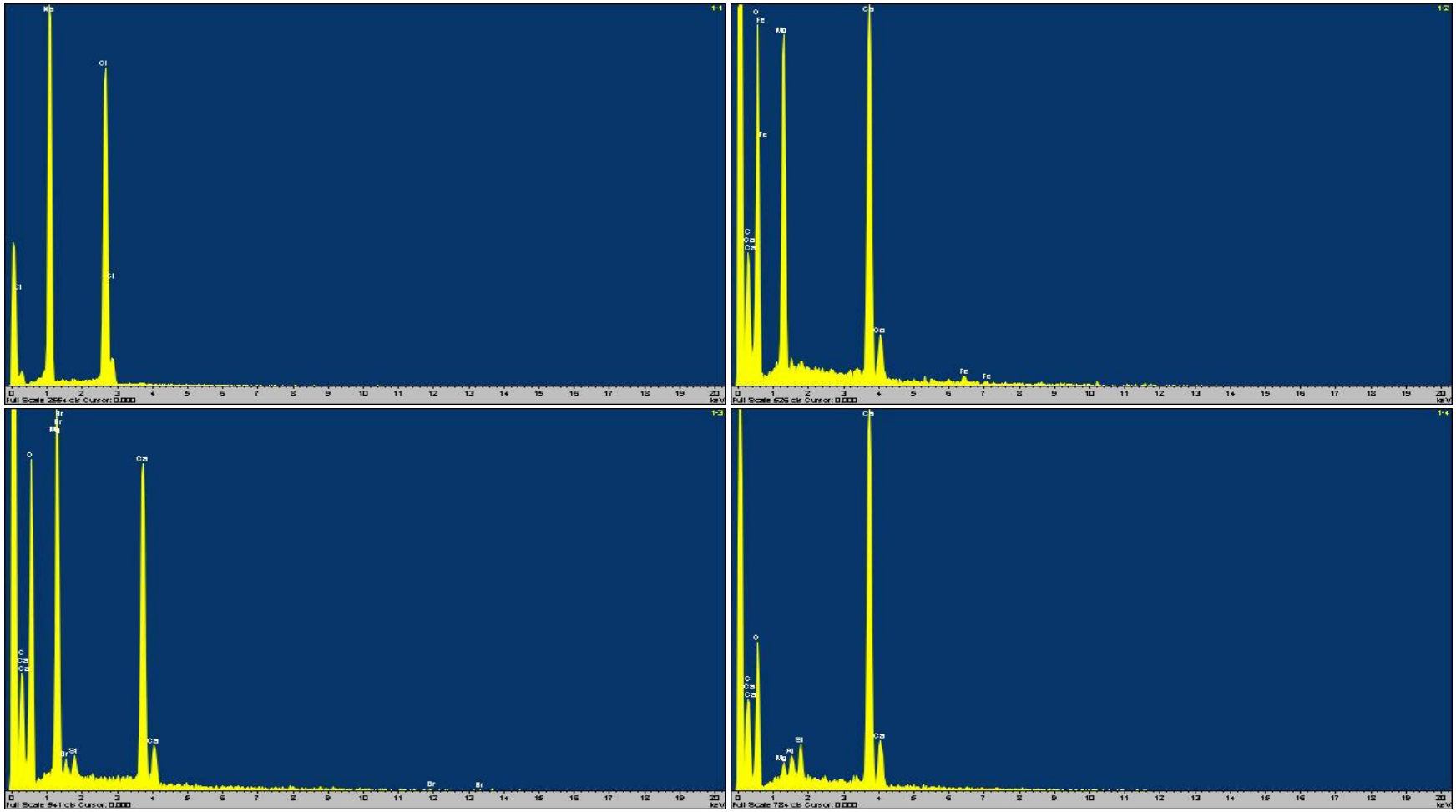

Fig 8: EDS Spectra for DGR5-715.40 (Spots 1-1 to 1-4)

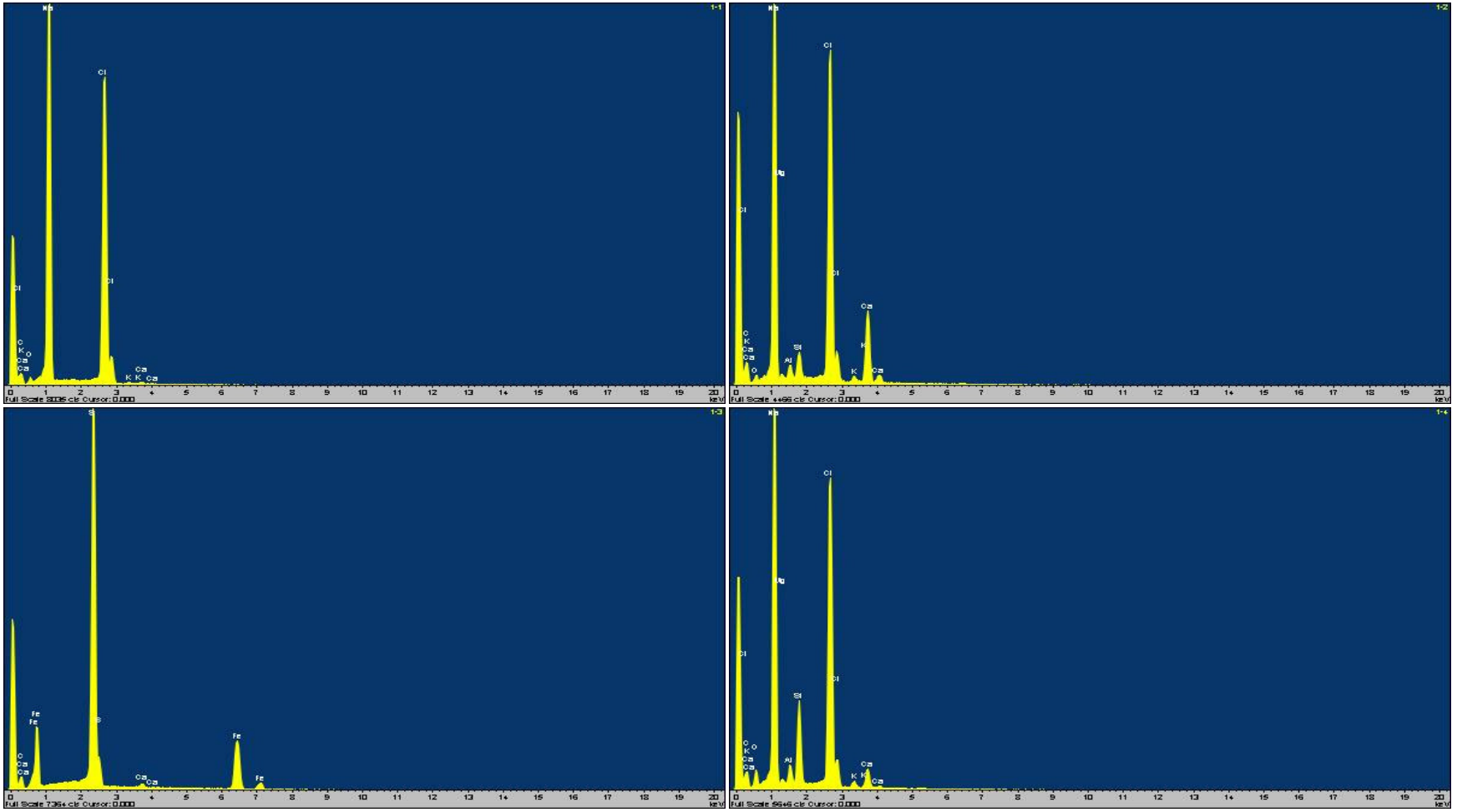

Fig 9: EDS Spectra for DGR5-725.33 (Spots 1-1 to 1-4)

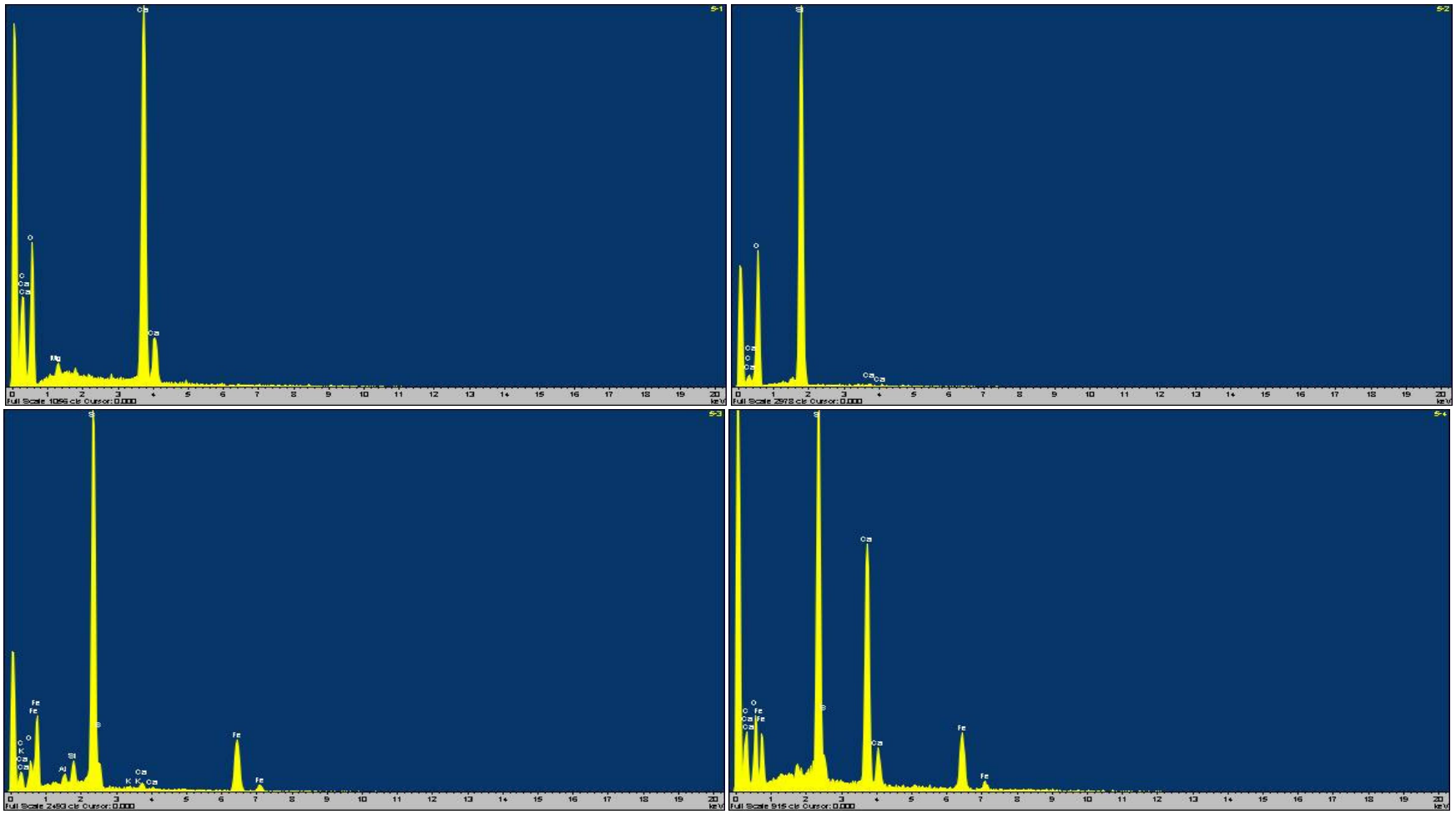

Fig 10: EDS Spectra for DGR5-764.72 (Spots 5-1 to 5-4)

# *Appendix – 3: Whole Rock Analysis Data*

**SGS Lakefield Research Limited**
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Phone: (613) 232-2525 ext. 326
Fax:(613) 232-7149

December 21, 2009

**Date Rec. :** 19 November 2009
**LR Report :** CA11330-NOV09
**Project :** 06-219.35.10
**Client Ref :** Whole Rock Analysis

# CERTIFICATE OF ANALYSIS

## Final Report

| Sample ID | SiO2 % | Al2O3 % | Fe2O3 % | MgO % | CaO % | Na2O % | K2O % | TiO2 % | P2O5 % | MnO % | Cr2O3 % | V2O5 % | LOI % | Sum % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5: DGR5-583.40 | 60.5 | 6.69 | 3.31 | 3.15 | 8.65 | 1.14 | 3.29 | 0.41 | 0.13 | 0.10 | 0.01 | 0.01 | 12.4 | 99.8 |
| 6: DGR5-605.55 | 54.1 | 17.0 | 6.79 | 3.55 | 1.93 | 0.58 | 5.31 | 0.88 | 0.20 | 0.06 | 0.02 | 0.03 | 8.71 | 99.2 |
| 7: DGR5-645.16 | 57.0 | 16.6 | 6.47 | 3.23 | 1.25 | 0.63 | 4.94 | 0.91 | 0.23 | 0.04 | 0.01 | 0.03 | 7.78 | 99.1 |
| 8: DGR5-677.25 | 56.4 | 15.5 | 6.56 | 3.11 | 2.69 | 0.94 | 4.44 | 0.85 | 0.14 | 0.05 | 0.01 | 0.03 | 8.69 | 99.5 |
| 9: DGR5-692.35 | 53.2 | 16.1 | 6.64 | 2.92 | 4.09 | 0.50 | 4.66 | 0.85 | 0.33 | 0.05 | < 0.01 | 0.03 | 9.76 | 99.2 |
| 10: DGR5-699.49 | 55.4 | 16.6 | 6.47 | 2.96 | 2.09 | 0.52 | 4.86 | 0.91 | 0.31 | 0.04 | 0.02 | 0.03 | 8.33 | 98.5 |
| 11: DGR5-704.99 | 4.15 | 1.16 | 0.55 | 0.75 | 51.6 | 0.08 | 0.42 | 0.06 | 0.18 | < 0.01 | < 0.01 | < 0.01 | 40.3 | 99.3 |
| 12: DGR5-715.40 | 9.83 | 2.72 | 0.95 | 2.30 | 44.8 | 0.10 | 1.11 | 0.13 | 0.07 | 0.03 | < 0.01 | < 0.01 | 37.3 | 99.4 |
| 13: DGR5-725.33 | 6.56 | 1.70 | 0.64 | 1.43 | 48.8 | 0.08 | 0.72 | 0.07 | 0.05 | 0.02 | < 0.01 | < 0.01 | 39.3 | 99.4 |
| 14: DGR5-764.72 | 6.08 | 1.78 | 0.76 | 1.12 | 49.3 | 0.09 | 0.73 | 0.06 | 0.04 | < 0.01 | < 0.01 | < 0.01 | 39.1 | 99.0 |

*Chris Sullivan, B.Sc., C.Chem*
*Project Specialist*
*Environmental Services, Analytical*

**Copy:** #1

**Email:** kraven@intera.com; rjackson@intera.com

**SGS Canada Inc.**
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

**Project :** 06-219.35.10

June 4, 2010

**Intera Engineering Ltd.**
Attn : Ken Raven

1 Raymond St., Suite 200, Ottawa
Canada, K1R 1A2
Phone: (613) 232-2525 ext. 326, Fax:(613) 232-7149

**Date Rec. :** 21 May 2010
**LR Report:** **CA11208-MAY10**

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 1: Analysis Start Date | 2: Analysis Start Time | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: DGR5-583.40 | 6: DGR5-605.55 | 7: DGR5-645.16 | 8: DGR5-677.25 |
|---|---|---|---|---|---|---|---|---|
| Total Carbon [%] | 25-May-10 | 09:42 | 25-May-10 | 15:38 | 2.62 | 0.512 | 0.519 | 0.922 |
| Total Organic Carbon [%] | 26-May-10 | 15:07 | 27-May-10 | 07:46 | 0.123 | 0.111 | 0.280 | 0.335 |
| Total Sulphur [%] | 26-May-10 | 11:53 | 26-May-10 | 12:42 | 0.056 | 0.111 | 0.600 | 0.768 |
| Carbon Dioxide [%] | 27-May-10 | 15:06 | 28-May-10 | 11:57 | 9.46 | 1.51 | 0.97 | 2.39 |
| Chloride [%] | 02-Jun-10 | 02:08 | 04-Jun-10 | 09:01 | 1.37 | 0.90 | 0.69 | 0.93 |
| Silver [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 0.22 | < 0.01 | 0.03 | 0.01 |
| Aluminum [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:25 | 33000 | 12000 | 86000 | 80000 |
| Arsenic [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 3.0 | 5.9 | 5.1 | 4.6 |
| Barium [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:25 | 220 | 400 | 340 | 320 |
| Beryllium [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:25 | 0.4 | 2.3 | 2.0 | 1.8 |
| Bismuth [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | < 0.09 | 0.10 | 0.23 | 0.15 |
| Calcium [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:25 | 55000 | 12000 | 8100 | 18000 |
| Cadmium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 0.42 | 0.16 | 0.13 | 0.11 |
| Cerium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 49 | 33 | 93 | 87 |
| Cobalt [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 7.3 | 17 | 17 | 14 |
| Chromium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 82 | 78 | 74 | 80 |
| Copper [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:25 | 27 | 50 | 45 | 130 |
| Cesium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 1.7 | 9.3 | 11 | 9.0 |
| Dysprosium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 4.8 | 2.5 | 4.9 | 4.7 |
| Erbium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 2.2 | 1.6 | 2.8 | 2.7 |
| Europium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 1.4 | 0.60 | 1.3 | 1.2 |
| Iron [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:25 | 22000 | 44000 | 43000 | 43000 |
| Gallium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 7.6 | 25 | 24 | 22 |
| Gadolinium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 5.8 | 2.4 | 6.0 | 5.4 |
| Germanium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 1.1 | 1.3 | 1.8 | 1.8 |
| Hafnium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 3.2 | 3.5 | 4.2 | 3.9 |
| Holmium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 1.00 | 0.62 | 1.1 | 1.1 |
| Indium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 0.09 | 0.09 | 0.07 | 0.08 |
| Potassium [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:26 | 29000 | 35000 | 44000 | 39000 |
| Lanthanum [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 20 | 13 | 46 | 44 |
| Lithium [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:26 | 20 | 40 | 43 | 42 |
| Lutetium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 0.32 | 0.28 | 0.48 | 0.47 |
| Magnesium [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:26 | 18000 | 7900 | 19000 | 18000 |
| Manganese [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:26 | 880 | 590 | 450 | 480 |

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**Project :** 06-219.35.10

**LR Report :** **CA11208-MAY10**

| Analysis | 1: Analysis Start Date | 2: Analysis Start Time | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: DGR5-583.40 | 6: DGR5-605.55 | 7: DGR5-645.16 | 8: DGR5-677.25 |
|---|---|---|---|---|---|---|---|---|
| Molybdenum [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 5.4 | 0.2 | 0.3 | 0.5 |
| Niobium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 10 | 15 | 18 | 16 |
| Neodymium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 30 | 16 | 40 | 37 |
| Nickel [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 16 | 35 | 35 | 32 |
| Total Phosphorus [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:26 | 560 | 660 | 930 | 560 |
| Lead [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 4.4 | 4.4 | 11 | 12 |
| Praseodymium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 8.0 | 4.9 | 13 | 12 |
| Rubidium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 49 | 50 | 150 | 140 |
| Antimony [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Scandium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 7.2 | 2.0 | 16 | 15 |
| Samarium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 6.5 | 3.2 | 7.5 | 6.5 |
| Strontium [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:26 | 80 | 350 | 140 | 160 |
| Tantalum [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 8.1 | 3.9 | 8.4 | 8.3 |
| Terbium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 1.0 | 0.48 | 1.0 | 0.93 |
| Thorium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 6.0 | 0.81 | 19 | 17 |
| Titanium [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:26 | 2300 | 5100 | 5600 | 5100 |
| Thallium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 0.25 | 0.69 | 0.76 | 0.69 |
| Thulium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 0.37 | 0.29 | 0.49 | 0.48 |
| Uranium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 1.4 | 3.3 | 3.7 | 3.5 |
| Vanadium [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:26 | 36 | 130 | 130 | 120 |
| Tungsten [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 0.75 | 1.3 | 1.6 | 1.4 |
| Ytterbium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 1.9 | 1.7 | 2.8 | 2.7 |
| Yttrium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 23 | 4.3 | 22 | 21 |
| Zinc [µg/g] | 27-May-10 | 14:10 | 28-May-10 | 08:26 | 47 | 82 | 69 | 65 |
| Zirconium [µg/g] | 27-May-10 | 21:37 | 31-May-10 | 12:59 | 92 | 97 | 120 | 110 |

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*Project Specialist*
*Environmental Services, Analytical*

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**Project :** 06-219.35.10

June 4, 2010

**Intera Engineering Ltd.**
Attn : Ken Raven

1 Raymond St., Suite 200, Ottawa
Canada, K1R 1A2
Phone: (613) 232-2525 ext. 326, Fax:(613) 232-7149

**Date Rec. :** 21 May 2010
**LR Report:** **CA11208-MAY10**

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 9: DGR5-692.35 | 10: DGR5-699.49 | 11: DGR5-704.99 | 12: DGR-715.40 | 13: DGR5-725.33 | 14: DGR5-764.72 |
|---|---|---|---|---|---|---|
| Total Carbon [%] | 1.61 | 1.72 | 10.9 | 9.95 | 10.4 | 10.4 |
| Total Organic Carbon [%] | 0.812 | 1.38 | 1.98 | 0.502 | 0.142 | 0.308 |
| Total Sulphur [%] | 1.04 | 0.998 | 0.192 | 0.122 | 0.127 | 0.207 |
| Carbon Dioxide [%] | 3.21 | 1.62 | 39.5 | 35.9 | 37.9 | 38.0 |
| Chloride [%] | 0.52 | 0.40 | 0.03 | 0.10 | 0.07 | 0.07 |
| Silver [µg/g] | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Aluminum [µg/g] | 81000 | 85000 | 5800 | 14000 | 8400 | 9100 |
| Arsenic [µg/g] | 5.0 | 4.5 | 1.8 | 1.4 | 1.8 | 1.0 |
| Barium [µg/g] | 570 | 340 | 27 | 63 | 37 | 32 |
| Beryllium [µg/g] | 2.0 | 2.1 | 0.2 | 0.3 | 0.2 | 0.2 |
| Bismuth [µg/g] | 0.18 | 0.23 | < 0.09 | < 0.09 | < 0.09 | < 0.09 |
| Calcium [µg/g] | 26000 | 13000 | 300000 | 280000 | 290000 | 290000 |
| Cadmium [µg/g] | 0.10 | 0.09 | < 0.02 | 0.02 | < 0.02 | < 0.02 |
| Cerium [µg/g] | 92 | 87 | 15 | 20 | 18 | 17 |
| Cobalt [µg/g] | 16 | 16 | 2.8 | 2.0 | 1.9 | 3.5 |
| Chromium [µg/g] | 71 | 73 | 10 | 19 | 11 | 12 |
| Copper [µg/g] | 32 | 36 | 1.8 | 4.2 | 0.7 | 9.2 |
| Cesium [µg/g] | 9.4 | 9.9 | 2.5 | 1.8 | 1.5 | 1.4 |
| Dysprosium [µg/g] | 5.3 | 4.5 | 1.1 | 1.00 | 0.87 | 0.61 |
| Erbium [µg/g] | 3.0 | 2.7 | 0.57 | 0.57 | 0.46 | 0.31 |
| Europium [µg/g] | 1.5 | 1.2 | 0.26 | 0.28 | 0.24 | 0.20 |
| Iron [µg/g] | 43000 | 42000 | 4000 | 6600 | 4400 | 5300 |
| Gallium [µg/g] | 23 | 24 | 1.6 | 3.6 | 2.2 | 2.4 |
| Gadolinium [µg/g] | 6.5 | 5.3 | 1.3 | 1.3 | 1.1 | 0.86 |
| Germanium [µg/g] | 2.0 | 1.9 | 0.3 | 0.4 | 0.4 | 0.4 |
| Hafnium [µg/g] | 3.5 | 3.6 | 0.7 | 0.9 | 0.7 | 0.5 |
| Holmium [µg/g] | 1.2 | 1.1 | 0.25 | 0.23 | 0.20 | 0.13 |
| Indium [µg/g] | 0.08 | 0.08 | < 0.01 | 0.01 | 0.01 | < 0.01 |
| Potassium [µg/g] | 40000 | 42000 | 4200 | 11000 | 7000 | 7300 |
| Lanthanum [µg/g] | 46 | 46 | 7.9 | 11 | 9.4 | 7.8 |
| Lithium [µg/g] | 40 | 42 | 1.9 | 4.3 | 2.8 | 2.4 |
| Lutetium [µg/g] | 0.49 | 0.49 | 0.080 | 0.088 | 0.072 | 0.048 |
| Magnesium [µg/g] | 17000 | 17000 | 4900 | 14000 | 8700 | 7100 |
| Manganese [µg/g] | 540 | 420 | 150 | 300 | 230 | 160 |

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**Project :** 06-219.35.10

**LR Report :** **CA11208-MAY10**

| Analysis | 9: DGR5-692.35 | 10: DGR5-699.49 | 11: DGR5-704.99 | 12: DGR-715.40 | 13: DGR5-725.33 | 14: DGR5-764.72 |
|---|---|---|---|---|---|---|
| Molybdenum [µg/g] | 1.0 | 1.2 | 0.5 | 1.4 | 0.8 | 2.8 |
| Niobium [µg/g] | 15 | 16 | 5.0 | 6.3 | 5.0 | 4.1 |
| Neodymium [µg/g] | 41 | 37 | 7.3 | 8.2 | 7.6 | 6.6 |
| Nickel [µg/g] | 39 | 40 | 8.6 | 49 | 6.5 | 7.5 |
| Total Phosphorus [µg/g] | 1300 | 1300 | 800 | 320 | 220 | 190 |
| Lead [µg/g] | 24 | 24 | 4.7 | 3.2 | 3.3 | 4.4 |
| Praseodymium [µg/g] | 13 | 12 | 2.1 | 2.5 | 2.3 | 2.0 |
| Rubidium [µg/g] | 140 | 150 | 10 | 25 | 15 | 18 |
| Antimony [µg/g] | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Scandium [µg/g] | 16 | 16 | 2.4 | 3.3 | 2.7 | 2.7 |
| Samarium [µg/g] | 7.9 | 6.4 | 1.4 | 1.5 | 1.4 | 1.1 |
| Strontium [µg/g] | 340 | 120 | 480 | 310 | 290 | 570 |
| Tantalum [µg/g] | 8.6 | 8.2 | 14 | 15 | 17 | 16 |
| Terbium [µg/g] | 1.1 | 0.88 | 0.22 | 0.20 | 0.19 | 0.12 |
| Thorium [µg/g] | 17 | 18 | 1.2 | 3.3 | 1.9 | 1.8 |
| Titanium [µg/g] | 5100 | 5300 | 360 | 800 | 470 | 380 |
| Thallium [µg/g] | 0.92 | 0.95 | 0.05 | 0.08 | 0.04 | 0.04 |
| Thulium [µg/g] | 0.50 | 0.50 | 0.088 | 0.089 | 0.068 | 0.043 |
| Uranium [µg/g] | 3.7 | 4.2 | 1.1 | 1.3 | 0.88 | 0.40 |
| Vanadium [µg/g] | 120 | 130 | 8.6 | 19 | 12 | 7.2 |
| Tungsten [µg/g] | 1.5 | 1.6 | 0.15 | 0.30 | 0.19 | 0.10 |
| Ytterbium [µg/g] | 2.9 | 2.9 | 0.48 | 0.53 | 0.42 | 0.28 |
| Yttrium [µg/g] | 25 | 22 | 7.7 | 6.5 | 5.3 | 3.4 |
| Zinc [µg/g] | 67 | 62 | 6.0 | 12 | 13 | 6.5 |
| Zirconium [µg/g] | 95 | 100 | 12 | 24 | 16 | 13 |

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*Project Specialist*
*Environmental Services, Analytical*

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# APPENDIX B

## SGS Report on SEM-EDS and XRD Mineralogy of DGR-6 Samples

# SEM-EDS and XRD Mineralogy of

# DGR6 SAMPLES

**prepared for**

## Intera Engineering Limited

**May 19, 2010**



SGS Canada Inc.

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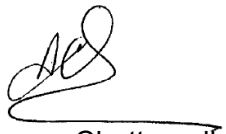
# *Introduction*

Eight samples from the DGR6, identified as DGR6-654.58, DGR6-664.31, DGR6-697.67, DGR6-717.97, DGR6-735.40, DGR6-750.80, DGR6-761.76 and DGR6-768.58 were submitted by Intera Engineering Limited for semi-quantitative XRD, whole rock analysis and SEM-EDS analysis. The objectives of the investigation were the estimation of different phases by XRD and SEM-EDS analysis of pore fabric and soluble minerals for the samples.

One polished section, prepared (Dry Preparation) from the cut slice of the above eight drill core samples was systematically scanned under scanning electron microscope with energy dispersive spectra for analysis of soluble minerals. X-ray powder diffraction analysis and whole rock analysis were carried out on the split grind samples

**SGS LAKEFIELD RESEARCH LIMITED**



Aparup Chattopadhyay, Ph.D., P. Geo.
Senior Mineralogist

Roch Marion, B.Sc., C.Chem.
Manager, Process Mineralogy

*Experimental Work by:* Elaine Glover – Sample Logging
Amie Brock – Polished Section Preparation
Kim Gibbs – SEM-EDS
Anita Coppaway/Huyun Zhou – X-Ray Diffracrtion
Anthony Bellis – Data Processing

*Report Preparation by: A*parup Chattopadhyay

# *Testwork Summary*

## 1. Sample Preparation

One polished section, prepared (Dry Preparation) from the cut slice of the above eight drill core samples. Representative sub-samples were split after grinding a cut slice for X-ray diffraction and chemical analysis from all the drill core samples (DGR6).

## 2. X-ray Powder Diffraction Analysis

XRD analysis results, listed in Appendix 1, showed that DGR6-654.58 sample was mainly composed of mica and quartz with minor amounts of potassium-feldspar, chlorite, ankerite, calcite, plagioclase, dolomite and pyrite and traces of palygorskite, anatase, apatite and halite; DGR6-664.31 sample was mainly composed of mica and quartz with minor amounts of potassium-feldspar, chlorite, ankerite, calcite, plagioclase and pyrite and traces of dolomite, palygorskite, anatase, apatite and halite; DGR6-697.67 sample was mainly composed of mica and quartz with minor amounts of potassium-feldspar, chlorite, calcite, plagioclase, palygorskite and pyrite and traces of ankerite, dolomite, anatase, apatite and halite; DGR6-717.97 sample was mainly composed of mica and quartz with minor amounts of potassium-feldspar, chlorite, calcite, pyrite, palygorskite and plagioclase, and traces of ankerite, anatase, dolomite, apatite and halite; DGR6-735.40 sample was mainly composed of mica and quartz with minor amounts of chlorite, calcite, potassium-feldspar, pyrite, ankerite, dolomite and plagioclase, and traces of palygorskite, anatase, apatite and halite; DGR6-750.80 sample was dominantly composed of calcite with minor amounts of dolomite, ankerite, quartz, mica and potassium-feldspar, and traces of plagioclase, pyrite and halite; DGR6-761.76 sample was dominantly composed of calcite with minor amounts of ankerite, dolomite, quartz, mica and potassium-feldspar, and

traces of chlorite, plagioclase, pyrite and halite; and DGR6-768.58 sample was dominantly composed of calcite with minor amounts of ankerite, mica, dolomite, quartz and potassium-feldspar, and traces of chlorite, plagioclase, pyrite and halite.

## 3. Scanning Electron Microscopy

The analysis of pore fabric and soluble minerals by SEM-EDS for the eight DGR6 core samples were carried out by Tescan Vega II SEM with Oxford Inca EDS/WDS system. The carbon coated polished sections (dry preparation) from DGR6 were scanned under the SEM-EDS system for semi-quantitative spot analysis for the study of the pore fabric and soluble minerals and the results were presented in Tables 1-43 and the back scattered scanning electron photographs in plates 1-43. Selected EDS spectra were tabulated in Appendix-2.

Irregular interconnected bands/veins of Na-Chloride (halite) were noted along the fracture or void spaces within silicates and carbonates (Plates 1-4) in DGR6-654.58 sample. Extensive interstitial cavity fillings zones of Na-Chloride (halite) and wide disseminated patches of halite were commonly noted in DGR6-664.31 (Plates 5 - 8). In DGR6-697.67 sample, irregular rims of Na-Chloride (halite) at the boundary of silicates and veins/disseminated patches of Na-Chloride (halite) within silicates were noted (Plates 9-12). In DGR6-717.97 sample, extensive interconnected bands and wide patches of Na-Chloride (halite) were noted within silicates groundmass and the results of the analysis were presented in Tables/Plates 13 - 16. Extensive interstitial cavity fillings zones of Na-Chloride (halite) and wide disseminated patches of halite were commonly noted in DGR6-735.40, DGR6-750.80, DGR6-761.76 and DGR6-768.58 samples, and the SEM-EDS results are presented in Tables/Plates 17 - 32

Table 1: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Mica, Quartz and Pyrite

| **Sample:** DGR6 - 654.58 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ti | Fe |
| 1-1 | 46.86 | | | 9.29 | 30.92 | | | 12.93 | | |
| 1-2 | 53.08 | | | | 46.92 | | | | | |
| 1-3 | | | | | | 54.80 | | | | 45.20 |
| 1-4 | 8.61 | 27.25 | 1.01 | 4.39 | 13.30 | | 39.17 | 1.82 | 1.09 | 3.36 |
| 1-5 | 7.01 | 33.61 | | 2.88 | 8.69 | | 46.58 | 1.23 | | |
| 1-6 | 8.87 | 32.24 | | 2.05 | 11.81 | | 44.32 | 0.70 | | |

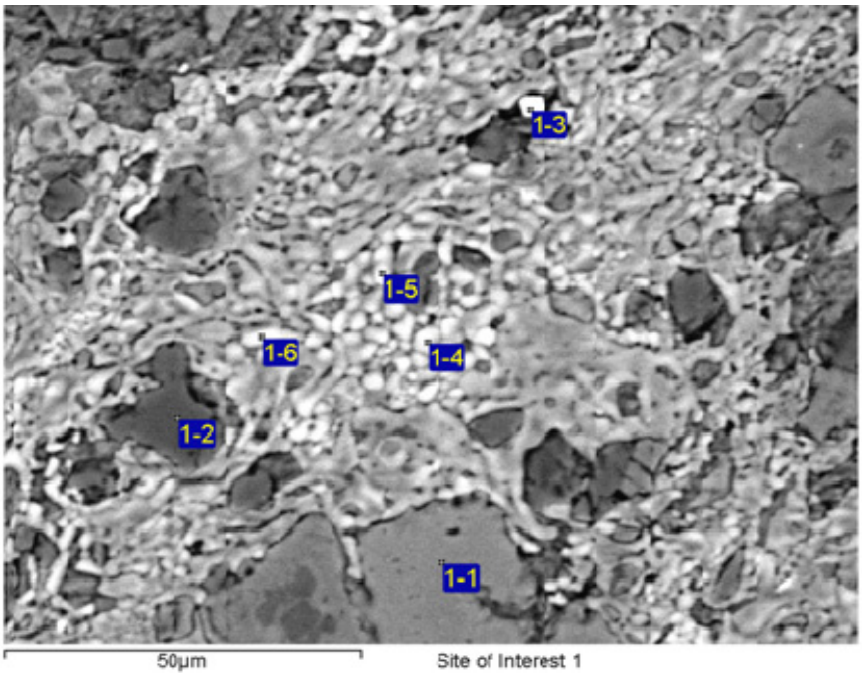



**Plate 1:** Back scattered scanning electron photographs indicating position of spots analysis in **DGR6 - 654.58**

Table 2: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Ankerite and Quartz

| **Sample:** DGR6 - 654.58 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | K | Ca | Mn | Fe |
| 3-1 | 59.27 | | 15.37 | | | | | 25.35 | | |
| 3-2 | 56.55 | | 9.38 | | | | | 25.65 | 1.18 | 7.24 |
| 3-3 | 53.54 | | | | 46.46 | | | | | |
| 3-4 | 6.81 | 28.18 | 0.78 | 4.48 | 11.42 | 42.17 | 2.45 | | | 3.71 |
| 3-5 | 21.49 | 16.88 | 1.25 | 9.87 | 20.85 | 21.80 | 5.24 | | | 2.63 |
| 3-6 | 26.30 | 16.32 | 1.78 | 9.11 | 19.14 | 19.90 | 4.12 | | | 3.34 |

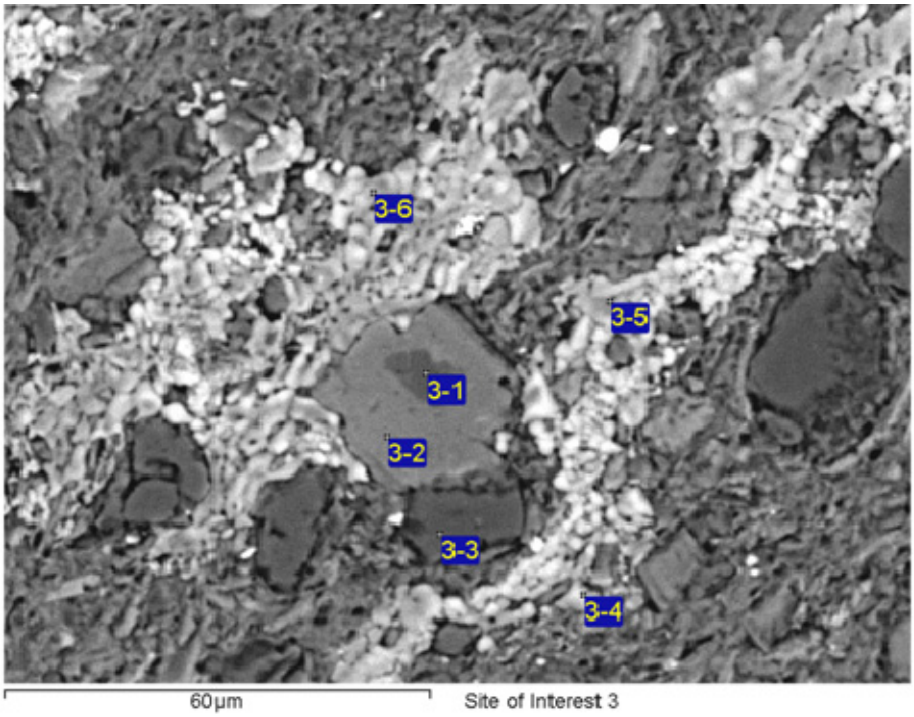



**Plate 2:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 - 654.58**

Table 3: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz and Pyrite

| **Sample:** DGR6 - 654.58 | | | | | Elements (in Wt.%) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Fe |
| 4-1 | 53.02 | | | | 46.98 | | | | |
| 4-2 | | | | | | 54.92 | | | 45.08 |
| 4-3 | 9.04 | 32.52 | 0.82 | 3.70 | 7.44 | | 43.58 | 1.30 | 1.59 |
| 4-4 | 10.27 | 31.73 | 0.96 | 3.71 | 6.56 | | 43.69 | 1.44 | 1.63 |
| 4-5 | | | | | 1.02 | 54.78 | | | 44.20 |

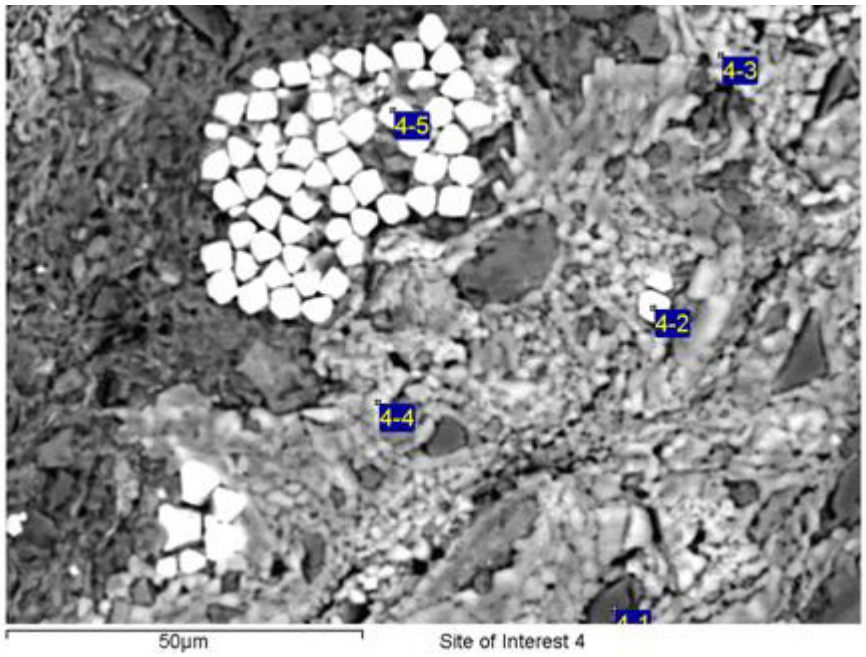



**Plate 3:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 - 654.58**

Table 4: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz, Pyrite and Calcite

| **Sample:** DGR6 - 654.58 | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Al | Si | S | Cl | K | Ca | Fe |
| 6-1 | 3.06 | 39.88 | 0.44 | 0.70 | | 55.91 | | | |
| 6-2 | | 37.76 | | 1.10 | | 61.13 | | | |
| 6-3 | 5.83 | 33.20 | 3.20 | 6.09 | | 49.85 | 1.83 | | |
| 6-4 | | | | | 55.41 | | | | 44.59 |
| 6-5 | 53.50 | | | 46.50 | | | | | |
| 6-6 | 54.85 | | | | | | | 45.15 | |

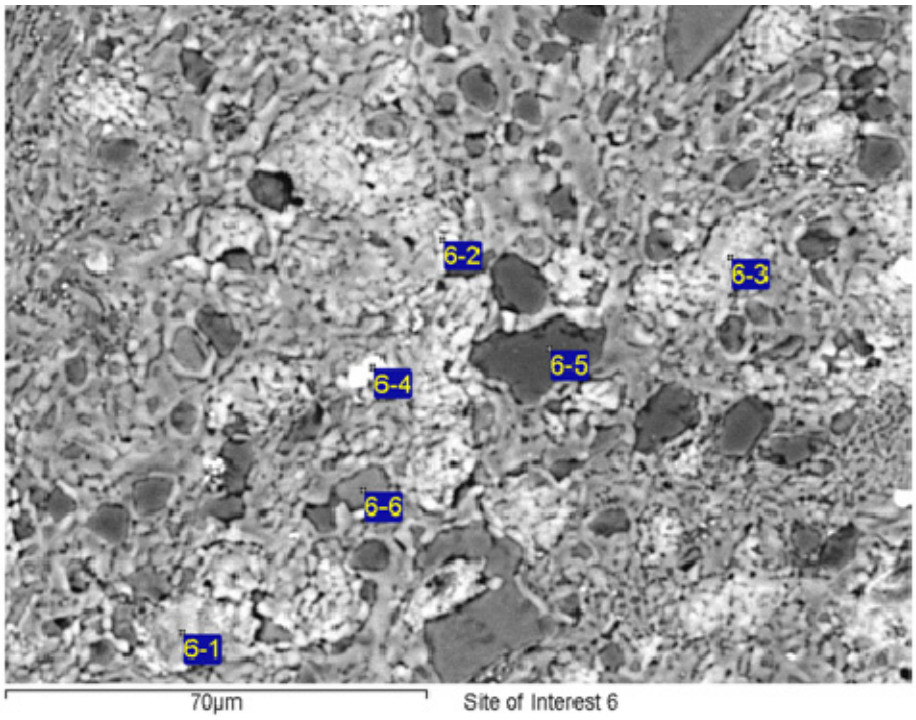



**Plate 4:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 - 654.58**

Table 5: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz, Ankerite and Pyrite

| **Sample:** DGR6 – 664.31 | Elements (in Wt.%) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ca | Ti | Fe |
| 1-1 | | | | | | 56.05 | | | | | 43.95 |
| 1-2 | 55.65 | | 9.74 | 0.63 | 1.37 | | | | 25.36 | | 7.24 |
| 1-3 | 54.80 | | | | 45.20 | | | | | | |
| 1-4 | 2.36 | 34.22 | | 3.18 | 6.26 | | 51.66 | 2.31 | | | |
| 1-5 | | 37.31 | | 1.16 | 2.34 | | 57.89 | | 0.75 | 0.56 | |
| 1-6 | | 38.79 | | | 0.49 | | 60.71 | | | | |
| 1-7 | | 35.49 | 1.02 | 2.20 | 3.69 | | 51.84 | | | | 5.77 |

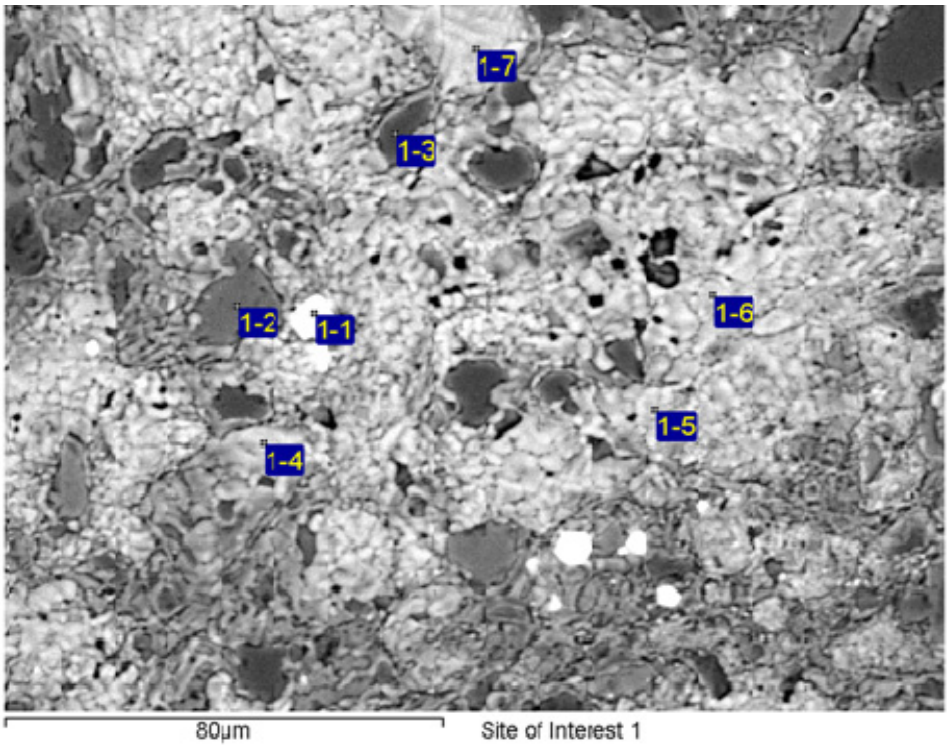



**Plate 5:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 664.31**

Table 6: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz, Feldspar and Pyrite

| **Sample:** DGR6 – 664.31 | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Fe |
| 2-1 | 52.41 | | | | 47.59 | | | | |
| 2-2 | 5.86 | 29.92 | 1.47 | 5.66 | 9.13 | | 40.70 | 2.13 | 5.14 |
| 2-3 | | 37.40 | 0.56 | 0.81 | 1.71 | | 57.46 | | 2.06 |
| 2-4 | 3.85 | 35.36 | 1.02 | 2.45 | 3.74 | | 50.15 | | 3.43 |
| 2-5 | | 36.29 | | 0.56 | 6.74 | | 56.41 | | |
| 2-6 | 46.19 | 0.56 | | 9.54 | 31.22 | | | 12.48 | |
| 2-7 | | | | | | 54.42 | | | 45.58 |

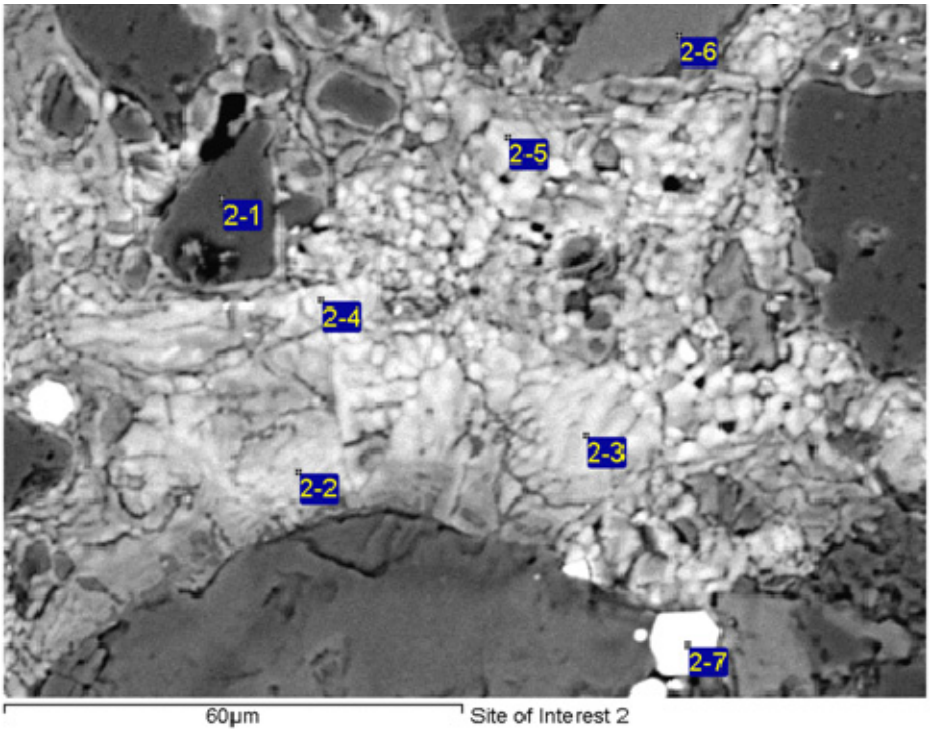



**Plate 6:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 664.31**

Table 7: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz and Calcite

| **Sample:** DGR6 – 664.31 | | | | | Elements (in Wt.%) | | | |
|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | K | Ca |
| 4-1 | 56.85 | 0.94 | 0.56 | | | 0.62 | | 41.04 |
| 4-2 | 53.15 | | | | 46.85 | | | |
| 4-3 | 3.28 | 33.55 | | 0.95 | 1.90 | 60.32 | | |
| 4-4 | 2.89 | 38.32 | | 1.56 | 2.51 | 54.00 | 0.72 | |
| 4-5 | 2.75 | 34.62 | | 0.63 | 1.93 | 60.06 | | |
| 4-6 | | 38.16 | | | | 61.84 | | |
| 4-7 | | 35.73 | | 0.63 | 1.70 | 61.94 | | |

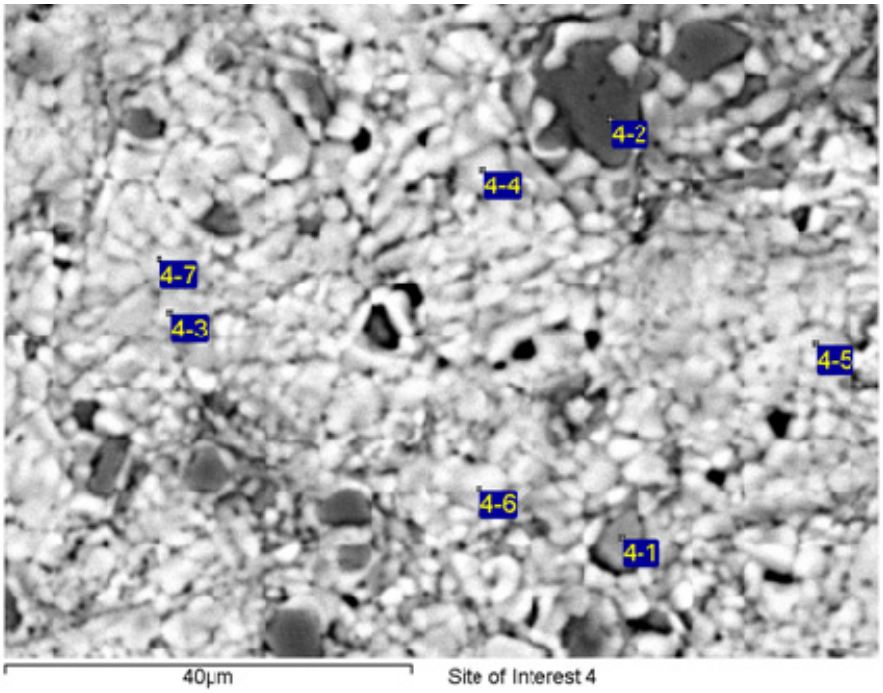



**Plate 7:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 664.31**

Table 8: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Feldspar and Chlorite

**Sample:** DGR6 – 664.31 Elements (in Wt.%)

| Spots | O | Na | Mg | Al | Si | Cl | K | Fe |
|---|---|---|---|---|---|---|---|---|
| 5-1 | | 38.00 | | | 1.52 | 59.39 | | 1.09 |
| 5-2 | | 37.64 | | 1.55 | 2.42 | 56.10 | 0.50 | 1.78 |
| 5-3 | 4.06 | 32.64 | 0.69 | 3.09 | 7.04 | 49.24 | 1.74 | 1.51 |
| 5-4 | | 38.85 | | | 0.83 | 60.31 | | |
| 5-5 | 5.57 | 35.00 | | 1.37 | 3.06 | 54.24 | 0.76 | |
| 5-6 | 46.11 | | 1.75 | 16.33 | 24.99 | 0.53 | 10.28 | |
| 5-7 | 51.15 | | 5.38 | 11.89 | 12.30 | 0.45 | | 18.84 |

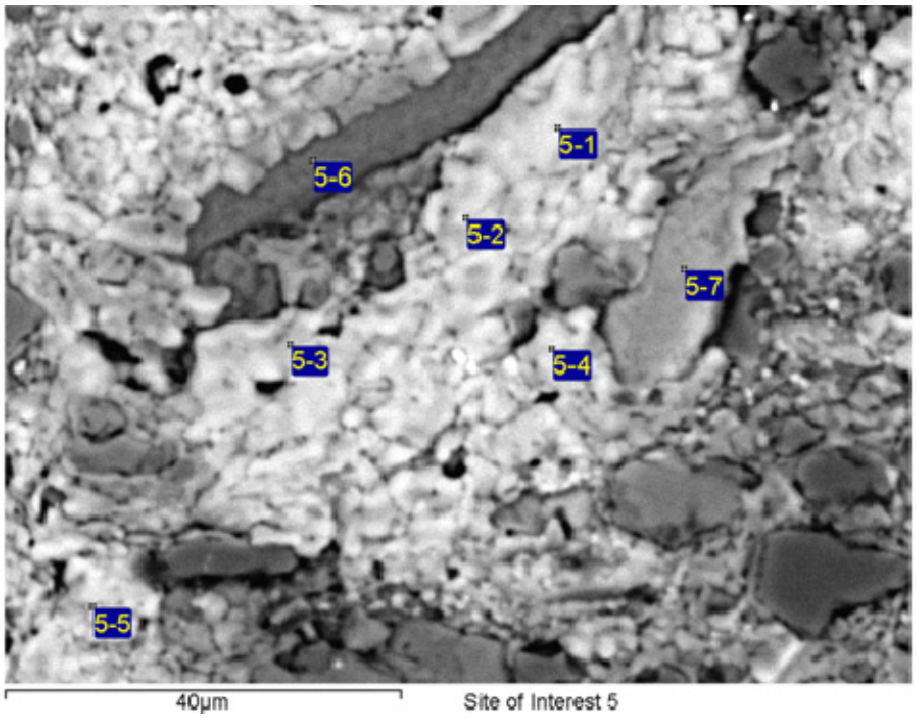



**Plate 8:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 664.31**

Table 9: Results of Semi-Quantitative Spot Analysis in Na-Chloride and Pyrite

| **Sample:** DGR6 – 697.67 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ca | Fe |
| 1-1 | 8.49 | 30.89 | 0.99 | 3.60 | 9.24 | | 43.82 | 1.05 | | 1.92 |
| 1-2 | | 39.91 | | | 0.49 | | 59.60 | | | |
| 1-3 | 3.61 | 38.10 | | 0.77 | 1.85 | | 55.67 | | | |
| 1-4 | | 38.43 | | 1.06 | 2.09 | | 58.42 | | | |
| 1-5 | 7.00 | 38.08 | | 1.18 | 2.55 | | 51.19 | | | |
| 1-6 | | 38.64 | | 0.54 | 0.91 | | 59.91 | | | |
| 1-7 | 5.04 | 36.02 | | 1.31 | 2.66 | | 54.95 | | | |
| 1-8 | | 1.78 | | | 1.20 | 50.97 | 2.36 | | | 43.70 |
| 1-9 | 10.74 | 31.29 | | 2.43 | 8.72 | | 43.80 | 1.10 | 0.73 | 1.17 |

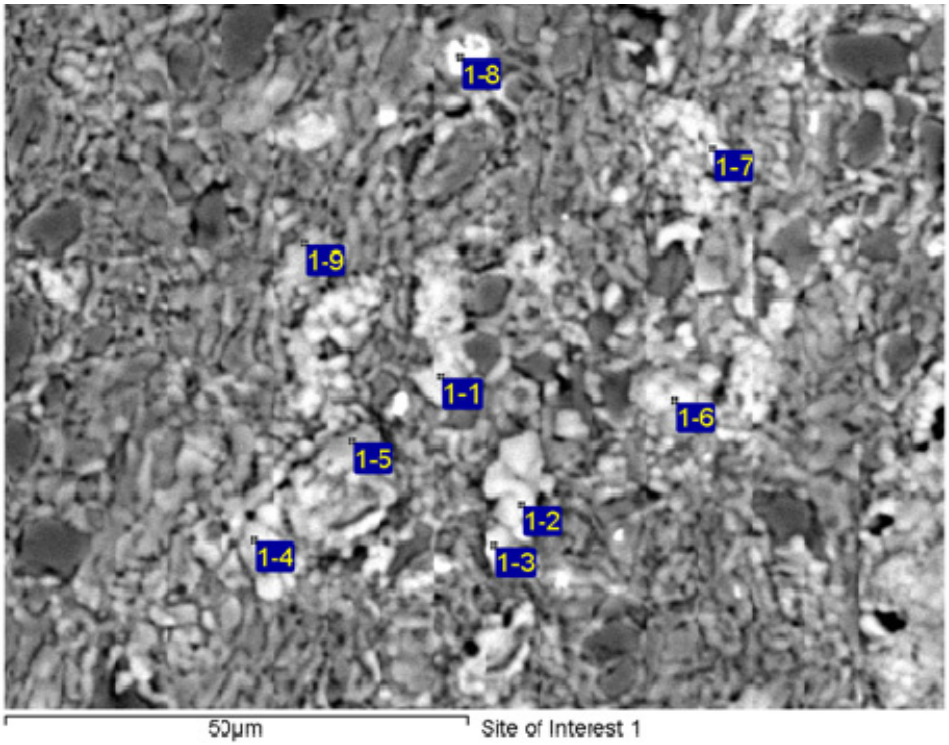



**Plate 9:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 697.67**

Table 10: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite, Quartz and Pyrite

| **Sample:** DGR6 – 697.67 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ca | Fe |
| 3-1 | 52.44 | | | | 47.56 | | | | | |
| 3-2 | 55.39 | | | | | | | | 44.61 | |
| 3-3 | | | | | | 55.19 | | | | 44.81 |
| 3-4 | | 36.66 | | 1.13 | 1.39 | | 60.82 | | | |
| 3-5 | | 39.24 | | | 0.49 | | 60.27 | | | |
| 3-6 | 3.86 | 35.71 | | 1.35 | 1.35 | | 57.73 | | | |
| 3-7 | 21.62 | 26.83 | 1.43 | 2.73 | 3.67 | | 40.67 | 0.52 | | 2.52 |

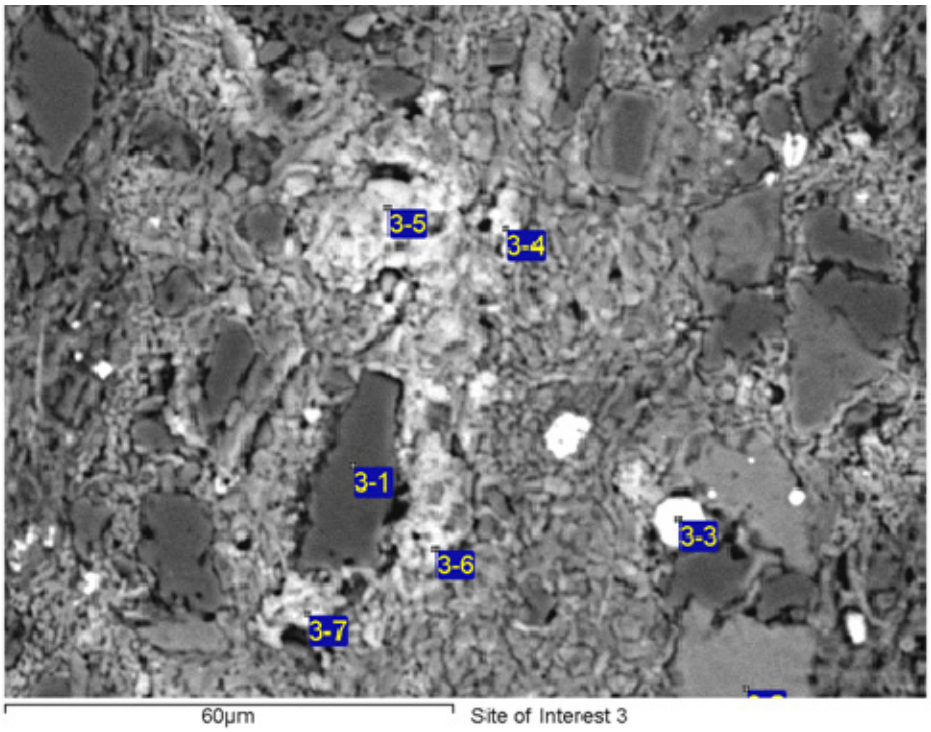



**Plate 10:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 697.67**

Table 11: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Feldspar and Pyrite

| **Sample:** DGR6 – 697.67 | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Fe |
| 4-1 | 52.72 | | | | 47.28 | | | | |
| 4-2 | 46.61 | | | 9.65 | 30.88 | | | 12.86 | |
| 4-3 | | | | | | 54.69 | | | 45.31 |
| 4-4 | 4.95 | 31.46 | | 1.58 | 8.99 | | 50.33 | | 2.69 |
| 4-5 | 3.08 | 39.94 | | 0.80 | 1.06 | | 55.13 | | |
| 4-6 | 6.08 | 30.95 | | 3.38 | 10.79 | | 45.69 | 3.12 | |
| 4-7 | 3.22 | 37.38 | | 1.53 | 2.64 | | 54.58 | 0.66 | |
| 4-8 | 14.75 | 27.94 | 0.84 | 5.05 | 9.86 | | 39.20 | 2.36 | |

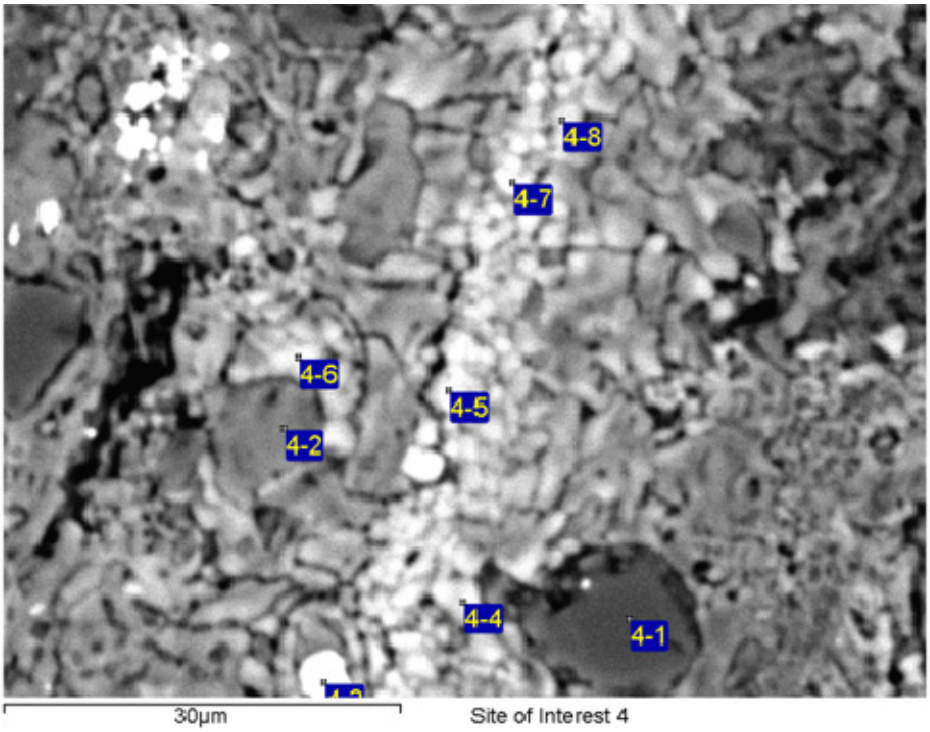



**Plate 11:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 697.67**

Table 12: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Feldspar and Pyrite

| **Sample:** DGR6 – 697.67 | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Al | Si | S | Cl | K | Ti | Fe |
| 5-1 | 8.60 | 28.68 | 4.22 | 11.28 | | 45.32 | 1.91 | | |
| 5-2 | | 2.33 | | | 53.26 | 1.75 | | | 42.66 |
| 5-3 | 44.59 | | 9.72 | 32.15 | | | 13.54 | | |
| 5-4 | 48.61 | 8.26 | 10.38 | 32.74 | | | | | |
| 5-5 | 5.11 | 36.63 | 1.17 | 2.70 | | 53.81 | 0.57 | | |
| 5-6 | 3.71 | 36.91 | 1.00 | 1.57 | | 56.80 | | | |
| 5-7 | 15.04 | 27.20 | 1.47 | 17.73 | | 38.03 | 0.54 | | |
| 5-8 | 5.38 | 36.94 | 0.77 | 4.98 | | 51.94 | | | |
| 5-9 | 9.96 | 32.80 | 2.17 | 5.40 | | 47.24 | 0.92 | 1.51 | |

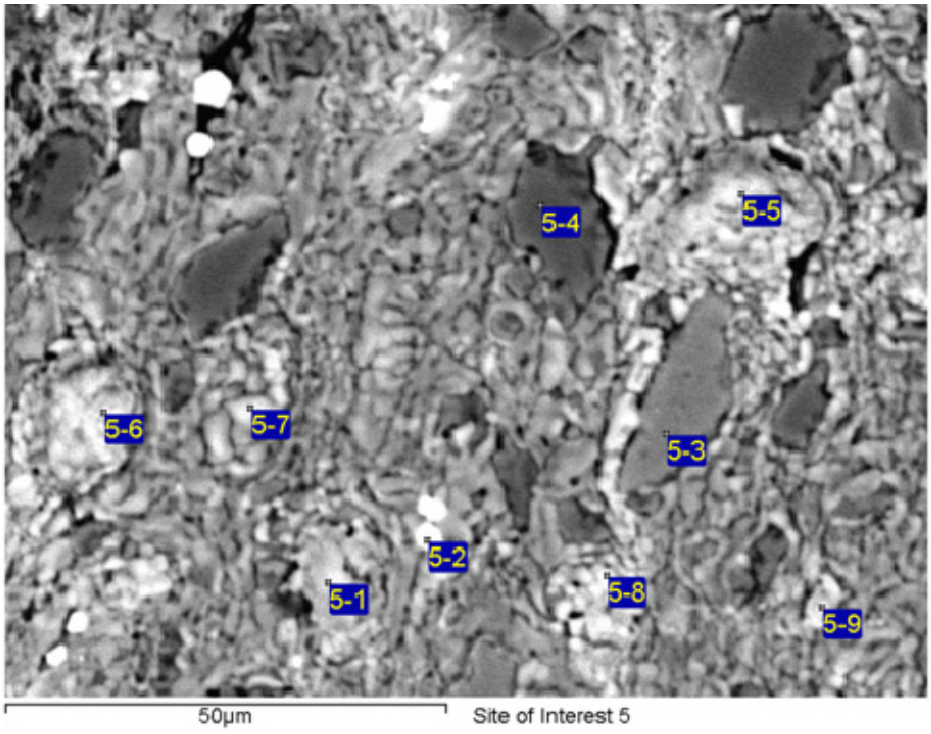



**Plate 12:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 697.67**

Table 13: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz and Pyrite

| **Sample:** DGR6 – 717.97 | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Fe |
| 1-1 | 53.61 | | | | 46.39 | | | | |
| 1-2 | | | | | | 53.94 | | | 46.06 |
| 1-3 | | 37.15 | | 1.06 | 2.65 | | 58.49 | 0.65 | |
| 1-4 | 6.63 | 32.87 | | 1.80 | 8.36 | | 49.46 | 0.88 | |
| 1-5 | 18.68 | 20.20 | 3.59 | 9.08 | 10.09 | | 20.85 | | 17.52 |
| 1-6 | 4.85 | 31.87 | | 1.30 | 10.47 | | 50.87 | 0.63 | |
| 1-7 | 4.81 | 34.53 | | 1.87 | 7.74 | | 49.92 | 1.12 | |
| 1-8 | | 36.88 | | 1.52 | 3.34 | | 57.46 | 0.79 | |

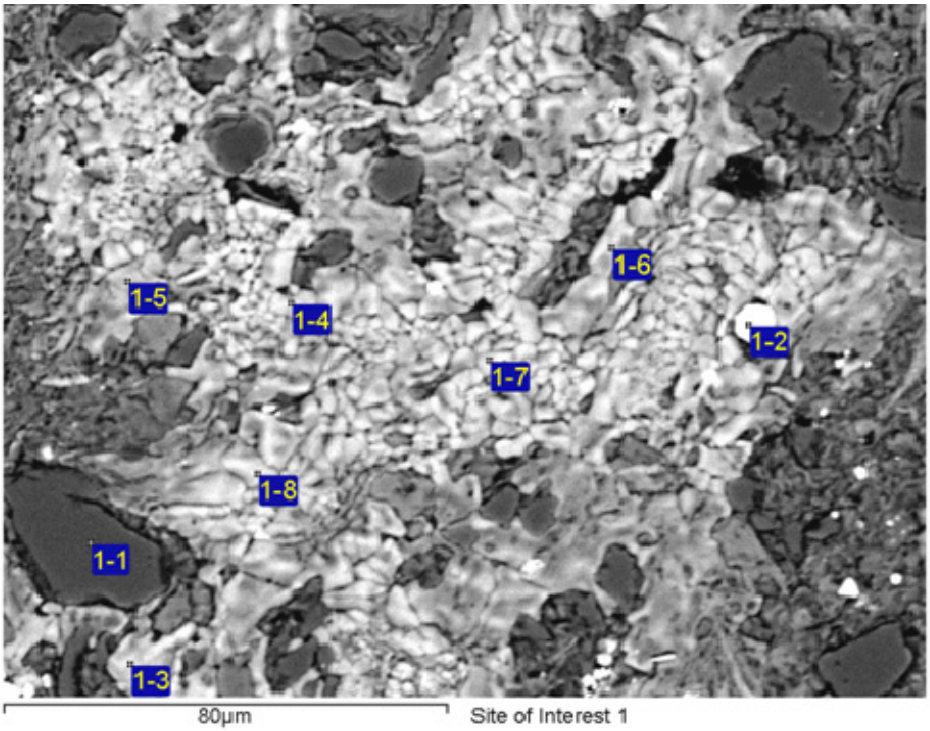



**Plate 13:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 717.97**

Table 14: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz, Feldspar and Pyrite

| **Sample:** DGR6 – 717.97 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ca | Fe |
| 2-1 | 46.05 | 0.65 | | 9.49 | 31.53 | | | 12.28 | | |
| 2-2 | 52.67 | | | | 47.33 | | | | | |
| 2-3 | | | | | | 55.49 | | | | 44.51 |
| 2-4 | | 37.15 | | | 0.71 | | 62.14 | | | |
| 2-5 | | 34.05 | | 0.54 | 2.05 | | 62.72 | 0.65 | | |
| 2-6 | 6.39 | 31.24 | 0.98 | 4.74 | 7.76 | | 43.01 | 1.98 | 1.56 | 2.33 |
| 2-7 | 13.07 | 28.51 | | 1.11 | 17.61 | | 39.69 | | | |
| 2-8 | | 37.32 | | 0.61 | 6.25 | | 55.82 | | | |
| 2-9 | | 37.66 | | | 0.44 | | 61.89 | | | |
| 2-10 | | 33.62 | | 2.35 | 6.29 | | 54.48 | 1.53 | | 1.74 |

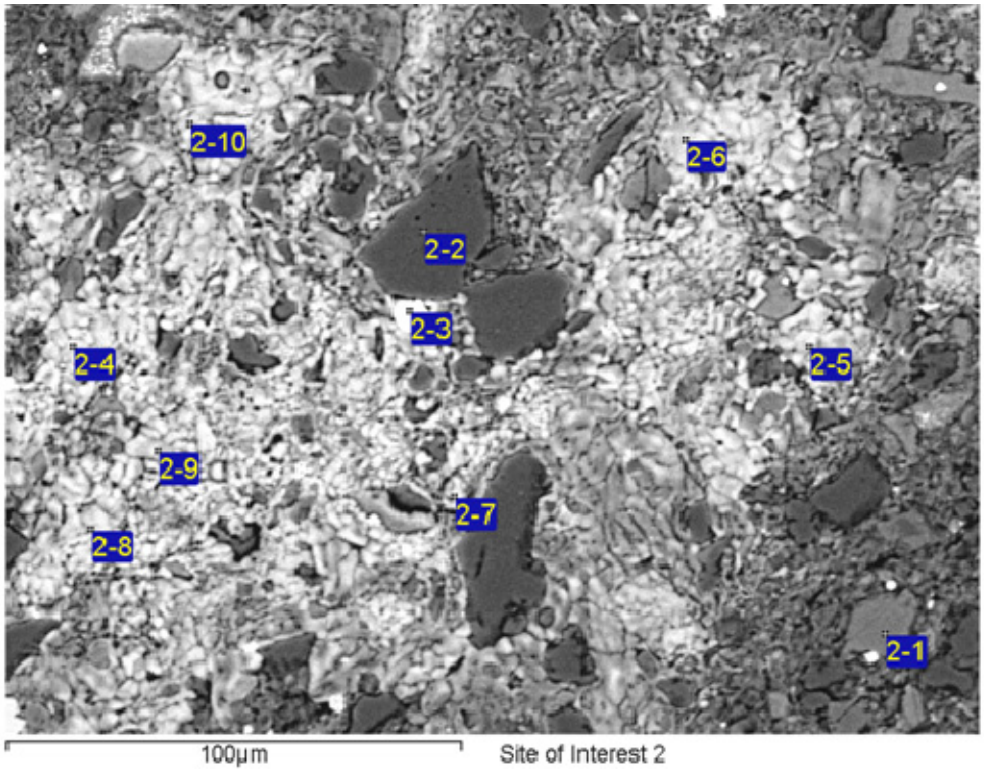



**Plate 14:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 717.97**

Table 15: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz, Feldspar and Pyrite

| **Sample:** DGR6 – 717.97 | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Fe |
| 4-1 | | | | | | 54.85 | | | 45.15 |
| 4-2 | 52.91 | | | | 47.09 | | | | |
| 4-3 | 48.68 | 1.95 | | 9.00 | 30.94 | | | 9.43 | |
| 4-4 | | 37.08 | | 1.44 | 3.28 | | 56.39 | 0.75 | 1.06 |
| 4-5 | 2.13 | 37.66 | | 0.89 | 1.77 | | 57.08 | 0.49 | |
| 4-6 | 4.07 | 35.51 | | 2.40 | 5.45 | | 51.05 | 1.52 | |
| 4-7 | 5.82 | 34.07 | 0.59 | 2.71 | 6.33 | | 49.18 | 1.30 | |
| 4-8 | 5.05 | 34.70 | | 2.53 | 6.22 | | 49.99 | 1.52 | |

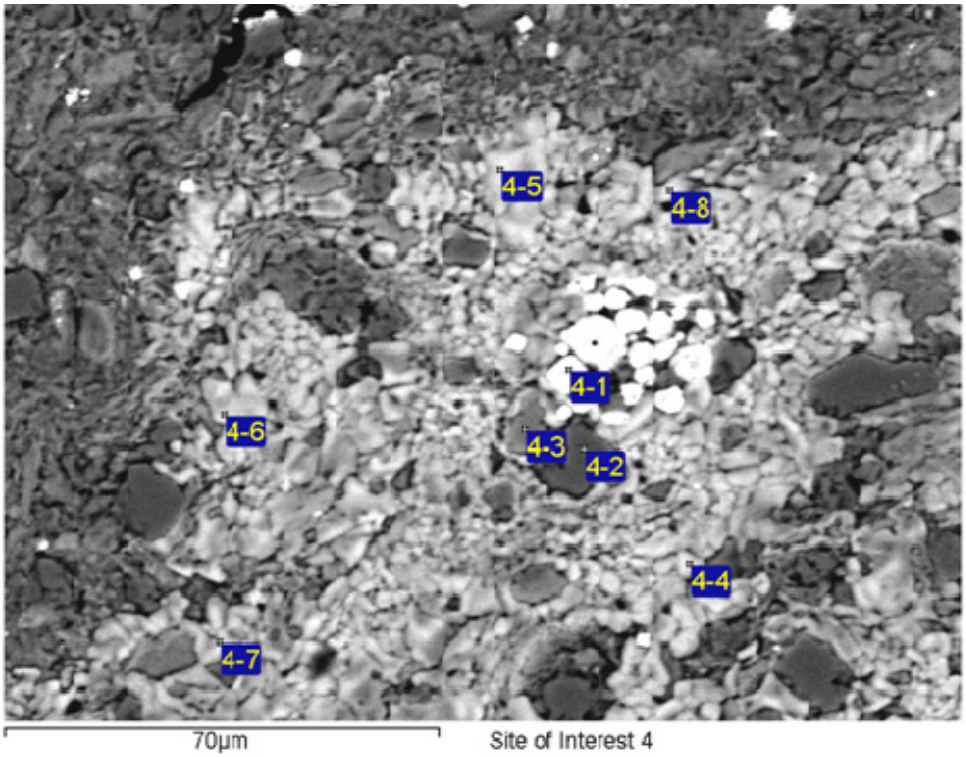



**Plate 15:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 717.97**

Table 16: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz, Pyrite and Chlorite

| **Sample:** DGR6 – 717.97 | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Fe |
| 5-1 | 52.32 | | | | 47.68 | | | | |
| 5-2 | 9.34 | 21.48 | 1.05 | 9.27 | 18.87 | | 31.47 | 5.36 | 3.16 |
| 5-3 | | 2.42 | | | 0.53 | 52.51 | 2.03 | | 42.51 |
| 5-4 | | | | | | 53.93 | | | 46.07 |
| 5-5 | 46.41 | | 6.93 | 10.98 | 15.13 | | | 0.41 | 20.14 |
| 5-6 | 4.46 | 28.66 | 0.99 | 5.20 | 10.81 | | 39.91 | 1.84 | 8.13 |
| 5-7 | 3.82 | 34.33 | | 3.64 | 6.24 | | 48.45 | 1.84 | 1.69 |
| 5-8 | 3.35 | 38.24 | 0.51 | 1.17 | 2.65 | | 52.78 | 0.45 | 0.85 |
| 5-9 | 2.21 | 37.64 | | 1.33 | 3.28 | | 54.94 | 0.60 | |
| 5-10 | 2.44 | 38.84 | | 1.28 | 2.82 | | 54.17 | 0.44 | |

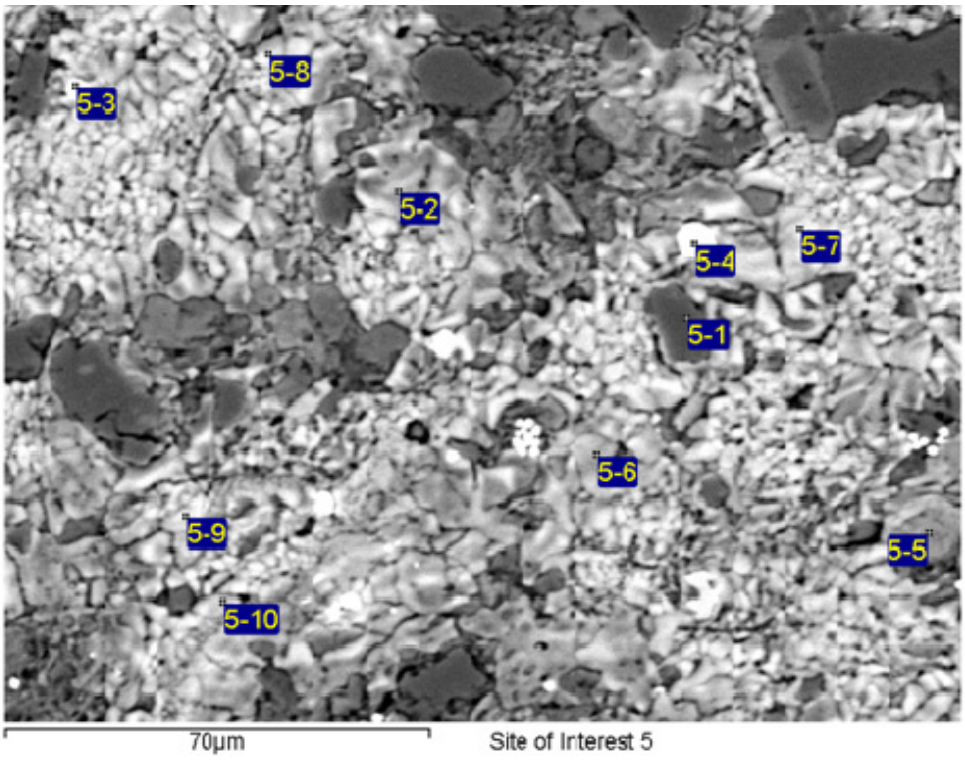



**Plate 16:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 717.97**

Table 17: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz, Ankerite and Pyrite

| **Sample:** DGR6 – 735.40 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ca | Fe |
| 2-1 | 55.84 | | 10.27 | | 1.35 | | | | 27.32 | 5.21 |
| 2-2 | 50.07 | | | | 39.96 | 5.07 | | | | 4.90 |
| 2-3 | 16.58 | | 2.25 | | | 42.90 | | | 4.03 | 34.25 |
| 2-4 | | 34.52 | | 1.39 | 5.90 | | 57.41 | 0.78 | | |
| 2-5 | 2.77 | 36.64 | | 1.96 | 4.11 | | 52.58 | 1.12 | 0.83 | |
| 2-6 | | 38.24 | | 1.52 | 2.83 | | 57.41 | | | |
| 2-7 | 8.39 | 28.44 | | 4.87 | 13.37 | | 41.06 | 2.42 | | 1.45 |
| 2-8 | | 31.22 | | 0.49 | 1.62 | | 66.67 | | | |

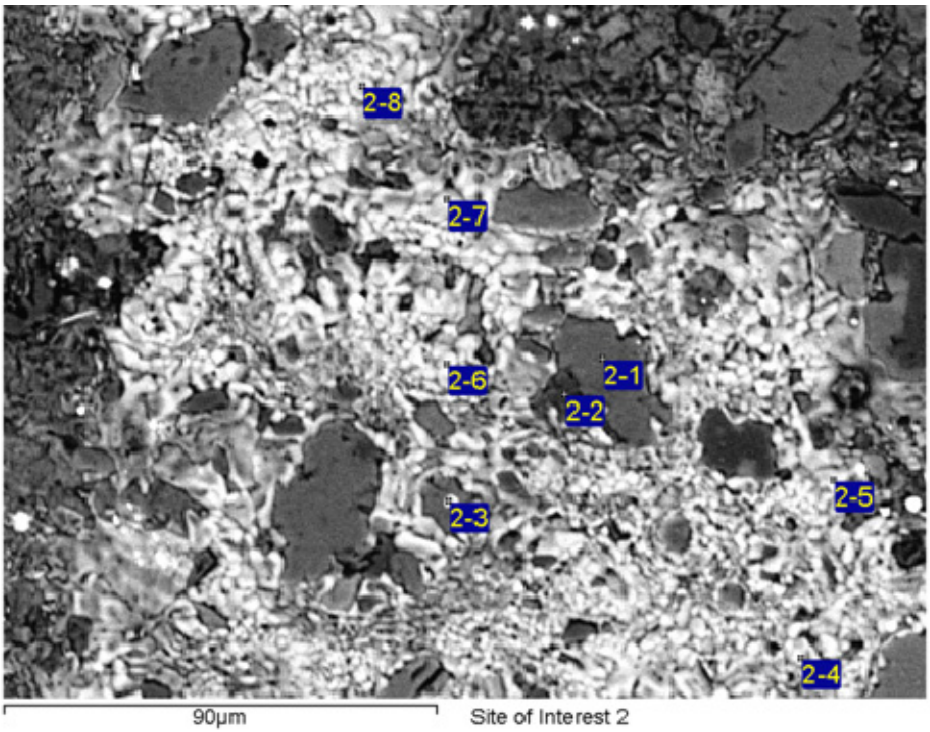



**Plate 17:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 735.40**

Table 18: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Quartz, Ankerite and Pyrite

| **Sample:** DGR6 – 735.40 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ca | Fe |
| 3-1 | 53.31 | | | | 46.69 | | | | | |
| 3-2 | 55.73 | | 10.50 | | | | | | 28.66 | 5.11 |
| 3-3 | | 34.70 | | | 1.75 | | 63.55 | | | |
| 3-4 | | | | | | 54.65 | | | | 45.35 |
| 3-5 | 2.91 | 31.44 | | 2.38 | 7.16 | | 53.88 | 0.93 | | 1.30 |
| 3-6 | | 37.67 | | 0.52 | 1.09 | | 60.72 | | | |
| 3-7 | 3.58 | 36.84 | | 2.14 | 3.88 | | 53.57 | | | |
| 3-8 | 3.49 | 36.56 | | 1.87 | 3.95 | 0.89 | 51.55 | | | 1.69 |
| 3-9 | | 36.87 | | 2.13 | 3.48 | | 56.76 | 0.76 | | |
| 3-10 | | 38.32 | | 1.19 | 1.93 | | 58.56 | | | |

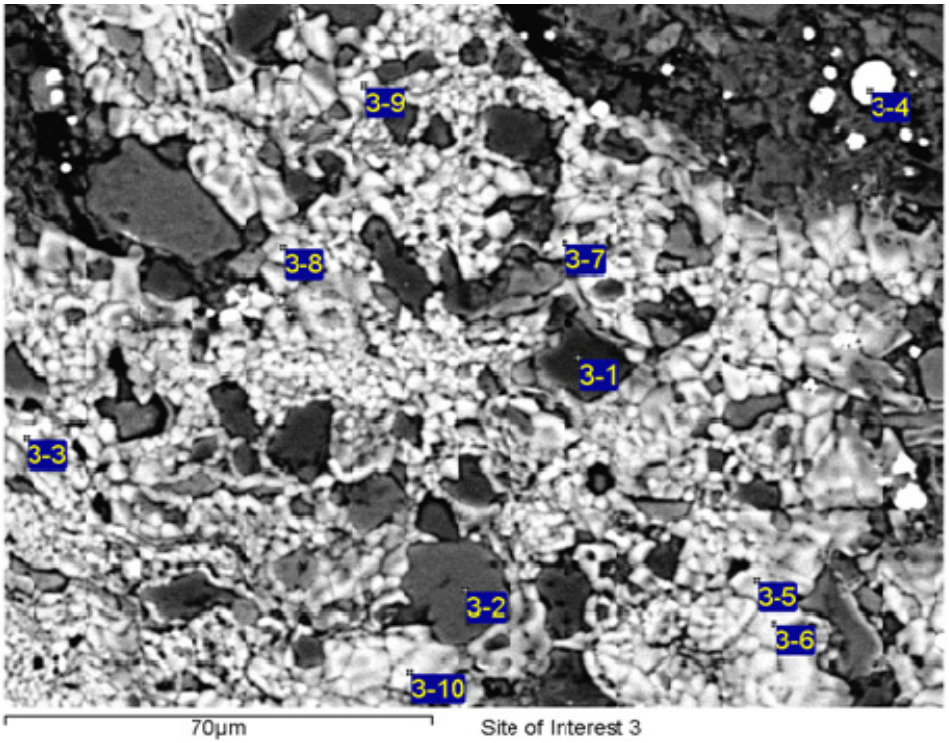



**Plate 18:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 735.40**

Table 19: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Ankerite and Calcite

| **Sample:** DGR6 – 735.40 | Elements (in Wt.%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | K | Ca | Fe |
| 4-1 | 57.16 | | | | 0.59 | | | 42.25 | |
| 4-2 | 56.98 | | 11.56 | | | | | 25.71 | 5.76 |
| 4-3 | | 30.93 | | 3.41 | 11.42 | 50.50 | 1.28 | | 2.45 |
| 4-4 | | 32.51 | | 0.93 | 2.55 | 64.01 | | | |
| 4-5 | | 36.13 | | 1.18 | 6.97 | 55.72 | | | |
| 4-6 | | 38.95 | | | 1.24 | 59.81 | | | |
| 4-7 | | 36.91 | | | 0.88 | 62.22 | | | |

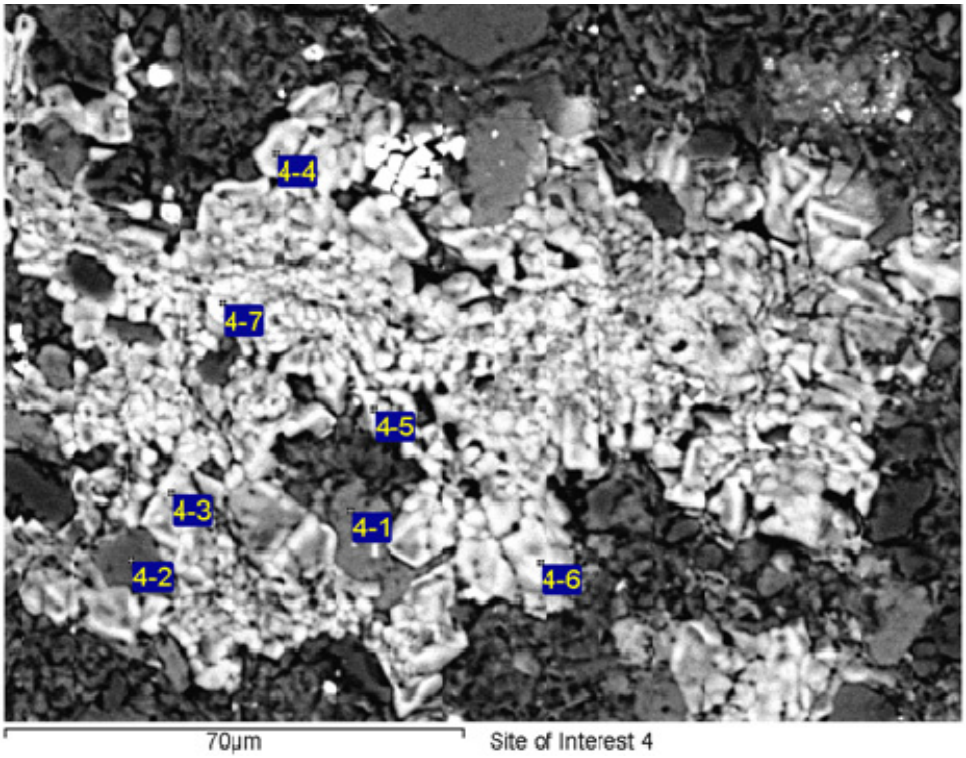



**Plate 19:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 735.40**

Table 20: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Feldspar, Ankerite and Calcite

| **Sample:** DGR6 – 735.40 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ca | Fe |
| 5-1 | | | | | | 53.56 | | | | 46.44 |
| 5-2 | 56.14 | | 12.53 | | | | | | 25.99 | 5.35 |
| 5-3 | 46.92 | | | 9.24 | 31.11 | | | 12.72 | | |
| 5-4 | | 38.33 | | 0.42 | 0.78 | | 60.47 | | | |
| 5-5 | | 40.04 | | | | | 59.96 | | | |
| 5-6 | | 40.70 | | | 0.80 | | 58.51 | | | |
| 5-7 | | 38.40 | | | 0.50 | | 61.09 | | | |
| 5-8 | | 38.47 | | 0.73 | 1.23 | | 59.57 | | | |
| 5-9 | | 38.00 | | | 0.61 | | 61.40 | | | |

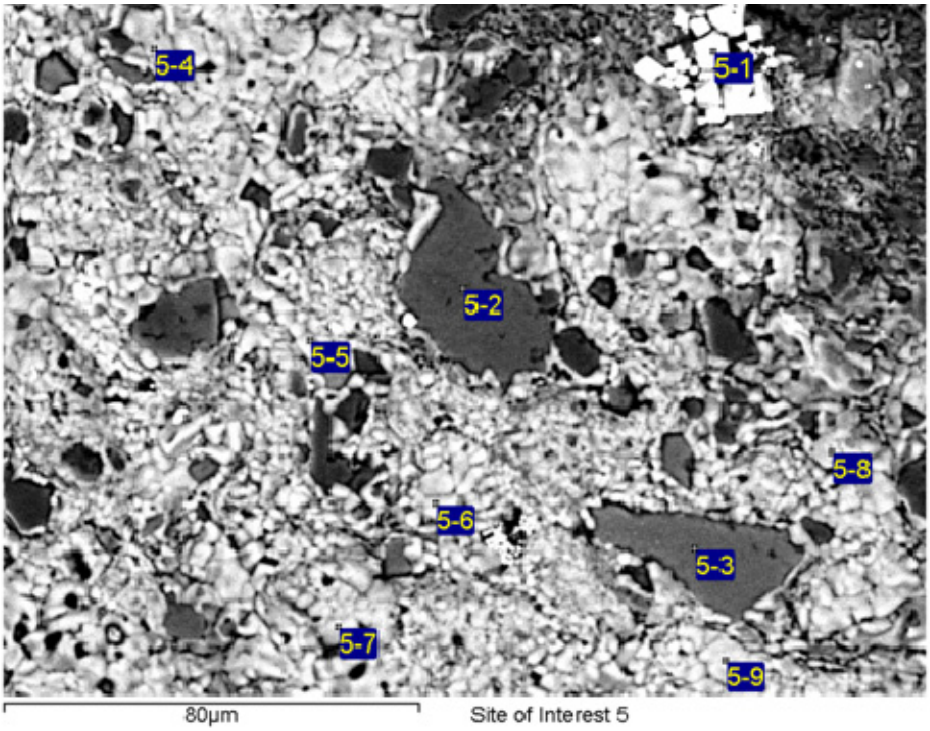



**Plate 20:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 735.40**

Table 21: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite and Dolomite

| **Sample:** DGR6 – 750.80 | Elements (in Wt.%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | K | Ca |
| 1-1 | 56.88 | | 13.92 | | | | | 29.20 |
| 1-2 | 54.61 | | | | | | | 45.39 |
| 1-3 | | 35.37 | | 2.12 | 3.94 | 55.41 | 1.43 | 1.73 |
| 1-4 | | 38.27 | | | | 61.73 | | |
| 1-5 | | 31.87 | | 2.37 | 9.68 | 50.82 | 3.86 | 1.41 |
| 1-6 | 2.78 | 35.47 | | 0.56 | 1.24 | 51.61 | | 8.34 |
| 1-7 | 2.32 | 37.77 | | | 0.99 | 58.92 | | |

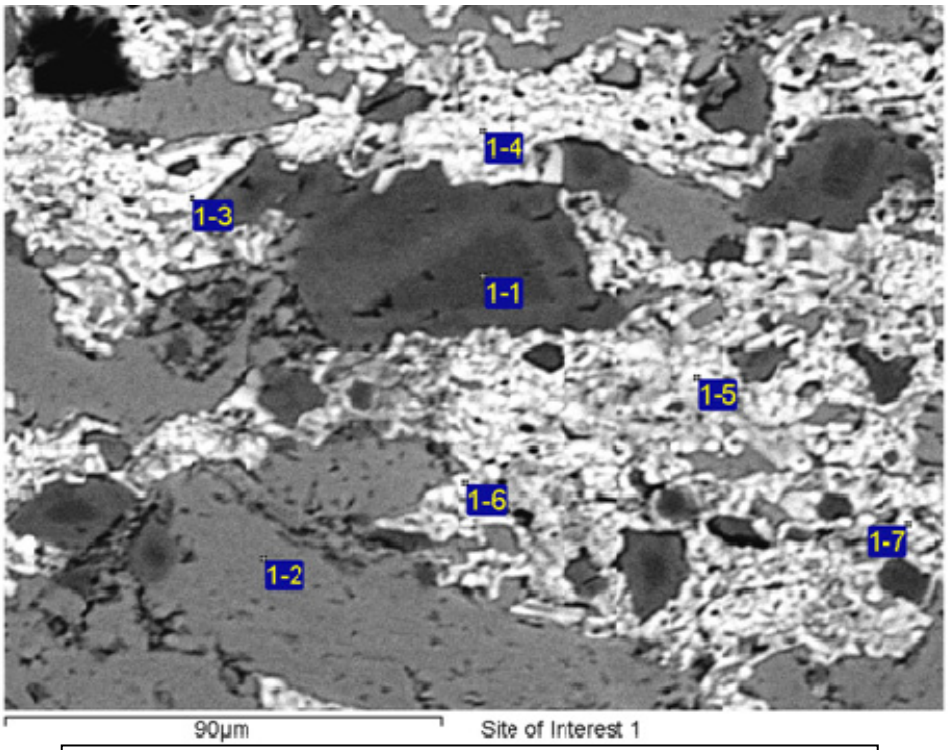



**Plate 21:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 750.80**

Table 22: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite, Dolomite and Apatite

| **Sample:** DGR6 – 750.80 | Elements (in Wt.%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Spots | O | F | Na | Mg | P | S | Cl | Ca |
| 3-1 | | | 38.47 | | 1.15 | | 58.88 | 1.50 |
| 3-2 | 38.34 | 5.75 | 1.31 | | 16.50 | 0.73 | 2.65 | 34.71 |
| 3-3 | 58.15 | | | 13.99 | | | | 27.86 |
| 3-4 | 56.03 | | | 0.72 | | | | 43.25 |
| 3-5 | | | 36.57 | | 0.71 | | 61.35 | 1.36 |
| 3-6 | | | 37.25 | | | | 62.75 | |
| 3-7 | | | 34.98 | | 3.84 | | 53.22 | 7.95 |
| 3-8 | | | 38.50 | | | | 61.50 | |

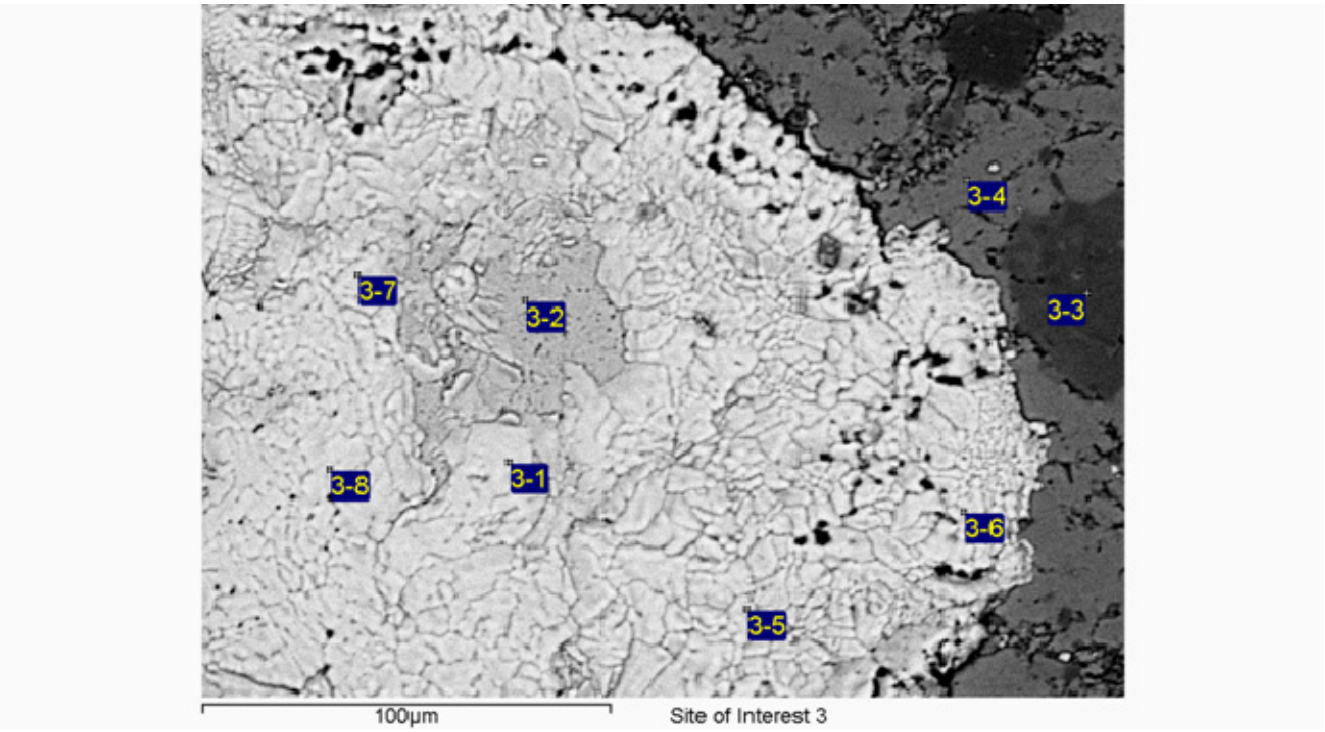



**Plate 22:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 750.80**

Table 23: Results of Semi-Quantitative Spot Analysis in Na-Chloride and Calcite

| **Sample:** DGR6 – 750.80 | | | | Elements (in Wt.%) | |
|---|---|---|---|---|---|
| Spots | O | Na | Si | Cl | Ca |
| 4-1 | 54.18 | | | | 45.82 |
| 4-2 | | 38.31 | | 61.69 | |
| 4-3 | | 37.29 | 1.24 | 52.99 | 8.49 |
| 4-4 | 4.12 | 32.23 | 0.83 | 47.10 | 15.72 |
| 4-5 | | 34.30 | 1.76 | 59.05 | 4.88 |
| 4-6 | 3.00 | 37.83 | 0.72 | 56.74 | 1.72 |

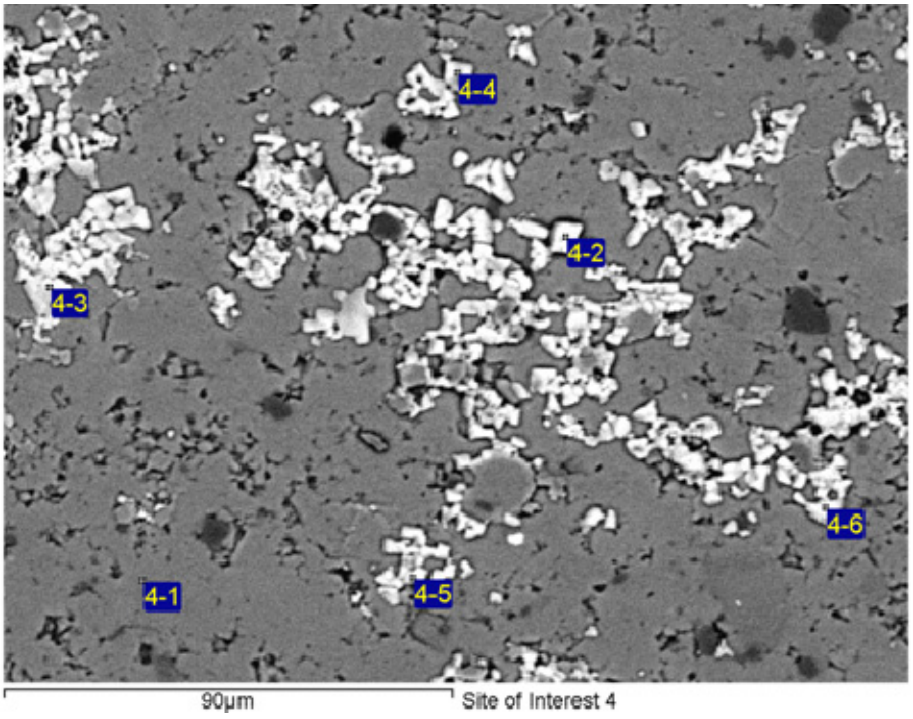



**Plate 23:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 750.80**

Table 24: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite, Dolomite and Pyrite

| **Sample:** DGR6 – 750.80 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ca | Fe |
| 5-1 | | 2.76 | | | | 51.26 | 2.09 | | | 43.89 |
| 5-2 | 3.24 | 33.35 | | 0.57 | 5.09 | | 57.74 | | | |
| 5-3 | 56.76 | | 16.60 | | | | | | 26.65 | |
| 5-4 | 54.77 | | 0.63 | | | | | | 44.60 | |
| 5-5 | | 32.96 | | 0.82 | 3.23 | | 56.52 | | 6.47 | |
| 5-6 | 3.61 | 32.03 | | 1.48 | 5.76 | | 55.17 | 1.95 | | |
| 5-7 | 2.91 | 39.58 | | | | | 56.87 | | 0.64 | |
| 5-8 | 4.96 | 36.81 | | | 1.37 | | 53.23 | | 3.63 | |
| 5-9 | 2.94 | 33.74 | | 0.74 | 1.97 | | 59.73 | | 0.87 | |
| 5-10 | | 38.79 | | | 0.54 | | 59.81 | | 0.85 | |

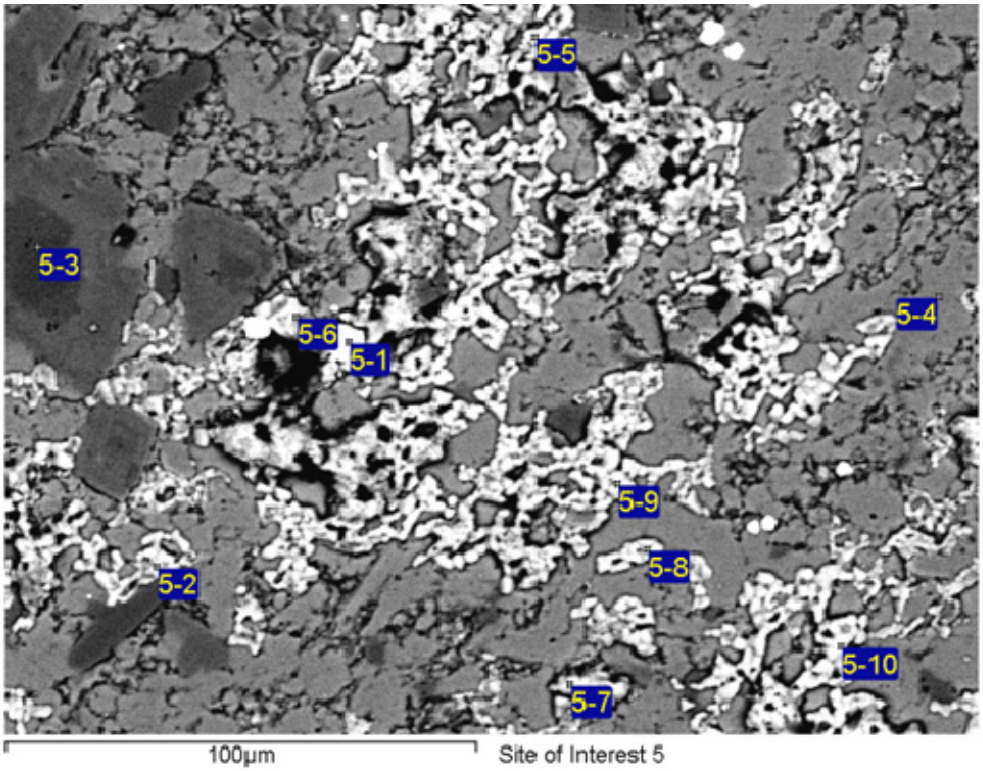



**Plate 24:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 750.80**

Table 25: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite, Dolomite, Quartz and Apatite

| **Sample:** DGR6 – 761.76 | Elements (in Wt.%) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | F | Na | Mg | Al | Si | P | S | Cl | K | Ca | Fe |
| 1-1 | 56.01 | | | 13.73 | | | | | | | 27.96 | 2.30 |
| 1-2 | 52.25 | | | | | 47.75 | | | | | | |
| 1-3 | 55.95 | | | | | | | | | | 44.05 | |
| 1-4 | 3.90 | | 32.94 | | 2.20 | 6.49 | | | 46.19 | 2.26 | 6.03 | |
| 1-5 | 3.72 | | 38.06 | | | | | | 58.22 | | | |
| 1-6 | 4.97 | | 36.74 | | 0.43 | 0.78 | | | 56.13 | | 0.95 | |
| 1-7 | 23.60 | 5.90 | 9.56 | | | | 15.17 | 0.83 | 9.04 | | 35.90 | |
| 1-8 | 13.70 | 4.23 | 21.14 | | | | 11.36 | | 24.61 | | 24.96 | |
| 1-9 | 20.11 | | 15.91 | | | | 14.22 | 0.93 | 16.37 | | 32.45 | |
| 1-10 | 15.03 | | 31.25 | | 1.09 | 2.19 | | | 39.92 | 0.79 | 9.73 | |
| 1-11 | 17.00 | | 30.50 | 0.61 | 0.65 | 1.39 | | | 35.97 | | 13.88 | |

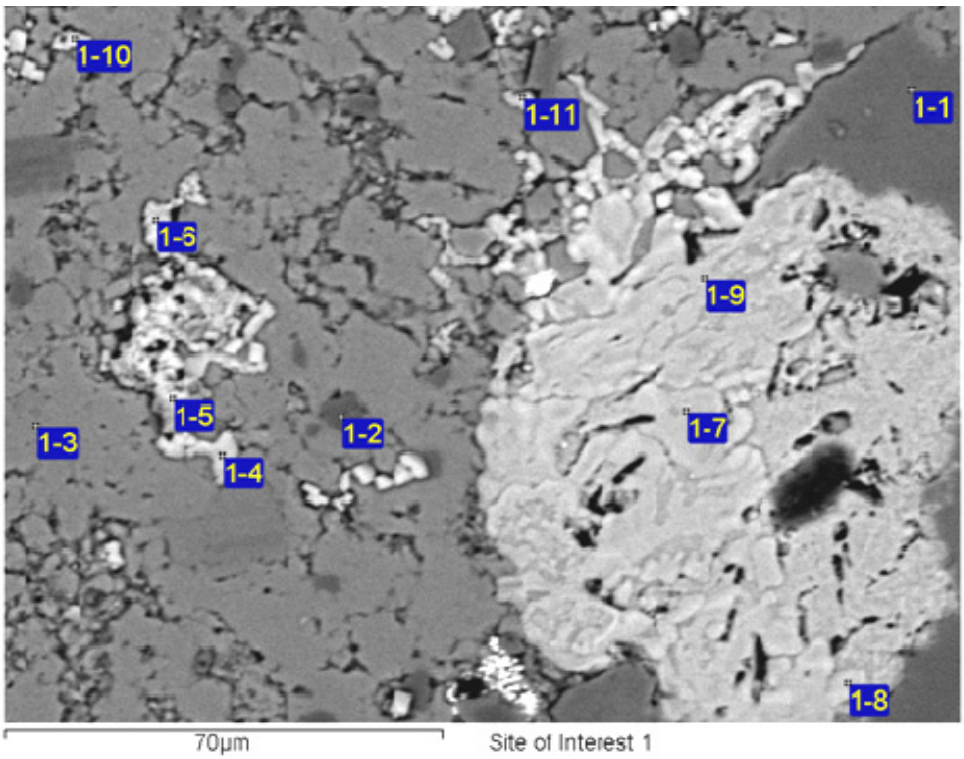



**Plate 25:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 761.76**

Table 26: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite and Dolomite

| **Sample:** DGR6 – 761.76 | Elements (in Wt.%) | | | | | | |
|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | Ca |
| 2-1 | 5.72 | 34.61 | | | 1.07 | 43.42 | 15.18 |
| 2-2 | | 38.12 | | | 1.21 | 54.96 | 5.72 |
| 2-3 | 9.69 | 33.55 | | | 0.87 | 44.63 | 11.26 |
| 2-4 | 5.10 | 36.27 | | | 0.61 | 47.78 | 10.25 |
| 2-5 | | 37.90 | | | 0.64 | 60.09 | 1.37 |
| 2-6 | | 39.55 | | | 0.68 | 57.05 | 2.72 |
| 2-7 | 4.55 | 35.59 | | 0.75 | 1.07 | 46.30 | 11.74 |
| 2-8 | 2.44 | 38.22 | | 0.56 | 1.79 | 54.47 | 2.54 |
| 2-9 | 7.47 | 33.52 | | 0.72 | 1.31 | 44.85 | 12.13 |
| 2-10 | | 39.06 | | | | 56.67 | 4.26 |
| 2-11 | 57.38 | | 13.58 | | | | 29.04 |
| 2-12 | 54.66 | | 0.71 | | | | 44.63 |
| 2-13 | 4.77 | 35.08 | | | 0.79 | 56.04 | 3.32 |

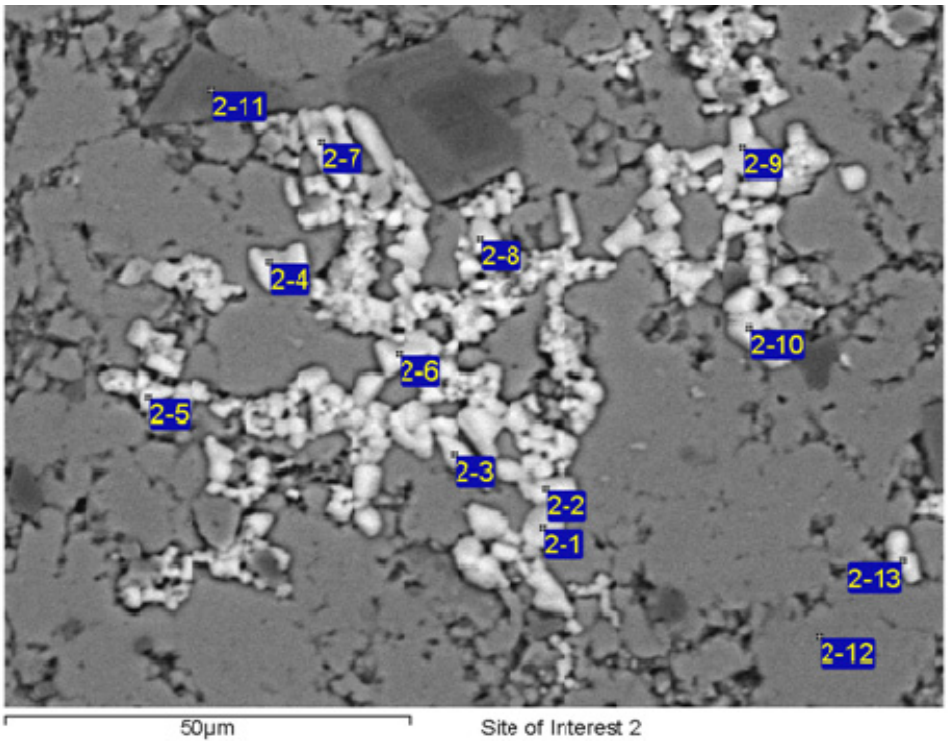



**Plate 26:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 761.76**

Table 27: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite, Dolomite and Pyrite

| **Sample:** DGR6 – 761.76 | Elements (in Wt.%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | S | Cl | K | Ca | Fe |
| 4-1 | | 0.83 | | | | 54.65 | | | | 44.52 |
| 4-2 | 55.72 | | 0.75 | | | | | | 43.52 | |
| 4-3 | 56.83 | | 13.11 | | 0.65 | | | | 26.91 | 2.50 |
| 4-4 | | 36.91 | | 0.65 | 1.86 | | 57.72 | 0.58 | 2.29 | |
| 4-5 | | 34.73 | | | 0.52 | | 64.75 | | | |
| 4-6 | 15.60 | 27.39 | | 2.07 | 5.71 | | 32.77 | 1.02 | 15.44 | |
| 4-7 | 6.14 | 30.68 | 0.88 | 0.74 | 7.78 | | 44.64 | | 9.14 | |
| 4-8 | 3.49 | 37.74 | | 0.50 | | | 56.22 | | 2.05 | |

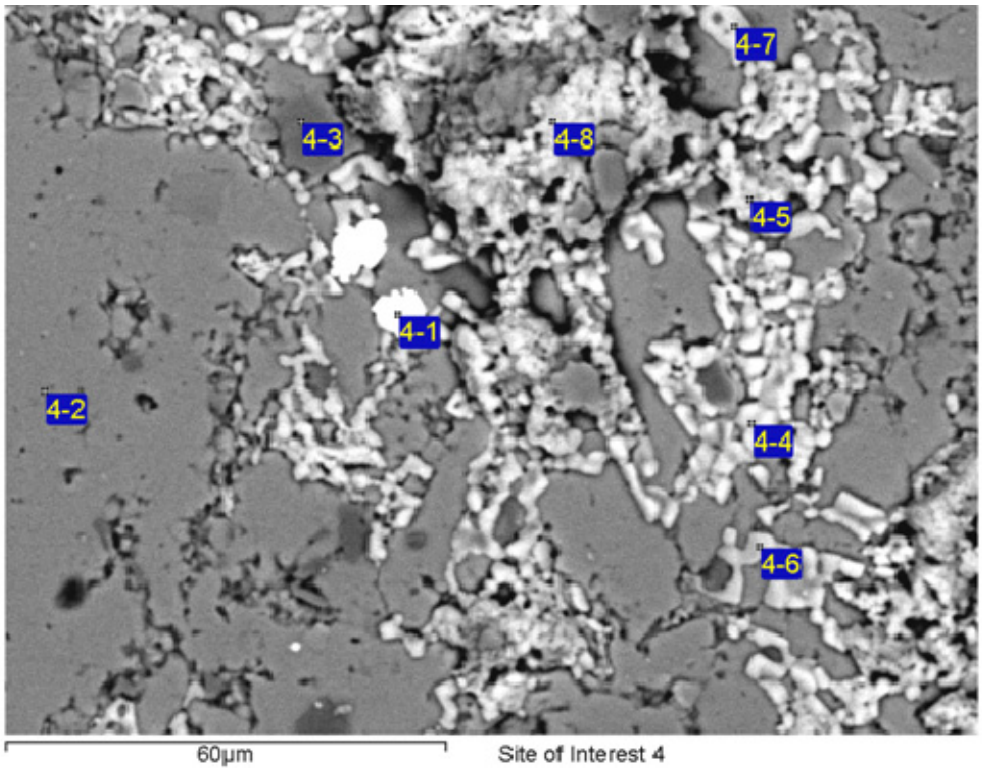



**Plate 27:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 761.76**

Table 28: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite, Quartz, Anatase, and Pyrite

| **Sample:** DGR6 – 761.76 | Elements (in Wt.%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Al | Si | Cl | K | Ca | Ti |
| 5-1 | 54.42 | | | | | | 45.58 | |
| 5-2 | 52.15 | | | 47.85 | | | | |
| 5-3 | | 34.03 | 0.59 | 1.98 | 62.74 | 0.65 | | |
| 5-4 | 5.33 | 32.82 | 2.48 | 5.77 | 48.14 | 1.89 | 3.58 | |
| 5-5 | 44.18 | | | | | | 11.73 | 44.10 |
| 5-6 | | 40.23 | | 0.75 | 59.01 | | | |
| 5-7 | | 36.26 | | 1.46 | 59.62 | | 2.66 | |
| 5-8 | 12.25 | 37.39 | | | 47.26 | | 3.10 | |

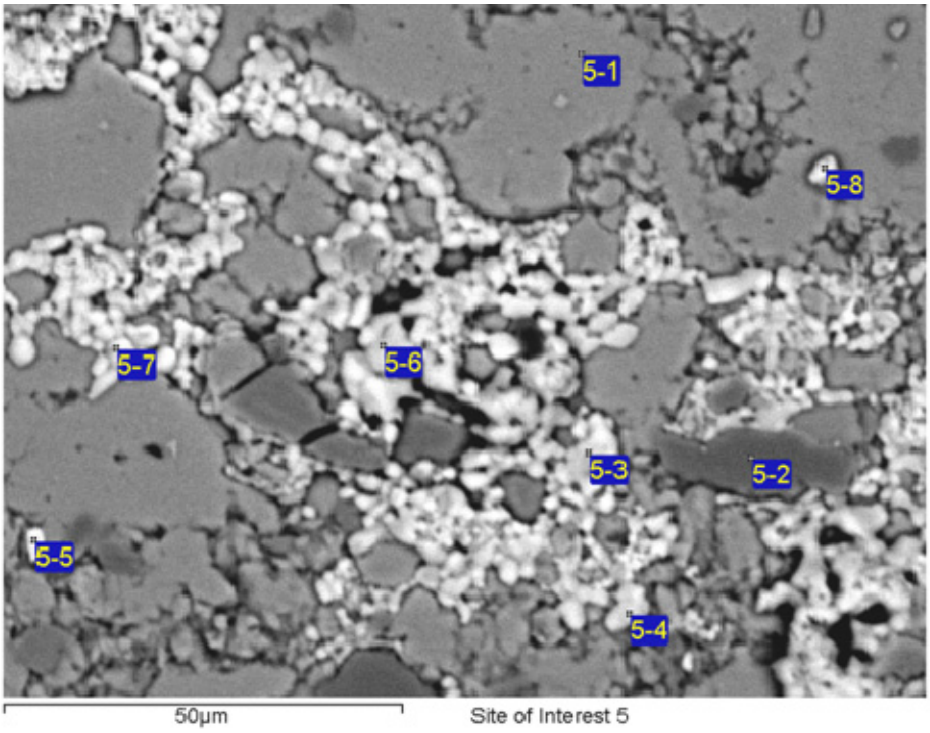



**Plate 28:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 761.76**

Table 29: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite and Dolomite

| **Sample:** DGR6 – 768.58 | Elements (in Wt.%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | K | Ca |
| 1-1 | 53.62 | | 0.72 | | | | | 45.66 |
| 1-2 | 56.21 | | 17.18 | | | | | 26.60 |
| 1-3 | | 37.63 | | | | 62.37 | | |
| 1-4 | 9.09 | 32.38 | | 0.92 | 3.33 | 41.24 | | 13.03 |
| 1-5 | 3.89 | 40.42 | | 0.48 | | 55.21 | | |
| 1-6 | 6.07 | 27.02 | | 1.17 | 13.92 | 36.32 | 0.86 | 14.64 |
| 1-7 | 14.97 | 30.56 | | 2.80 | 6.23 | 39.83 | 1.18 | 4.43 |
| 1-8 | | 37.70 | | 0.62 | 1.09 | 56.20 | | 4.38 |

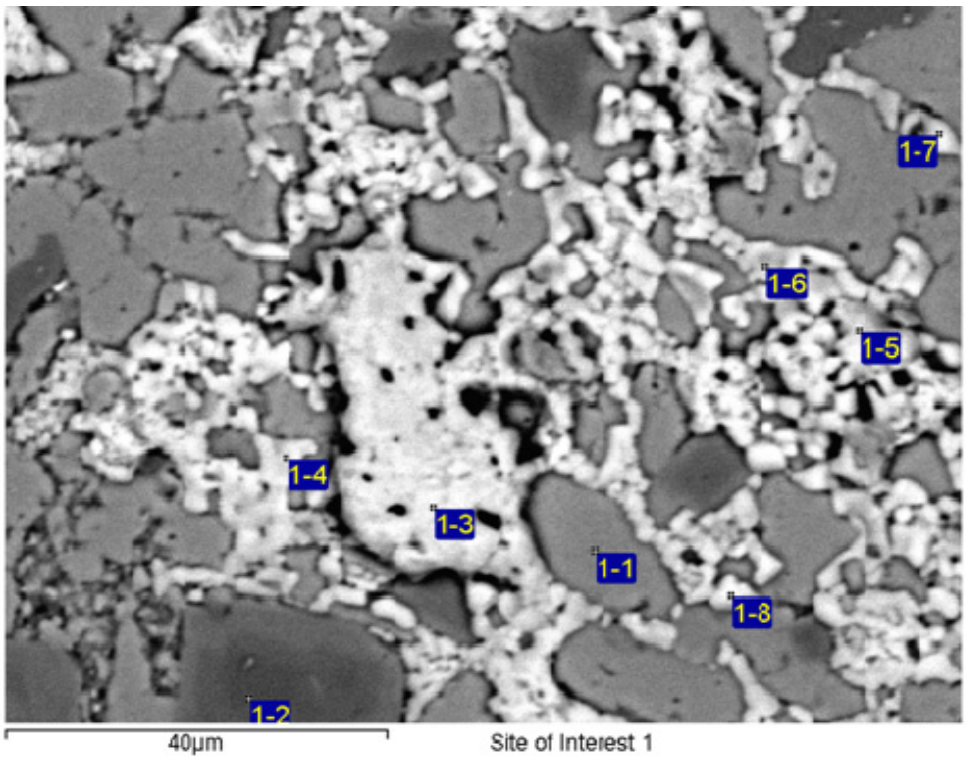



**Plate 29:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 768.58**

Table 30: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite and Quartz

| **Sample:** DGR6 – 768.58 | | | | | Elements (in Wt.%) | | |
|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | Ca |
| 2-1 | 54.21 | | 0.75 | | | | 45.04 |
| 2-2 | 50.24 | 0.56 | | | 49.20 | | |
| 2-3 | | 39.66 | | | | 60.34 | |
| 2-4 | 2.18 | 37.78 | | | | 60.04 | |
| 2-5 | 2.55 | 38.75 | | | 0.92 | 57.78 | |
| 2-6 | | 39.08 | | | | 60.92 | |
| 2-7 | 3.13 | 39.07 | | | 0.61 | 57.19 | |
| 2-8 | | 38.10 | | | | 61.90 | |
| 2-9 | 2.82 | 39.92 | | | | 56.73 | 0.54 |
| 2-10 | 3.47 | 40.34 | | | | 54.69 | 1.49 |
| 2-11 | 8.63 | 36.97 | | 0.55 | 1.65 | 51.59 | 0.61 |

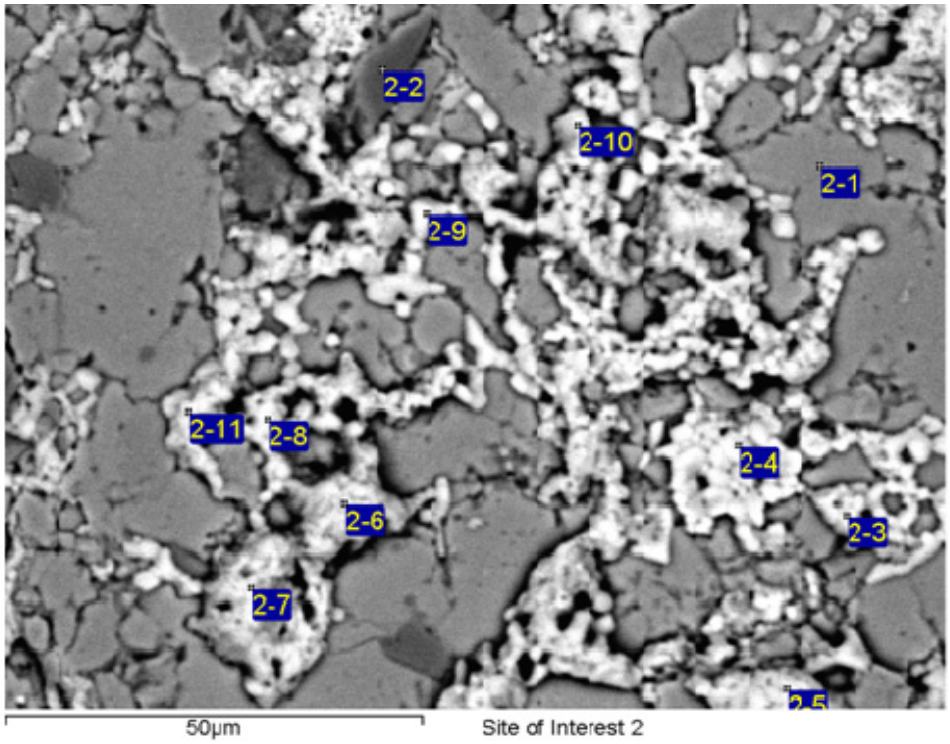



**Plate 30:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 768.58**

Table 31: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite, Dolomite, Pyrite and Apatite

| **Sample:** DGR6 – 768.58 | Elements (in Wt.%) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spots | O | F | Na | Mg | Al | Si | P | S | Cl | K | Ca | Fe |
| 3-1 | 54.89 | | | | | | | | | | 45.11 | |
| 3-2 | 57.39 | | | 14.26 | | 1.31 | | | | | 27.05 | |
| 3-3 | 2.55 | | 37.05 | | | 0.61 | | | 59.24 | | 0.55 | |
| 3-4 | 29.46 | 5.89 | 7.32 | | | | 14.77 | 0.69 | 8.77 | | 33.10 | |
| 3-5 | 16.77 | 5.13 | 18.99 | | | | 12.58 | | 18.83 | | 27.70 | |
| 3-6 | 6.52 | | 29.44 | | 4.85 | 8.35 | | | 42.53 | 3.15 | 5.16 | |
| 3-7 | | | | | | | | 54.47 | | | 0.91 | 44.62 |
| 3-8 | 4.62 | | 34.91 | | 0.70 | 3.89 | | | 51.01 | | 4.87 | |

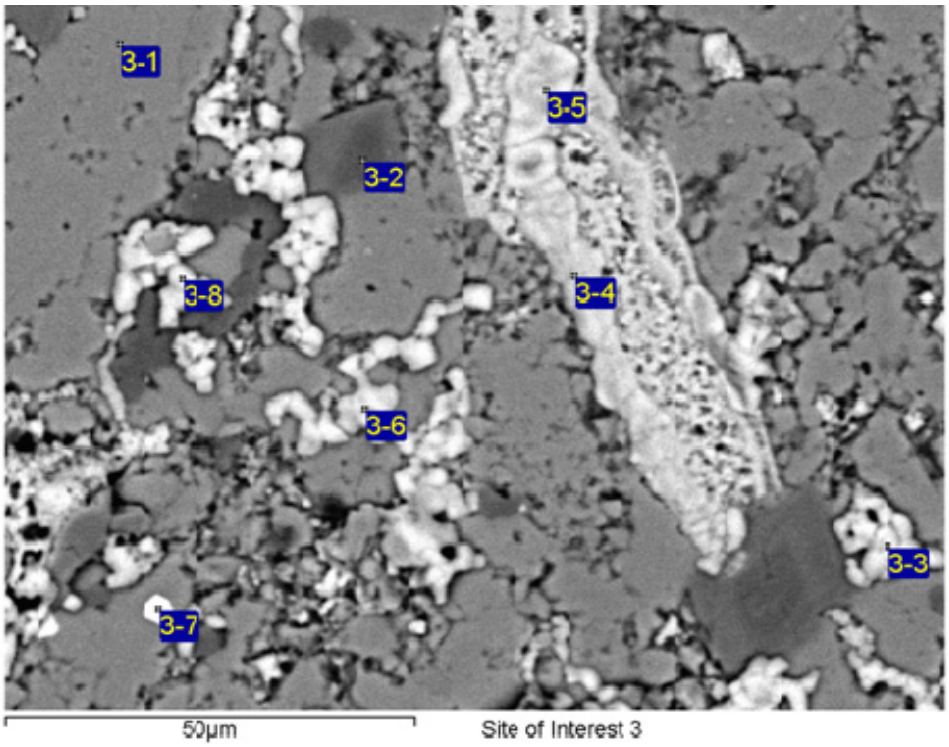



**Plate 31:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 768.58**

Table 32: Results of Semi-Quantitative Spot Analysis in Na-Chloride, Calcite and Dolomite

| **Sample:** DGR6 – 768.58 | Elements (in Wt.%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Spots | O | Na | Mg | Al | Si | Cl | K | Ca |
| 5-1 | 53.59 | | | | | | | 46.41 |
| 5-2 | 57.24 | | 15.11 | | | | | 27.65 |
| 5-3 | 2.84 | 39.67 | | | 0.84 | 56.12 | | 0.53 |
| 5-4 | | 37.22 | | | | 62.78 | | |
| 5-5 | 3.24 | 34.93 | | 0.87 | 3.21 | 50.16 | | 7.59 |
| 5-6 | 7.26 | 28.26 | | 2.80 | 9.13 | 35.47 | 2.60 | 14.47 |

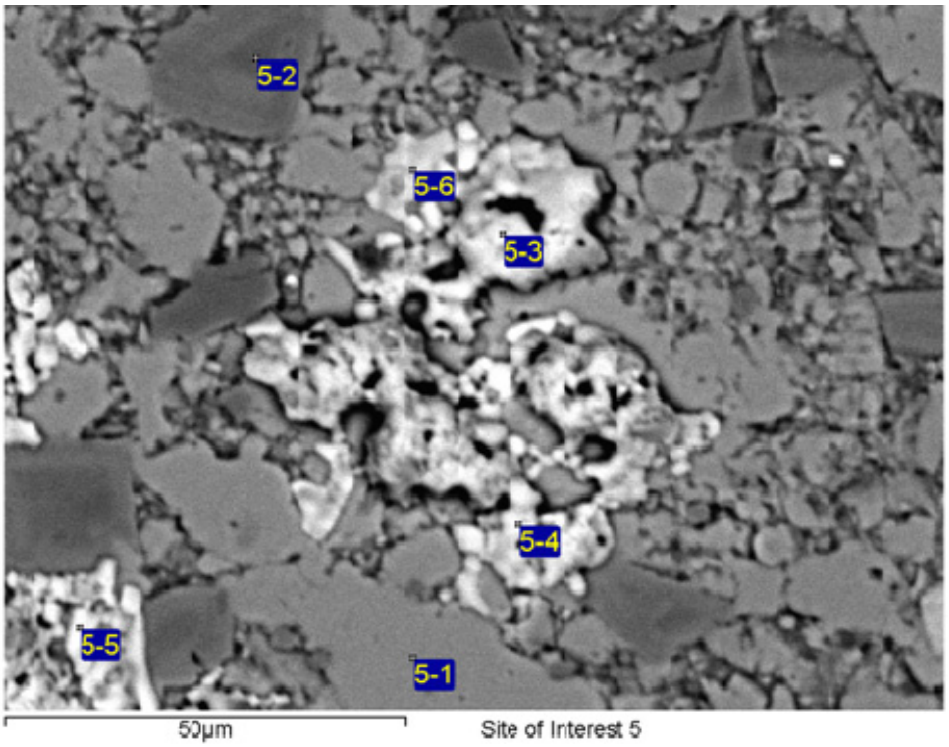



**Plate 32:** Back scattered scanning electron photograph indicating position of spots analysis in **DGR6 – 768.58**

## 4. Comments

1. General Mineralogy by semi-quantitative XRD analysis and analysis of pore fabric and soluble minerals by SEM-EDS was carried out for all the eight DGR6 samples.
2. The first five samples (DGR6-654.58 to 735.40) were mainly composed of quartz and mica with minor amounts of potassium feldspar, chlorite, plagioclase, calcite, ankerite and pyrite, and traces of dolomite, apatite, anatase and halite.
3. Calcite was the dominant mineral phase for last three samples (DGR6-750.80 to 768.58). Minor to traces of other carbonates (ankerite and dolomite), quartz, mica, feldspar, pyrite, chlorite and halite were also noted.
4. SEM-EDS study indicated presence of Na-Chloride (halite) in these eight samples.
5. Na-Chloride (halite) mostly occurred as voids/cavity fillings interstitial materials mainly within silicates/carbonates groundmass in the form of irregular bands, veins/stringers and disseminated grains.
6. Irregular discontinuous rimmed halite along the boundary of silicates/carbonates was commonly noted.
7. Broadly interconnected bands/veins of halite were also noted within silicates and carbonates groundmass.
8. The irregular or sub-rounded grains and stringers of pyrite were commonly noted within silicates and carbonates matrix in most of the samples.

# *Appendix – 1: XRD Results*

## Summary of Semi-Quantitative X-ray Diffraction Results

***Crystalline Mineral Assemblage (relative proportions based on peak height)***

| Sample | Major (>30% Wt) | Moderate (10% -30% Wt) | Minor (2% -10% Wt) | Trace (<2% Wt) |
|---|---|---|---|---|
| DRG6-654.58 | mica, quartz | - | potassium feldspar, chlorite, ankerite, calcite, plagioclase, dolomite, pyrite | *palygorskite, *anatase, *apatite, *halite |
| DGR6-664.31 | mica, quartz | - | potassium feldspar, chlorite, calcite, ankerite, pyrite, plagioclase | *dolomite, *palygorskite, *anatase, *apatite, *halite |
| DRG6-697-67 | mica, quartz | - | potassium feldspar, chlorite, calcite, pyrite, plagioclase, palygorskite | *ankerite, *halite, *dolomite, *anatase, *apatite |
| DRG6-717.97 | mica, quartz | - | potassium feldspar, chlorite, calcite, pyrite, palygorskite, plagioclase | *ankerite, *anatase, *dolomite, *apatite, *halite |
| DRG6-735.40 | mica, quartz | - | chlorite, calcite, potassium feldspar, pyrite, ankerite, dolomite, plagioclase | *palygorskite, *anatase, *halite, *apatite |
| DRG6-750.80 | calcite | - | dolomite, ankerite, quartz, mica, potassium feldspar | *plagioclase, *pyrite, *halite |
| DRG6-761.76 | calcite | - | ankerit, quartz, dolomite, mica, potassium feldspar | *chlorite, *plagoclase, *pyrite, *halite |
| DRG6-768.58 | calcite | - | ankerite, mica, quartz, dolomite, potassium feldspar | *chlorite, *plagioclase *pyrite, *halite |

** tentative identification due to low concentrations, diffraction line overlap or poor crystallinity*

| **Mineral** | **Composition** |
|---|---|
| Anatase | $TiO_2$ |
| Ankerite | $CaFe(CO_3)_2$ |
| Apatite | $Ca_5(PO_4)_3(F,Cl,OH)$ |
| Calcite | $CaCO_3$ |
| Chlorite | $(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$ |
| Dolomite | $CaMg(CO_3)_2$ |
| Halite | $NaCl$ |
| Mica | $K(Mg,Fe)Al_2Si_3AlO_{10}(OH)_2$ |
| Palygorskite | $(Mg,Al)_2Si_4O_{10}(OH)\cdot 4H_2O$ |
| Plagioclase | $(NaSi,CaAl)AlSi_2O_8$ |
| Potassium Feldspar | $KAlSi_3O_8$ |
| Pyrite | $FeS_2$ |
| Quartz | $SiO_2$ |

## Method Summary

| | |
|---|---|
| ***Instrument:*** | BRUKER AXS D8 Advance Diffractometer |
| ***Test Conditions:*** | Co radiation, 40 kV, 35 mA<br>Regular Scanning: Step: 0.02°, Step time:0.2s, 2θ range: 3-70° |
| ***Detection Limit*** : | 0.5-2%. Strongly dependent on crystallinity. |

***Mineral Identification and Interpretation:***

Mineral identification and interpretation involve matching the diffraction pattern of an unknown material to patterns of single-phase reference materials. The reference patterns are compiled by the JCPDS-ICDD database and released on software as Powder Diffraction File (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds. Mineral proportions are based on relative peak heights and may be strongly influenced by crystallinity, structural group or preferred orientations. Interpretations and relative proportions should be accompanied by supporting petrographic and geochemical data (WRA, ICP-OES).

***Semi-Quantitative Analysis:***

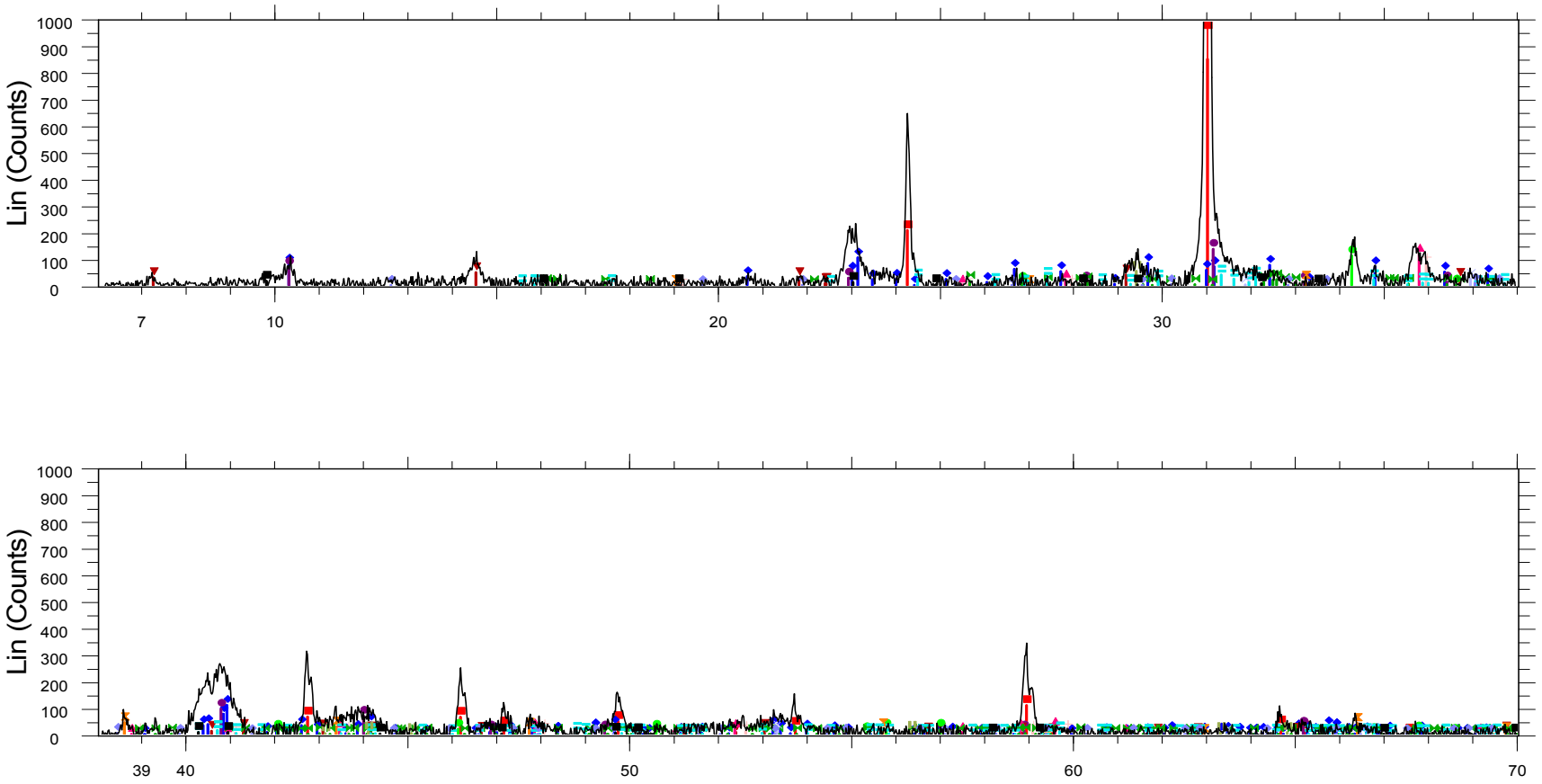
The Semi-Quantitative analysis (RIR method) is performed based on each mineral's relative peak heights and of their respective I/Icor values, which are available from the PDF database. Mineral abundances for the bulk sample (in weight %) are generated by Bruker-EVA Software. These data are reconciled with a bulk chemistry (e.g. whole rock analysis including $SiO_2$, $Al_2O_3$, $Na_2O$, $K_2O$, CaO, MgO, $Fe_2O_3$, $Cr_2O_3$, MnO, $TiO_2$, $P_2O_5$, $V_2O_5$ or other chemical data).

## Semi-Quantitative X-ray Diffraction Results

| **Mineral** | **DRG6-654.58** (wt %) | **DGR6-664.31** (wt %) | **DRG6-697-67** (wt %) | **DRG6-717.97** (wt %) |
|---|---|---|---|---|
| Quartz | 30.3 | 31.0 | 35.8 | 33.9 |
| Orthoclase | 4.9 | 5.0 | 4.5 | 4.6 |
| Albite | 3.2 | 2.6 | 2.4 | 2.4 |
| Clinochlore | 4.6 | 4.7 | 4.2 | 4.3 |
| Muscovite | 28.1 | 28.7 | 25.6 | 26.5 |
| Glauconite | 12.9 | 13.2 | 15.2 | 15.7 |
| Palygorskite | 1.5 | 1.5 | 2.2 | 2.5 |
| Calcite | 3.3 | 3.4 | 2.9 | 4.2 |
| Ankerite | 3.5 | 3.3 | 1.2 | 1.0 |
| Dolomite | 2.8 | 1.7 | 0.9 | 0.5 |
| Hydroxylapatite | 0.7 | 0.8 | 0.7 | 0.5 |
| Pyrite | 2.6 | 2.7 | 2.4 | 2.5 |
| Anatase | 1.0 | 1.0 | 0.9 | 1.0 |
| Halite | 0.5 | 0.2 | 1.0 | 0.4 |
| TOTAL | 99.9 | 99.8 | 99.9 | 100.0 |

| **Mineral** | **DRG6-735.40** (wt %) | **DRG6-750.80** (wt %) | **DRG6-761.76** (wt %) | **DRG6-768.58** (wt %) |
|---|---|---|---|---|
| Quartz | 32.6 | 3.6 | 4.5 | 3.3 |
| Orthoclase | 4.1 | 2.3 | 3.1 | 3.2 |
| Albite | 2.2 | 0.5 | 0.5 | 0.5 |
| Clinochlore | 5.4 | - | 1.7 | 1.7 |
| Muscovite | 29.5 | 3.4 | 3.3 | 3.4 |
| Glauconite | 10.2 | - | - | - |
| Palygorskite | 1.3 | - | - | - |
| Calcite | 5.3 | 74.7 | 77.2 | 79.6 |
| Ankerite | 2.3 | 6.9 | 5.5 | 5.0 |
| Dolomite | 2.3 | 7.7 | 3.4 | 2.5 |
| Hydroxylapatite | 0.1 | - | - | - |
| Pyrite | 3.7 | 0.5 | 0.5 | 0.5 |
| Anatase | 0.9 | - | - | - |
| Halite | 0.3 | 0.3 | 0.3 | 0.3 |
| TOTAL | 100.2 | 99.9 | 100.0 | 100.0 |

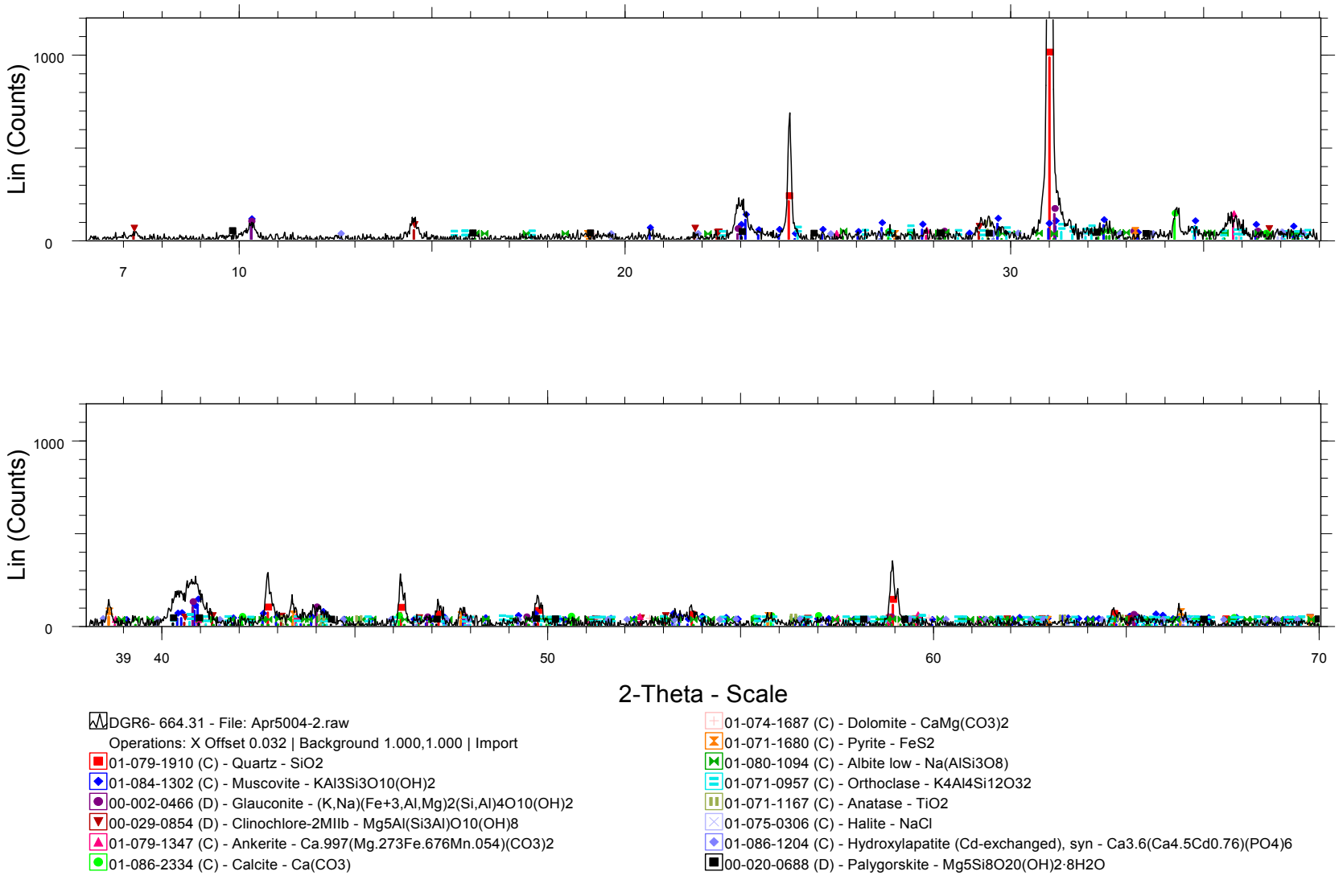
# DGR6- 654.58




DGR6- 654.58 - File: Apr5004-1.raw
Operations: X Offset 0.024 | Background 1.000,1.000 | Import
01-079-1910 (C) - Quartz - SiO2
01-084-1302 (C) - Muscovite - KAl3Si3O10(OH)2
00-002-0466 (D) - Glauconite - (K,Na)(Fe+3,Al,Mg)2(Si,Al)4O10(OH)2
00-029-0854 (D) - Clinochlore-2MIIb - Mg5Al(Si3Al)O10(OH)8
01-079-1347 (C) - Ankerite - Ca.997(Mg.273Fe.676Mn.054)(CO3)2
01-086-2334 (C) - Calcite - Ca(CO3)
01-074-1687 (C) - Dolomite - CaMg(CO3)2
01-071-1680 (C) - Pyrite - FeS2
01-080-1094 (C) - Albite low - Na(AlSi3O8)
01-071-0957 (C) - Orthoclase - K4Al4Si12O32
01-071-1167 (C) - Anatase - TiO2
01-075-0306 (C) - Halite - NaCl
01-086-1204 (C) - Hydroxylapatite (Cd-exchanged), syn - Ca3.6(Ca4.5Cd0.76)(PO4
00-020-0688 (D) - Palygorskite - Mg5Si8O20(OH)2·8H2O

SGS Minerals Services

# DGR6- 664.31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DGR6- 664.31 - File: Apr5004-2.raw
Operations: X Offset 0.032 | Background 1.000,1.000 | Import
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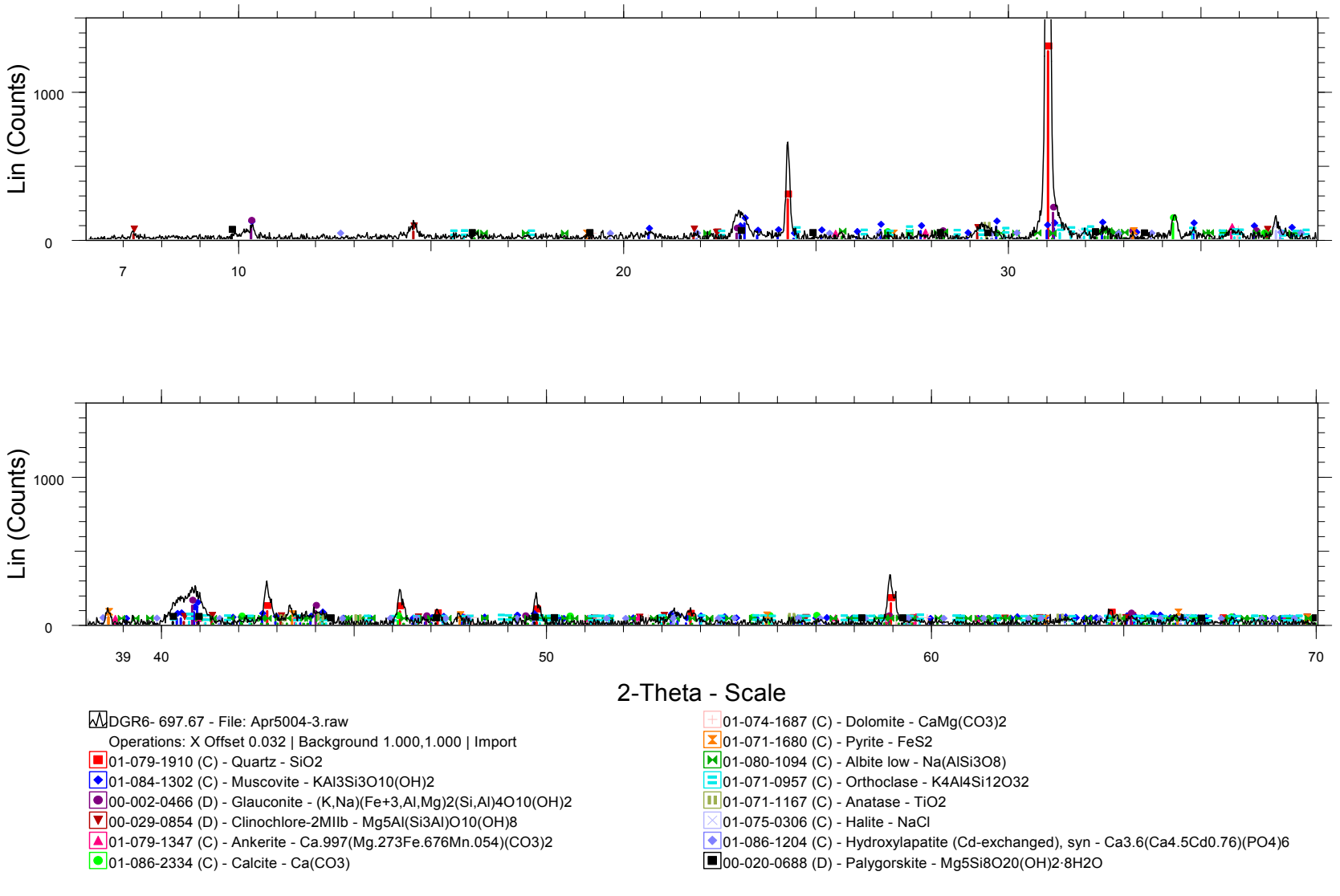
01-084-1302 (C) - Muscovite - KAl3Si3O10(OH)2
00-002-0466 (D) - Glauconite - (K,Na)(Fe+3,Al,Mg)2(Si,Al)4O10(OH)2
00-029-0854 (D) - Clinochlore-2MIIb - Mg5Al(Si3Al)O10(OH)8
01-079-1347 (C) - Ankerite - Ca.997(Mg.273Fe.676Mn.054)(CO3)2
01-086-2334 (C) - Calcite - Ca(CO3)
01-074-1687 (C) - Dolomite - CaMg(CO3)2
01-071-1680 (C) - Pyrite - FeS2
01-080-1094 (C) - Albite low - Na(AlSi3O8)
01-071-0957 (C) - Orthoclase - K4Al4Si12O32
01-071-1167 (C) - Anatase - TiO2
01-075-0306 (C) - Halite - NaCl
01-086-1204 (C) - Hydroxylapatite (Cd-exchanged), syn - Ca3.6(Ca4.5Cd0.76)(PO4)6
00-020-0688 (D) - Palygorskite - Mg5Si8O20(OH)2·8H2O

# DGR6- 697.67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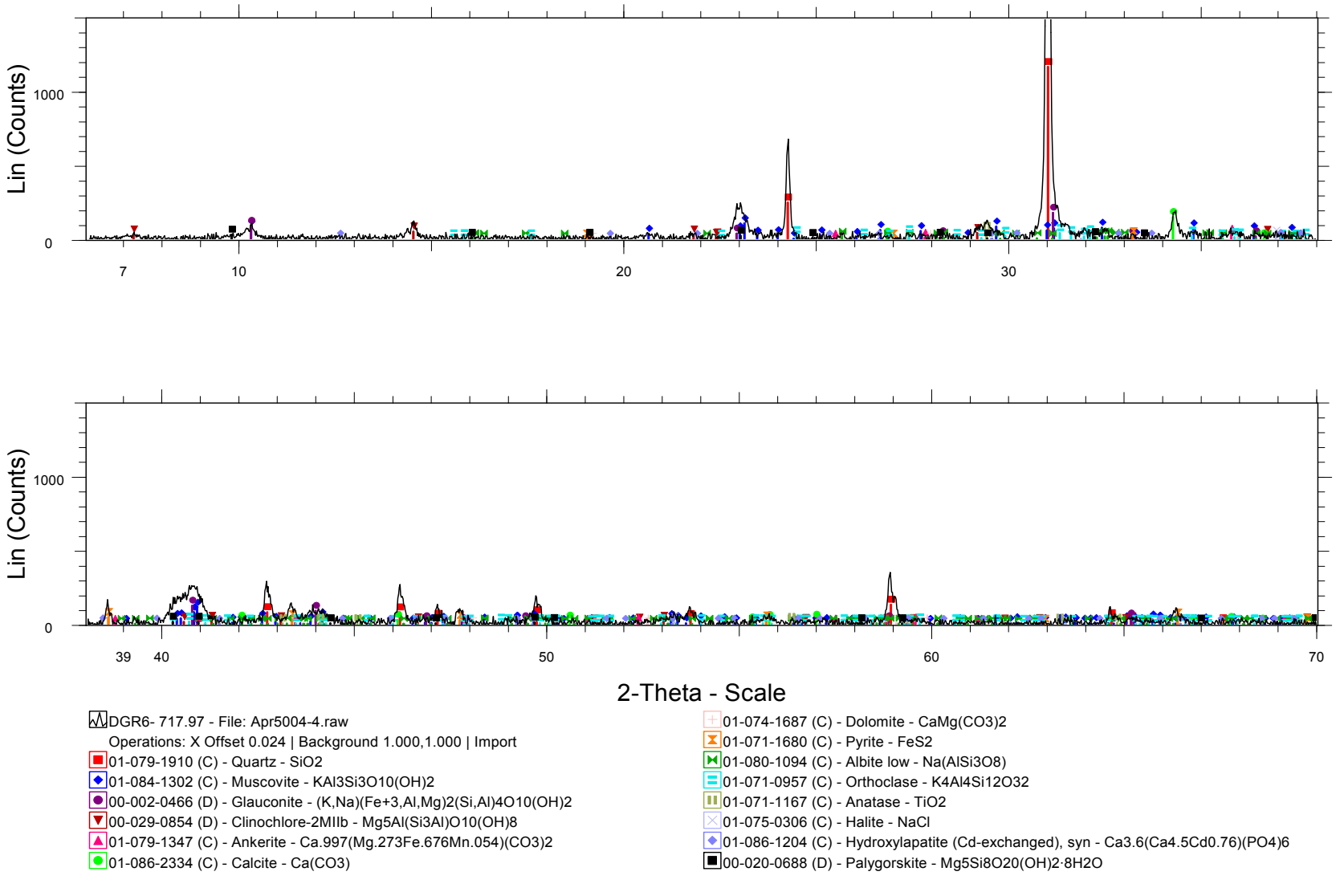
DGR6- 697.67 - File: Apr5004-3.raw
Operations: X Offset 0.032 | Background 1.000,1.000 | Import
01-079-1910 (C) - Quartz - SiO2
01-084-1302 (C) - Muscovite - KAl3Si3O10(OH)2
00-002-0466 (D) - Glauconite - (K,Na)(Fe+3,Al,Mg)2(Si,Al)4O10(OH)2
00-029-0854 (D) - Clinochlore-2MIIb - Mg5Al(Si3Al)O10(OH)8
01-079-1347 (C) - Ankerite - Ca.997(Mg.273Fe.676Mn.054)(CO3)2
01-086-2334 (C) - Calcite - Ca(CO3)
01-074-1687 (C) - Dolomite - CaMg(CO3)2
01-071-1680 (C) - Pyrite - FeS2
01-080-1094 (C) - Albite low - Na(AlSi3O8)
01-071-0957 (C) - Orthoclase - K4Al4Si12O32
01-071-1167 (C) - Anatase - TiO2
01-075-0306 (C) - Halite - NaCl
01-086-1204 (C) - Hydroxylapatite (Cd-exchanged), syn - Ca3.6(Ca4.5Cd0.76)(PO4)6
00-020-0688 (D) - Palygorskite - Mg5Si8O20(OH)2·8H2O

# DGR6- 717.97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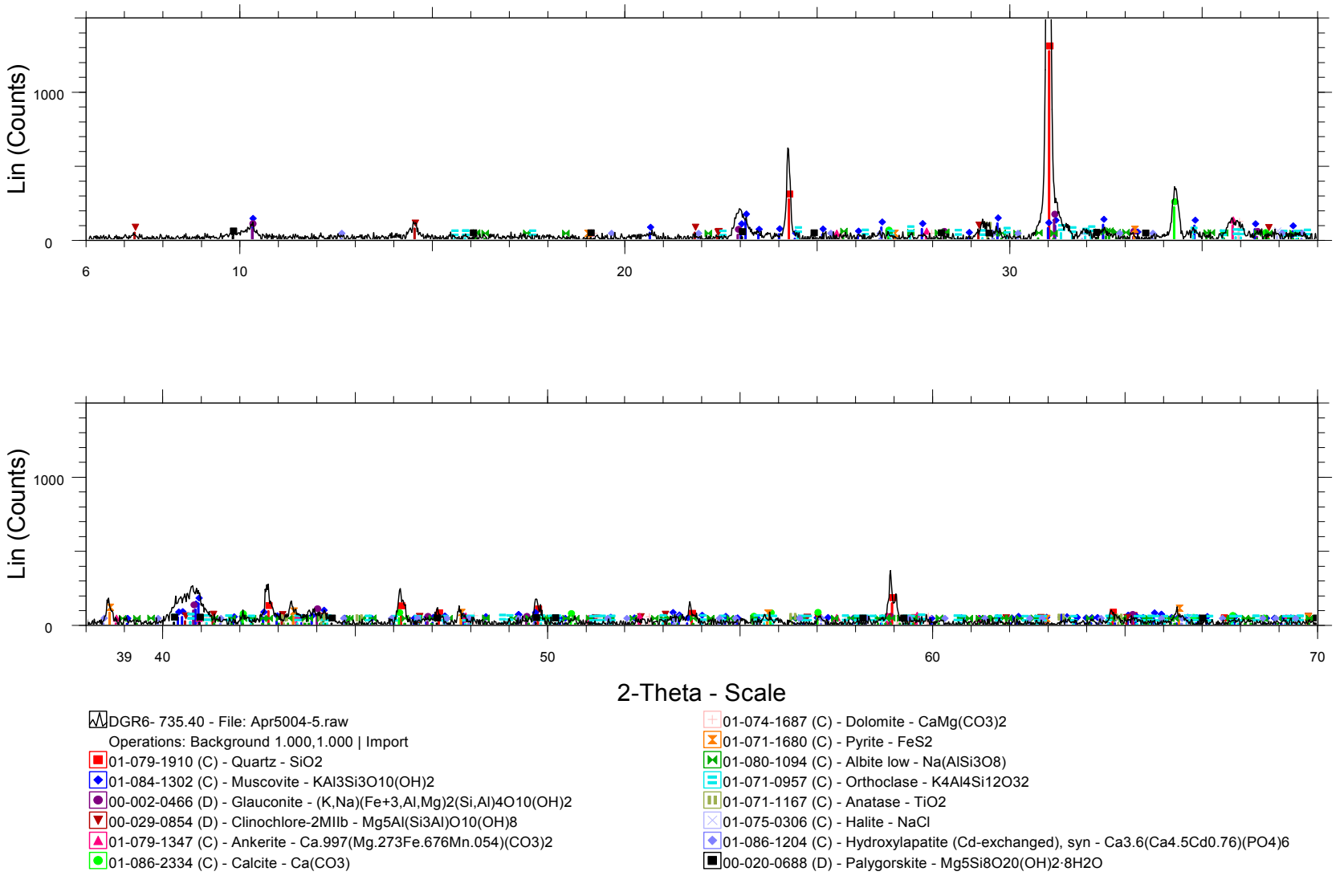
Operations: X Offset 0.024 | Background 1.000,1.000 | Import
01-079-1910 (C) - Quartz - SiO2
01-084-1302 (C) - Muscovite - KAl3Si3O10(OH)2
00-002-0466 (D) - Glauconite - (K,Na)(Fe+3,Al,Mg)2(Si,Al)4O10(OH)2
00-029-0854 (D) - Clinochlore-2MIIb - Mg5Al(Si3Al)O10(OH)8
01-079-1347 (C) - Ankerite - Ca.997(Mg.273Fe.676Mn.054)(CO3)2
01-086-2334 (C) - Calcite - Ca(CO3)
01-074-1687 (C) - Dolomite - CaMg(CO3)2
01-071-1680 (C) - Pyrite - FeS2
01-080-1094 (C) - Albite low - Na(AlSi3O8)
01-071-0957 (C) - Orthoclase - K4Al4Si12O32
01-071-1167 (C) - Anatase - TiO2
01-075-0306 (C) - Halite - NaCl
01-086-1204 (C) - Hydroxylapatite (Cd-exchanged), syn - Ca3.6(Ca4.5Cd0.76)(PO4)6
00-020-0688 (D) - Palygorskite - Mg5Si8O20(OH)2·8H2O

# DGR6- 735.40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60
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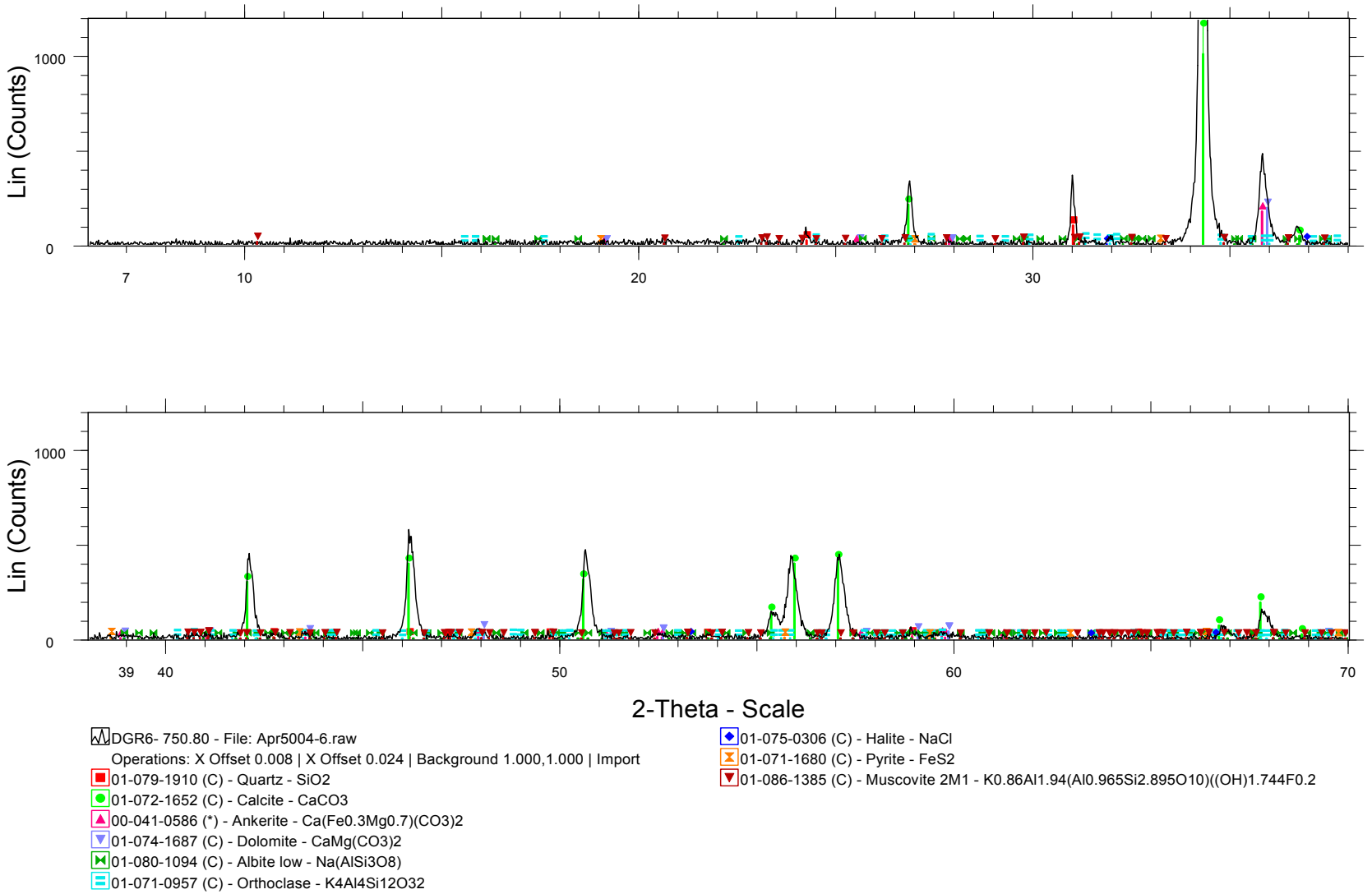
2-Theta - Scale
DGR6- 735.40 - File: Apr5004-5.raw
Operations: Background 1.000,1.000 | Import
01-079-1910 (C) - Quartz - SiO2
01-084-1302 (C) - Muscovite - KAl3Si3O10(OH)2
00-002-0466 (D) - Glauconite - (K,Na)(Fe+3,Al,Mg)2(Si,Al)4O10(OH)2
00-029-0854 (D) - Clinochlore-2MIIb - Mg5Al(Si3Al)O10(OH)8
01-079-1347 (C) - Ankerite - Ca.997(Mg.273Fe.676Mn.054)(CO3)2
01-086-2334 (C) - Calcite - Ca(CO3)
01-074-1687 (C) - Dolomite - CaMg(CO3)2
01-071-1680 (C) - Pyrite - FeS2
01-080-1094 (C) - Albite low - Na(AlSi3O8)
01-071-0957 (C) - Orthoclase - K4Al4Si12O32
01-071-1167 (C) - Anatase - TiO2
01-075-0306 (C) - Halite - NaCl
01-086-1204 (C) - Hydroxylapatite (Cd-exchanged), syn - Ca3.6(Ca4.5Cd0.76)(PO4)6
00-020-0688 (D) - Palygorskite - Mg5Si8O20(OH)2·8H2O

# DGR6- 750.80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Lin (Counts)
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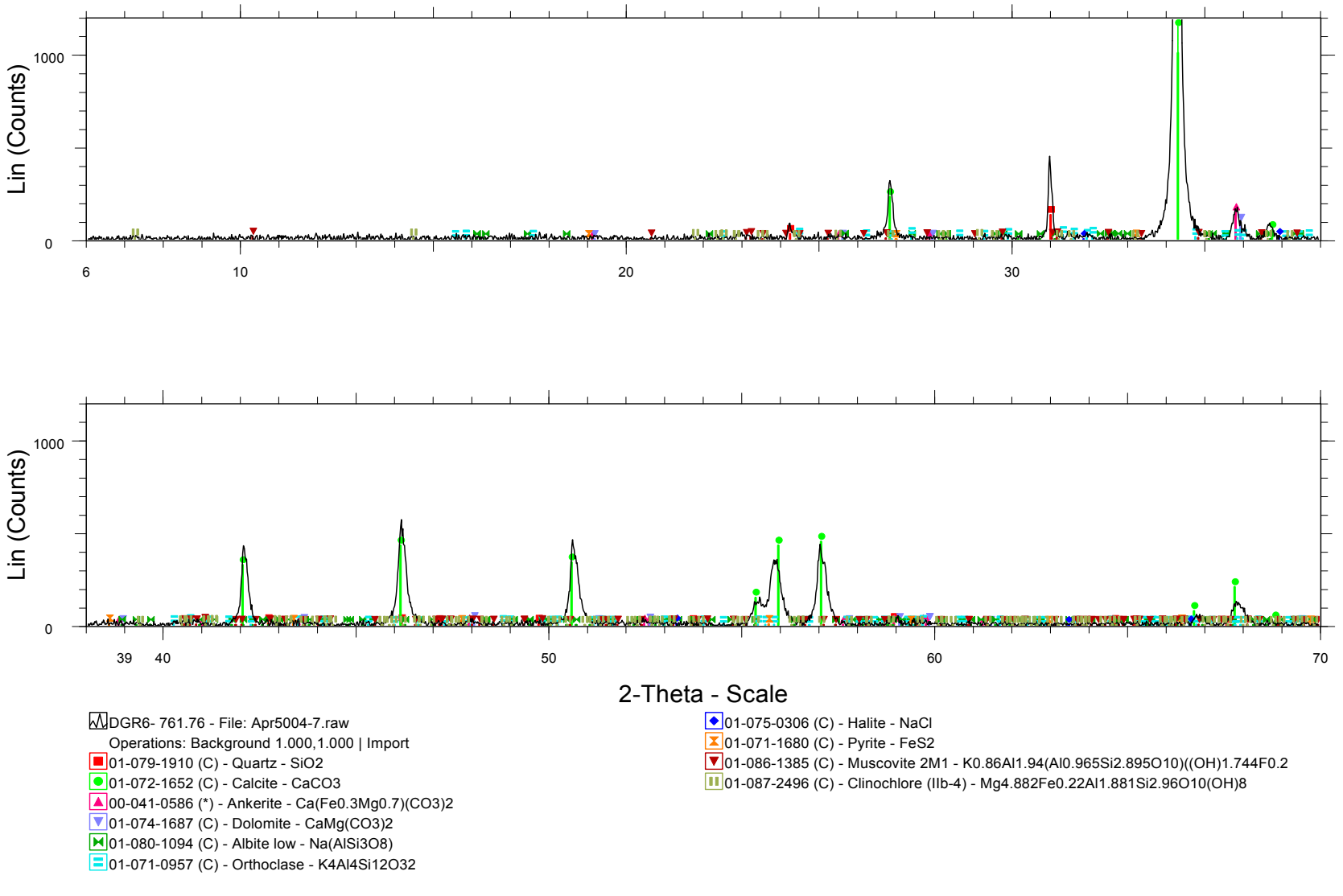
50
60
70
2-Theta - Scale
DGR6- 750.80 - File: Apr5004-6.raw
Operations: X Offset 0.008 | X Offset 0.024 | Background 1.000,1.000 | Import
01-079-1910 (C) - Quartz - SiO2
01-072-1652 (C) - Calcite - CaCO3
00-041-0586 (*) - Ankerite - Ca(Fe0.3Mg0.7)(CO3)2
01-074-1687 (C) - Dolomite - CaMg(CO3)2
01-080-1094 (C) - Albite low - Na(AlSi3O8)
01-071-0957 (C) - Orthoclase - K4Al4Si12O32
01-075-0306 (C) - Halite - NaCl
01-071-1680 (C) - Pyrite - FeS2
01-086-1385 (C) - Muscovite 2M1 - K0.86Al1.94(Al0.965Si2.895O10)((OH)1.744F0.2

# DGR6- 761.76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Lin (Counts)
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39
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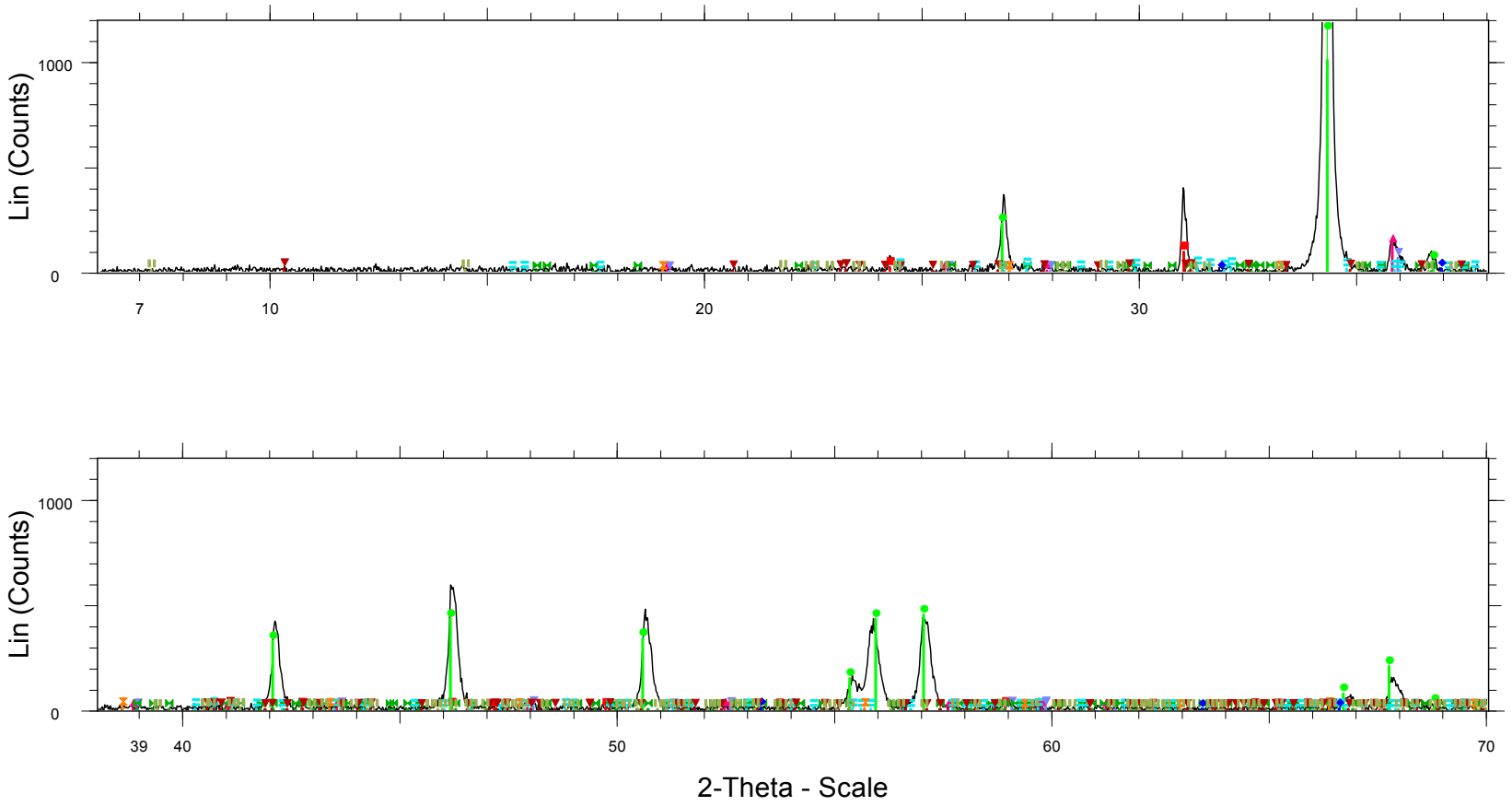
50
60
70
2-Theta - Scale
DGR6- 761.76 - File: Apr5004-7.raw
Operations: Background 1.000,1.000 | Import
01-079-1910 (C) - Quartz - SiO2
01-072-1652 (C) - Calcite - CaCO3
00-041-0586 (*) - Ankerite - Ca(Fe0.3Mg0.7)(CO3)2
01-074-1687 (C) - Dolomite - CaMg(CO3)2
01-080-1094 (C) - Albite low - Na(AlSi3O8)
01-071-0957 (C) - Orthoclase - K4Al4Si12O32
01-075-0306 (C) - Halite - NaCl
01-071-1680 (C) - Pyrite - FeS2
01-086-1385 (C) - Muscovite 2M1 - K0.86Al1.94(Al0.965Si2.895O10)((OH)1.744F0.2
01-087-2496 (C) - Clinochlore (IIb-4) - Mg4.882Fe0.22Al1.881Si2.96O10(OH)8

# DGR6- 768.58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20
30
Lin (Counts)
1000
0
39
40
50
60
70
2-Theta - Scale
DGR6- 768.58 - File: Apr5004-8.raw
Operations: X Offset 0.024 | Background 1.000,1.000 | Import
01-079-1910 (C) - Quartz - SiO2
01-072-1652 (C) - Calcite - CaCO3
00-041-0586 (*) - Ankerite - Ca(Fe0.3Mg0.7)(CO3)2
01-074-1687 (C) - Dolomite - CaMg(CO3)2
01-080-1094 (C) - Albite low - Na(AlSi3O8)
01-071-0957 (C) - Orthoclase - K4Al4Si12O32
01-075-0306 (C) - Halite - NaCl
01-071-1680 (C) - Pyrite - FeS2
01-086-1385 (C) - Muscovite 2M1 - K0.86Al1.94(Al0.965Si2.895O10)((OH)1.744F0.2
01-087-2496 (C) - Clinochlore (IIb-4) - Mg4.882Fe0.22Al1.881Si2.96O10(OH)8

# *Appendix – 2: EDS Spectra*

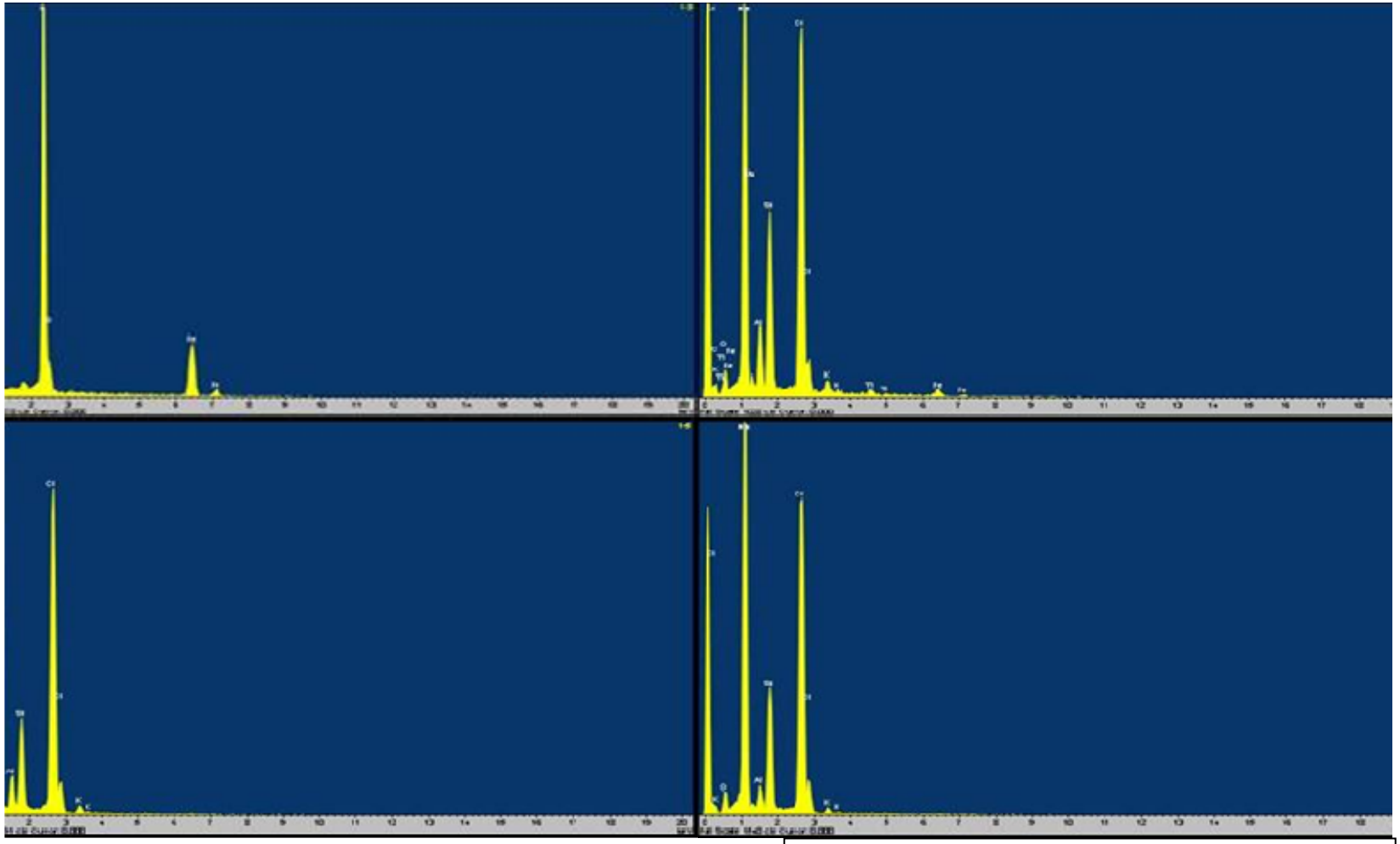

Fig 1: EDS Spectra for DGR6 - 654.58 (Spots 1-3 to 1-6)

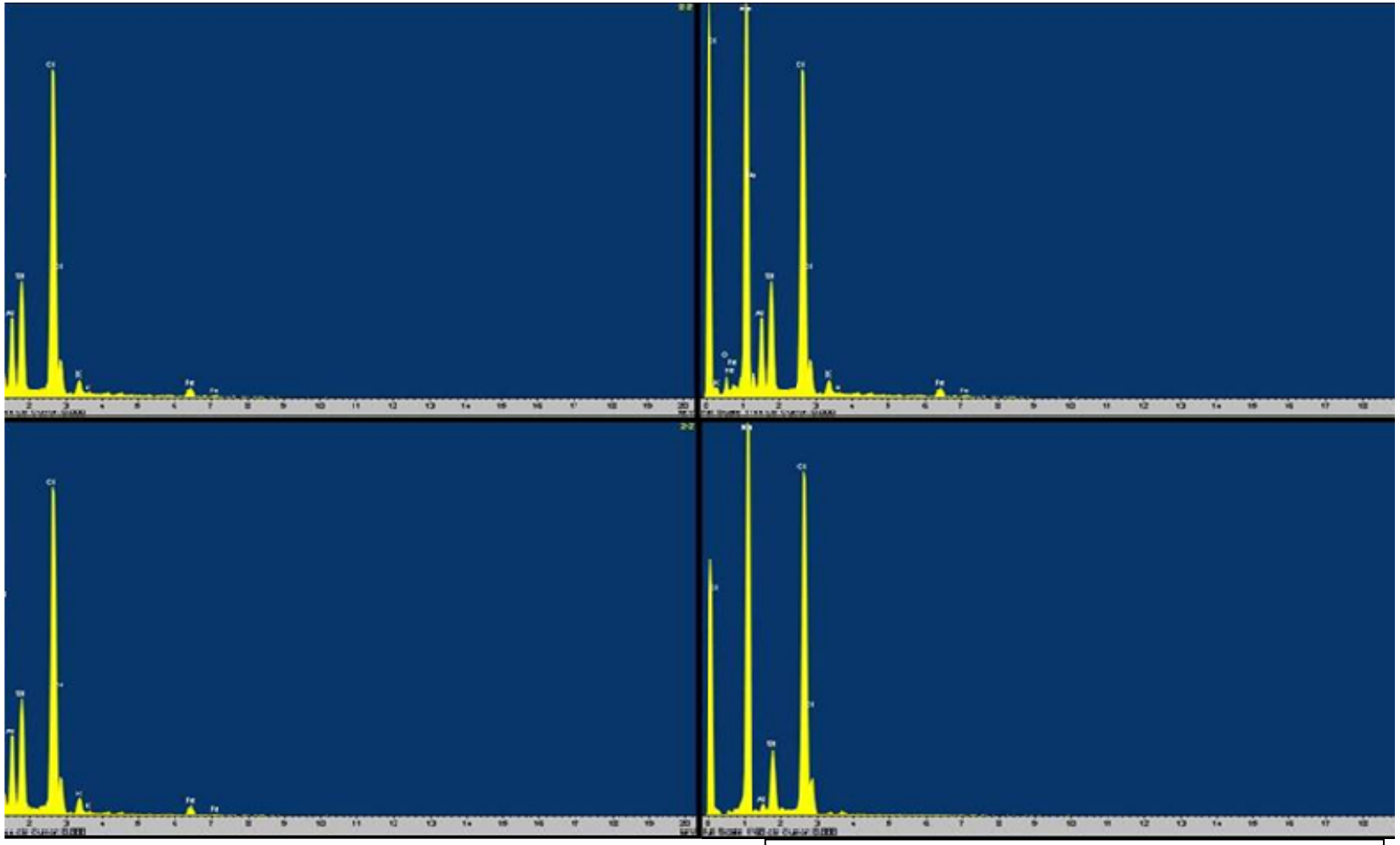

Fig 2: EDS Spectra for DGR6 - 664.31 (Spots 2-2 to 2-5)

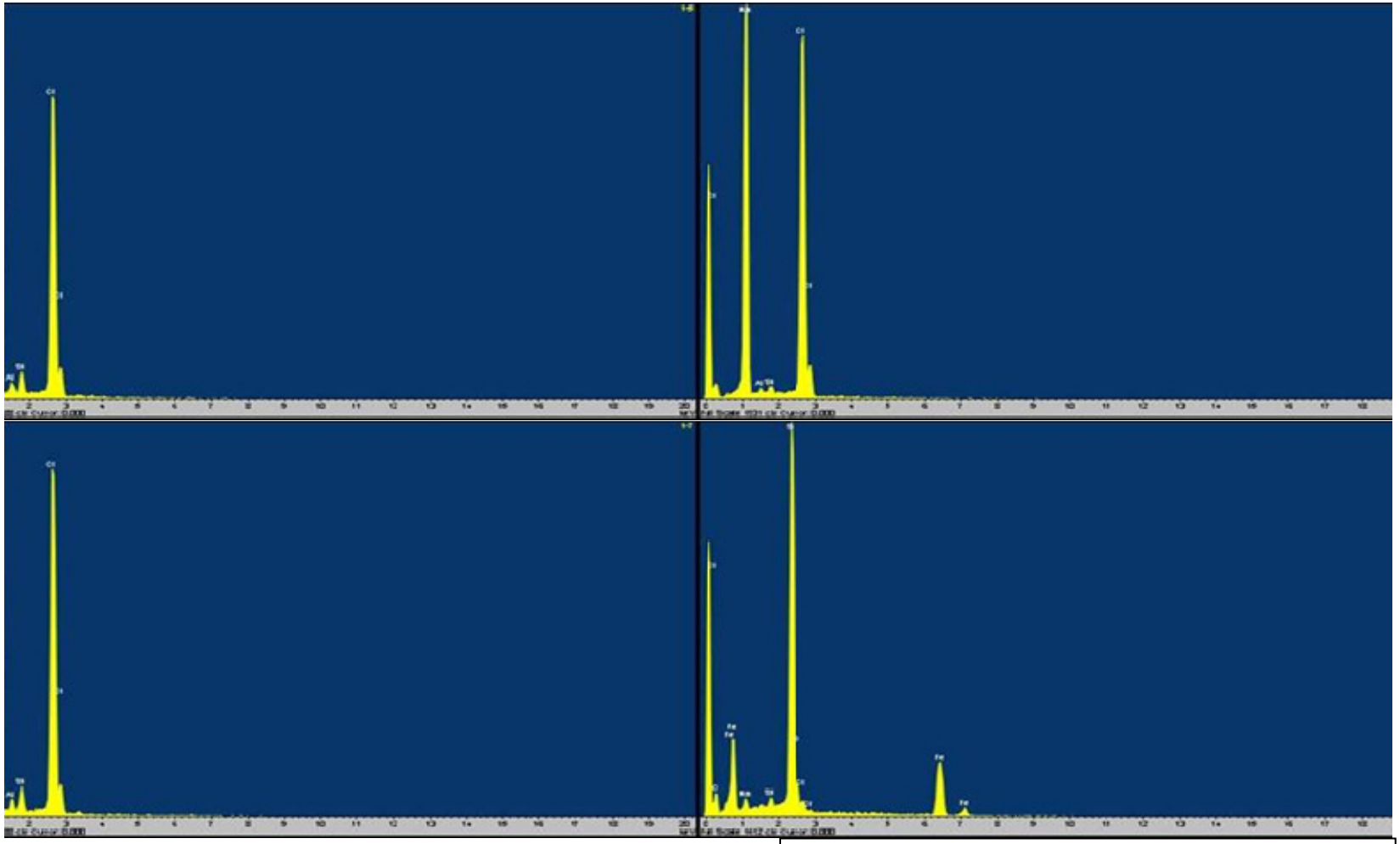

Fig 3: EDS Spectra for DGR6 - 697.67 (Spots 1-5 to 1-8)

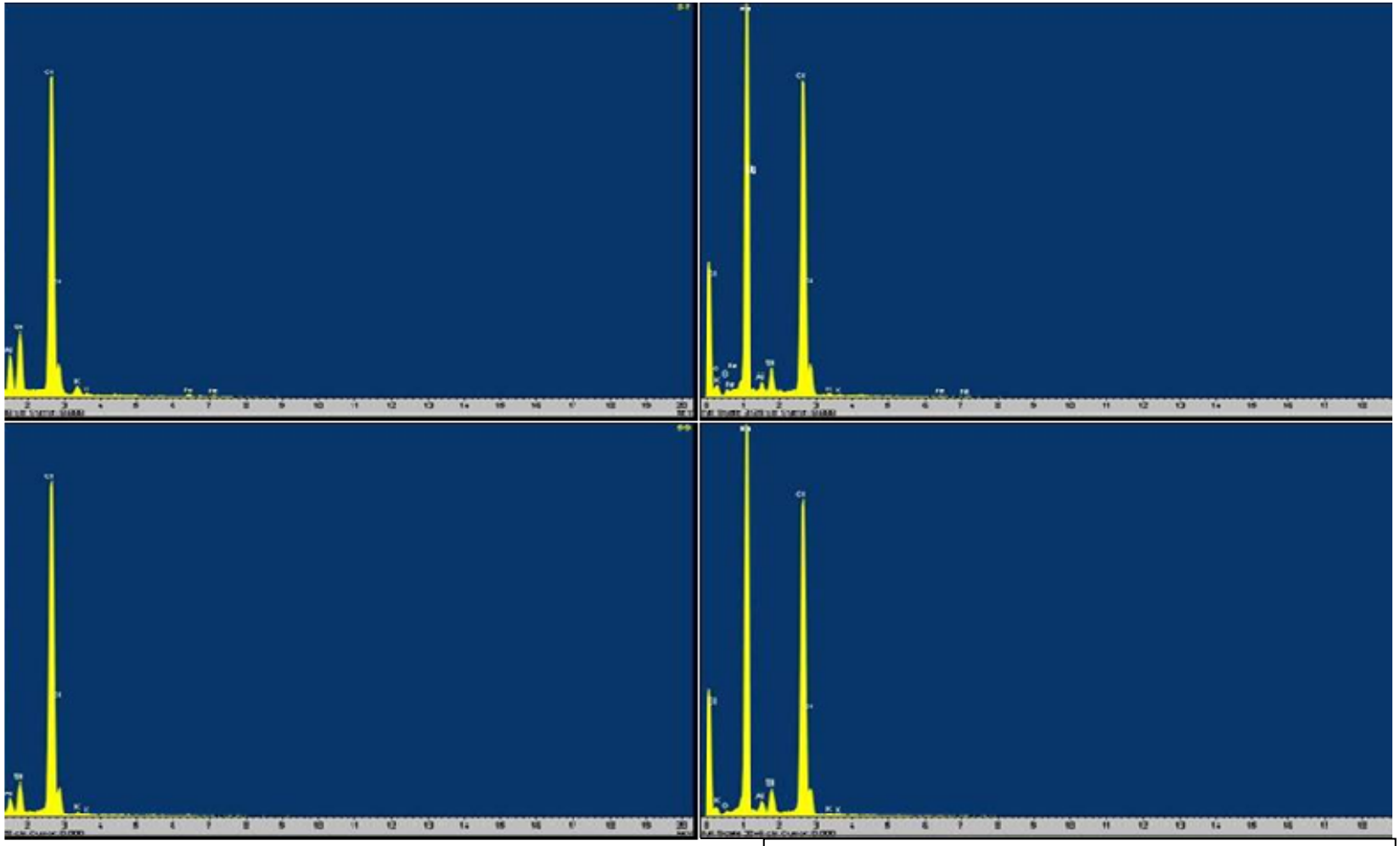

Fig 4: EDS Spectra for DGR6 - 717.97 (Spots 5-7 to 5-10)

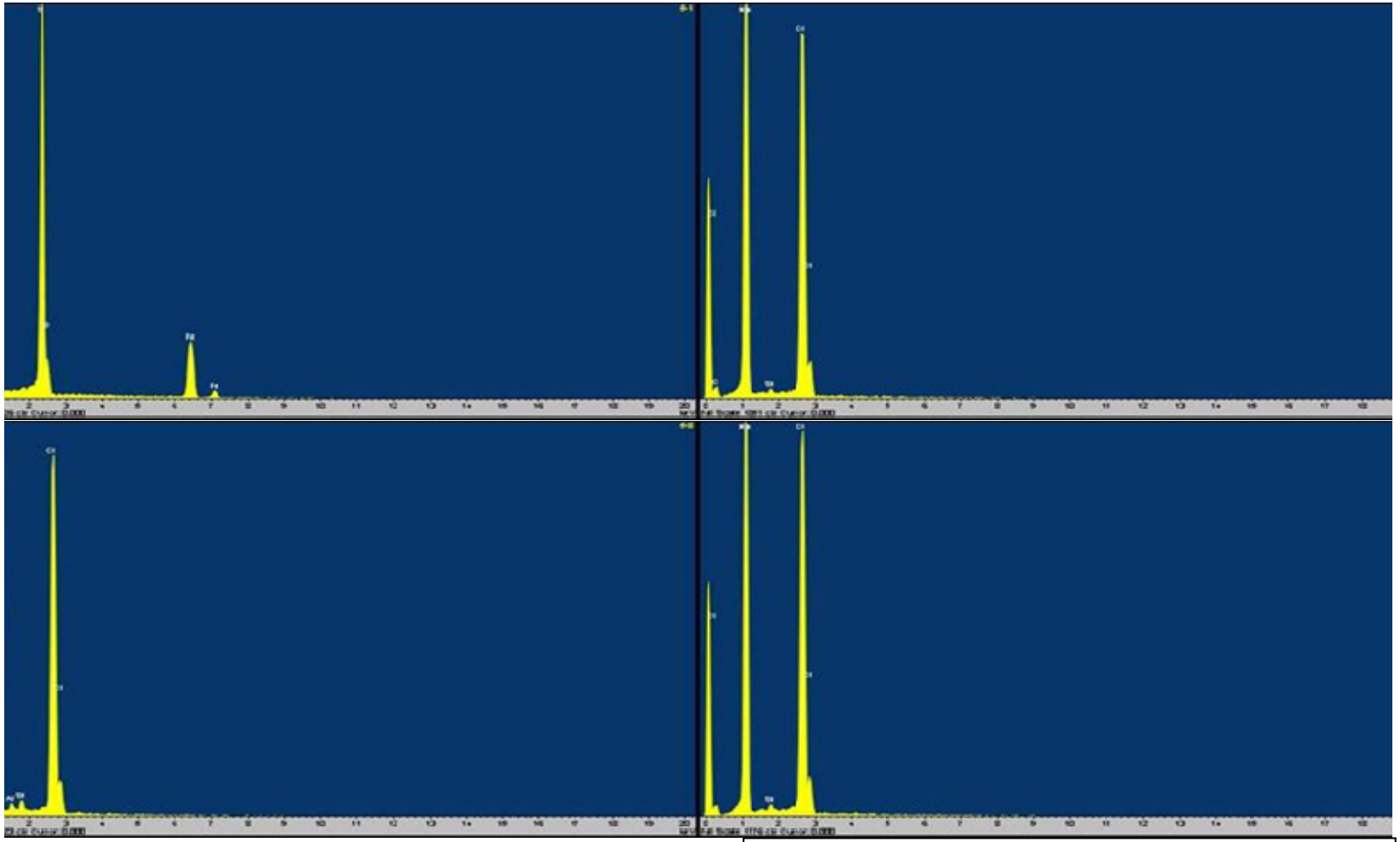

Fig 5: EDS Spectra for DGR6 - 735.40 (Spots 5-1, 5-7 to 5-9)

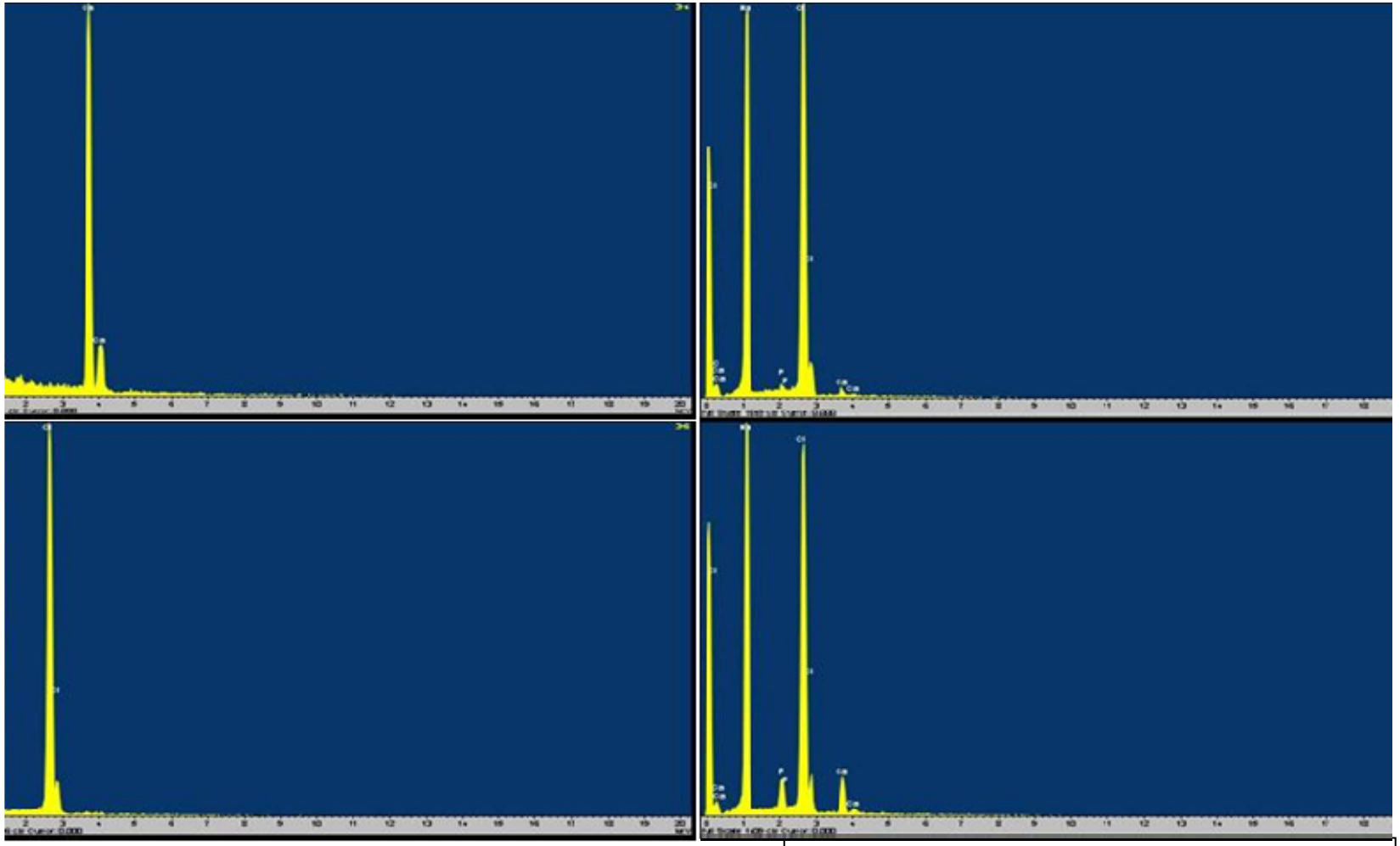

Fig 6: EDS Spectra for DGR6 - 750.80 (Spots 3-4 to 3-7)

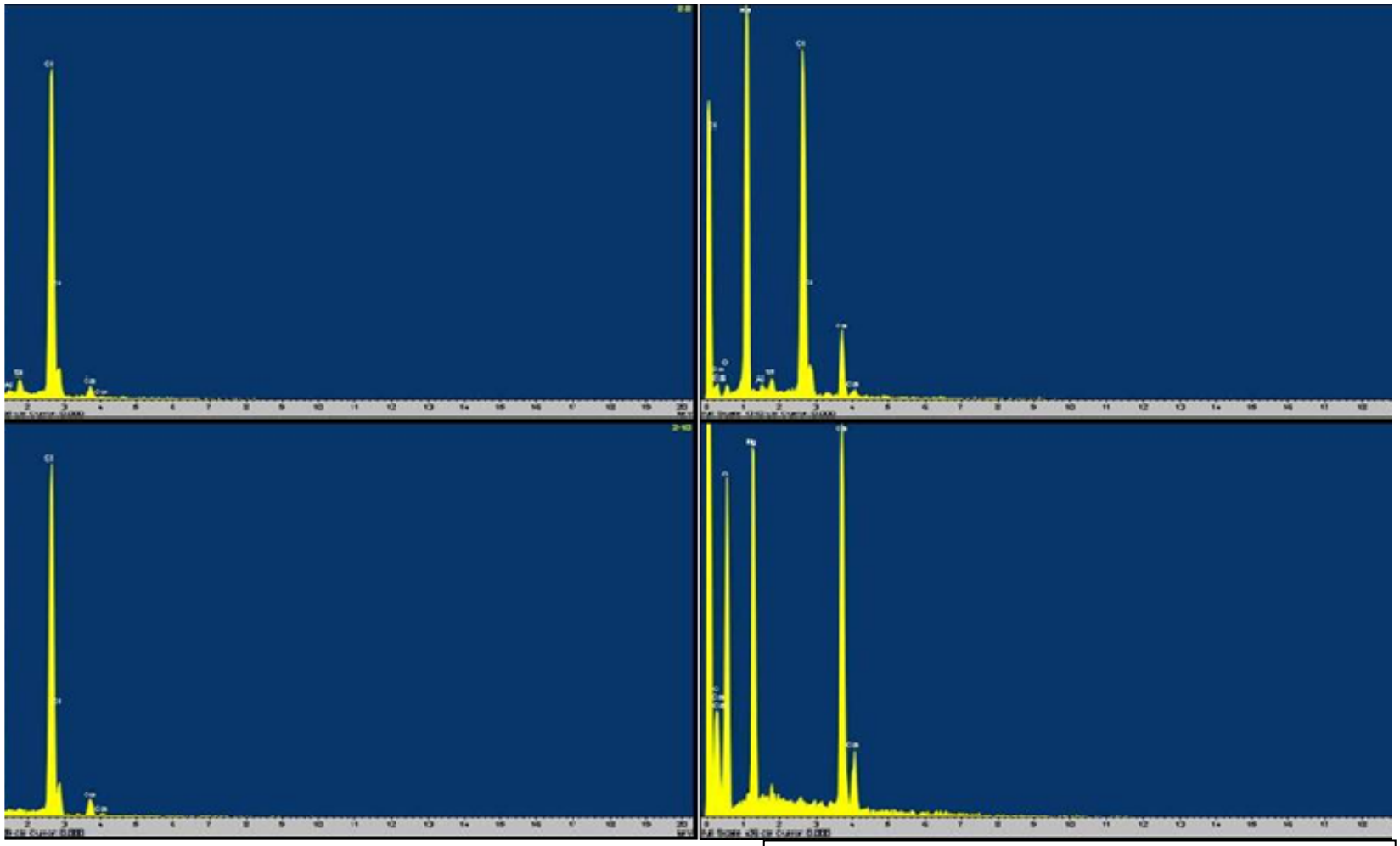

Fig 7: EDS Spectra for DGR6 - 761.76 (Spots 2-8 to 2-11)

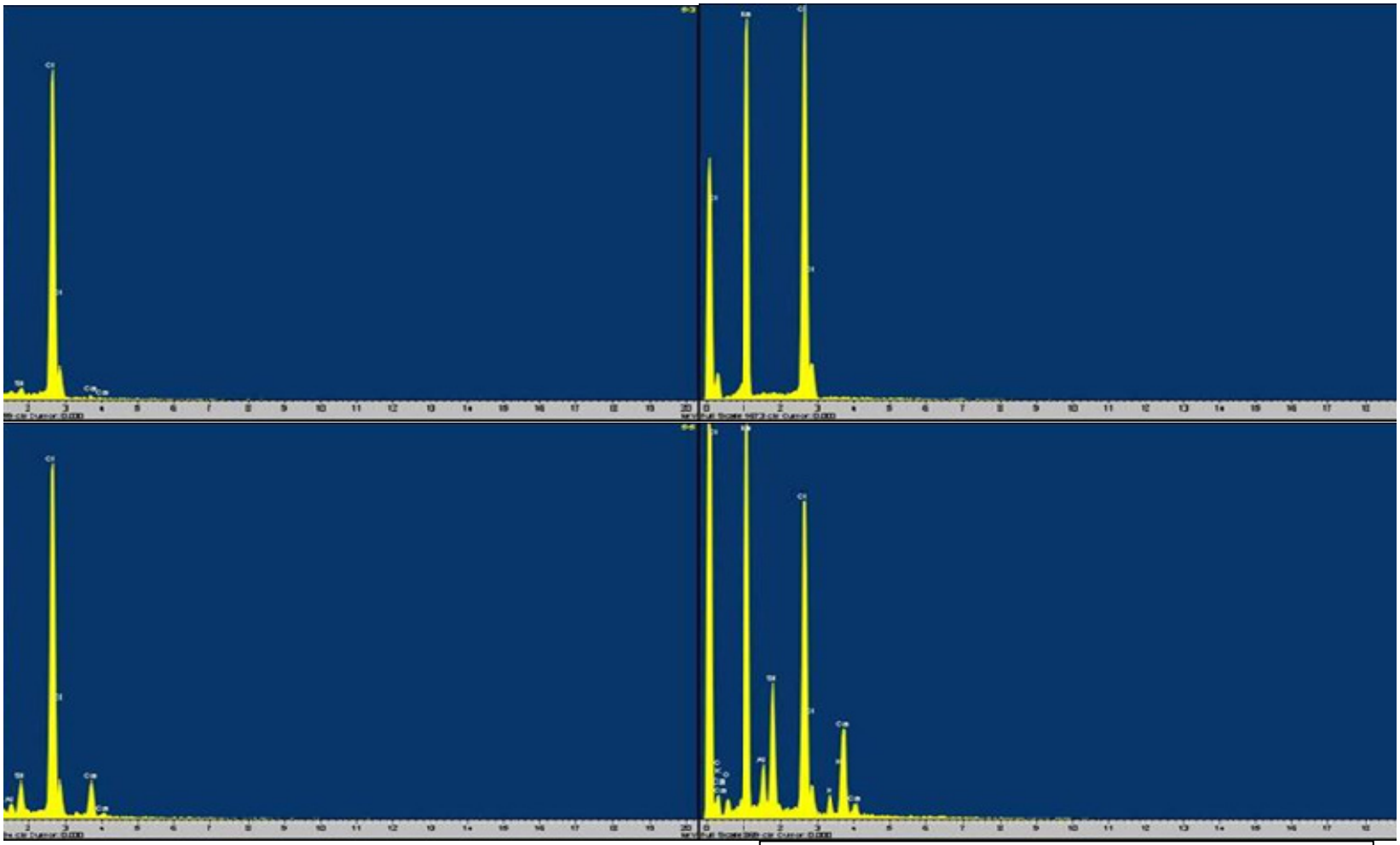

Fig 8: EDS Spectra for DGR6 - 768.58 (Spots 5-3 to 5-6)

# *Appendix – 3: Whole Rock Analysis Data*

**SGS Canada Inc.**
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

**Intera Engineering Ltd.**
Attn : Ken Raven

1 Raymond St., Suite 200
Ottawa, Ontario
K1R 1A2, Canada

Phone: (613) 232-2525 ext. 326
Fax:(613) 232-7149

May 18, 2010

**Date Rec. :** 12 May 2010
**LR Report :** **CA11120-MAY10**
**Project :** 06-219.35.10
**Client Ref :** Whole Rock Analysis
Project#11925-002

# CERTIFICATE OF ANALYSIS

## Whole Rock Report

| Sample ID | SiO2 % | Al2O3 % | Fe2O3 % | MgO % | CaO % | Na2O % |
|---|---|---|---|---|---|---|
| 5: DGR6-654-58 | 52.9 | 16.0 | 6.78 | 3.68 | 3.34 | 0.42 |
| 6: DGR6-664-31 | 53.4 | 15.6 | 6.88 | 3.44 | 3.45 | 0.50 |
| 7: DGR6-697-67 | 55.9 | 15.8 | 6.45 | 3.09 | 2.19 | 0.88 |
| 8: DGR6-717-97 | 55.5 | 16.2 | 6.99 | 3.06 | 2.47 | 0.49 |
| 9: DGR6-735-40 | 53.3 | 15.9 | 6.78 | 3.30 | 4.34 | 0.43 |
| 10: DGR6-750-80 | 6.03 | 1.48 | 0.83 | 2.47 | 47.9 | 0.06 |
| 11: DGR6-761-76 | 9.21 | 2.62 | 0.89 | 1.91 | 45.1 | 0.08 |
| 12: DGR6-768-58 | 7.79 | 1.97 | 0.77 | 1.73 | 47.2 | 0.08 |

| Sample ID | K2O % | TiO2 % | P2O5 % | MnO % | Cr2O3 % | V2O5 % | LOI % | Sum % |
|---|---|---|---|---|---|---|---|---|
| 5: DGR6-654-58 | 4.93 | 0.86 | 0.21 | 0.10 | 0.01 | 0.02 | 9.43 | 98.7 |
| 6: DGR6-664-31 | 4.72 | 0.84 | 0.28 | 0.10 | 0.01 | 0.02 | 9.10 | 98.3 |
| 7: DGR6-697-67 | 4.70 | 0.89 | 0.16 | 0.07 | 0.02 | 0.02 | 8.49 | 98.6 |
| 8: DGR6-717-97 | 4.77 | 0.92 | 0.21 | 0.08 | 0.01 | 0.02 | 8.51 | 99.2 |
| 9: DGR6-735-40 | 4.74 | 0.86 | 0.36 | 0.08 | 0.01 | 0.02 | 9.80 | 100.0 |
| 10: DGR6-750-80 | 0.61 | 0.07 | 0.06 | 0.06 | < 0.01 | < 0.01 | 40.3 | 99.9 |
| 11: DGR6-761-76 | 1.06 | 0.13 | 0.08 | 0.03 | < 0.01 | < 0.01 | 38.0 | 99.1 |
| 12: DGR6-768-58 | 0.86 | 0.10 | 0.05 | 0.03 | < 0.01 | < 0.01 | 39.0 | 99.6 |

*Chris Sullivan, B.Sc., C.Chem*
*Project Specialist*
*Environmental Services, Analytical*

Line LIMS

**SGS Canada Inc.**
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

**Project :** 06-219.35.10

May 20, 2010

**Intera Engineering Ltd.**
Attn : Ken Raven

1 Raymond St., Suite 200, Ottawa
Canada, K1R 1A2
Phone: (613) 232-2525 ext. 326, Fax:(613) 232-7149

**Date Rec. :** 12 May 2010
**LR Report:** **CA11083-MAY10**
**Reference:** Project#11925-002

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: DGR6-654-58 | 6: DGR6-664-31 | 7: DGR6-697-67 | 8: DGR6-717-97 | 9: DGR6-735-40 | 10: DGR6-750-80 | 11: DGR6-761-76 | 12: DGR6-768-58 |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Carbon [%] | 17-May-10 | 14:47 | 1.05 | 1.17 | 0.872 | 1.04 | 1.84 | 10.4 | 9.70 | 9.86 |
| Total Organic Carbon [%] | 18-May-10 | 14:16 | 0.211 | 0.333 | 0.426 | 0.565 | 0.791 | 0.612 | 0.192 | 0.351 |
| Total Sulphur [%] | 17-May-10 | 14:47 | 0.314 | 0.750 | 0.669 | 1.08 | 1.12 | 0.066 | 0.095 | 0.113 |
| Carbon Dioxide [%] | 19-May-10 | 15:32 | 3.15 | 3.15 | 1.69 | 1.92 | 3.61 | 37.8 | 35.1 | 35.8 |
| Chloride [%] | 20-May-10 | 10:38 | 0.61 | 0.58 | 0.90 | 0.51 | 0.43 | 0.06 | 0.09 | 0.08 |
| Silver [g/t] | 20-May-10 | 08:30 | 0.47 | 0.22 | 0.29 | 0.24 | 0.20 | < 0.01 | 0.02 | < 0.01 |
| Aluminum [µg/g] | 20-May-10 | 08:30 | 77000 | 7700 | 74000 | 77000 | 78000 | 7300 | 13000 | 9800 |
| Arsenic [g/t] | 20-May-10 | 08:30 | 5.3 | 4.8 | 3.1 | 4.4 | 4.8 | 1.3 | 1.5 | 1.7 |
| Barium [µg/g] | 20-May-10 | 08:30 | 310 | 300 | 320 | 320 | 320 | 36 | 57 | 48 |
| Beryllium [µg/g] | 20-May-10 | 08:30 | 2.0 | 1.9 | 1.8 | 1.9 | 2.0 | 0.2 | 0.4 | 0.2 |
| Bismuth [g/t] | 20-May-10 | 08:30 | 0.19 | 0.22 | 0.20 | 0.21 | 0.19 | < 0.09 | < 0.09 | < 0.09 |
| Calcium [µg/g] | 20-May-10 | 08:30 | 21000 | 20000 | 13000 | 15000 | 26000 | 270000 | 270000 | 270000 |
| Cadmium [g/t] | 20-May-10 | 08:30 | 0.14 | 0.13 | 0.10 | 0.11 | 0.09 | < 0.02 | < 0.02 | < 0.02 |
| Cerium [g/t] | 20-May-10 | 08:30 | 77 | 38 | 77 | 82 | 79 | 16 | 19 | 17 |
| Cobalt [g/t] | 20-May-10 | 08:30 | 16 | 15 | 15 | 15 | 14 | 1.6 | 2.2 | 1.8 |
| Chromium [g/t] | 20-May-10 | 08:30 | 70 | 77 | 71 | 71 | 69 | 13 | 18 | 14 |
| Copper [µg/g] | 20-May-10 | 08:30 | 29 | 21 | 60 | 40 | 26 | 1.5 | 2.5 | 0.7 |
| Cesium [g/t] | 20-May-10 | 08:30 | 8.7 | 5.9 | 8.7 | 8.8 | 8.8 | 1.0 | 1.9 | 1.4 |
| Dysprosium [g/t] | 20-May-10 | 08:30 | 4.5 | 2.7 | 4.4 | 4.5 | 4.8 | 0.95 | 1.0 | 0.84 |

OnLine LIMS

**SGS Canada Inc.**
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

**Project :** 06-219.35.10
**LR Report :** **CA11083-MAY10**

| Analysis | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: DGR6-654-58 | 6: DGR6-664-31 | 7: DGR6-697-67 | 8: DGR6-717-97 | 9: DGR6-735-40 | 10: DGR6-750-80 | 11: DGR6-761-76 | 12: DGR6-768-58 |
|---|---|---|---|---|---|---|---|---|---|---|
| Erbium [g/t] | 20-May-10 | 08:30 | 2.8 | 1.7 | 2.7 | 2.8 | 3.0 | 0.55 | 0.63 | 0.47 |
| Europium [g/t] | 20-May-10 | 08:30 | 1.3 | 0.80 | 1.3 | 1.3 | 1.4 | 0.27 | 0.31 | 0.27 |
| Iron [µg/g] | 20-May-10 | 08:30 | 43000 | 44000 | 41000 | 44000 | 43000 | 5200 | 5800 | 4900 |
| Gallium [g/t] | 20-May-10 | 08:30 | 23 | 22 | 22 | 23 | 22 | 1.8 | 3.4 | 2.5 |
| Gadolinium [g/t] | 20-May-10 | 08:30 | 5.5 | 3.0 | 5.2 | 5.3 | 5.8 | 1.2 | 1.3 | 1.1 |
| Germanium [g/t] | 20-May-10 | 08:30 | 1.1 | 0.8 | 1.0 | 1.1 | 1.2 | 0.3 | < 0.3 | 0.3 |
| Hafnium [g/t] | 20-May-10 | 08:30 | 3.6 | 3.3 | 3.7 | 3.5 | 3.2 | 0.5 | 0.7 | 0.5 |
| Holmium [g/t] | 20-May-10 | 08:30 | 1.0 | 0.61 | 0.98 | 1.0 | 1.1 | 0.21 | 0.23 | 0.18 |
| Indium [g/t] | 20-May-10 | 08:30 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Potassium [µg/g] | 20-May-10 | 08:30 | 42000 | 32000 | 40000 | 41000 | 40000 | 8800 | 14000 | 12000 |
| Lanthanum [g/t] | 20-May-10 | 08:30 | 38 | 15 | 37 | 42 | 41 | 8.3 | 10 | 8.1 |
| Lithium [µg/g] | 20-May-10 | 08:30 | 42 | 32 | 41 | 41 | 37 | 4.4 | 8.2 | 6.8 |
| Lutetium [g/t] | 20-May-10 | 08:30 | 0.42 | 0.23 | 0.42 | 0.44 | 0.46 | 0.072 | 0.090 | 0.064 |
| Magnesium [µg/g] | 20-May-10 | 08:30 | 16000 | 7300 | 17000 | 17000 | 18000 | 14000 | 11000 | 10000 |
| Manganese [µg/g] | 20-May-10 | 08:30 | 700 | 670 | 470 | 490 | 570 | 410 | 260 | 250 |
| Molybdenum [g/t] | 20-May-10 | 08:30 | 0.2 | 0.3 | 0.4 | 0.8 | 1.3 | 0.2 | 0.3 | 0.2 |
| Niobium [g/t] | 20-May-10 | 08:30 | 16 | 13 | 15 | 15 | 14 | 3.8 | 5.1 | 4.1 |
| Neodymium [g/t] | 20-May-10 | 08:30 | 33 | 19 | 32 | 34 | 35 | 6.8 | 7.7 | 6.7 |
| Nickel [g/t] | 20-May-10 | 08:30 | 33 | 34 | 34 | 36 | 37 | 6.2 | 8.6 | 5.9 |
| Total Phosphorus [ug/g] | 20-May-10 | 08:30 | 860 | 960 | 640 | 830 | 1400 | 290 | 340 | 220 |
| Lead [g/t] | 20-May-10 | 08:30 | 6.7 | 14 | 18 | 23 | 24 | 2.2 | 2.5 | 2.7 |
| Praseodymium [g/t] | 20-May-10 | 08:30 | 9.7 | 5.1 | 9.5 | 10 | 10 | 1.9 | 2.2 | 1.9 |
| Rubidium [g/t] | 20-May-10 | 08:30 | 160 | 42 | 150 | 160 | 160 | 17 | 31 | 23 |
| Antimony [g/t] | 20-May-10 | 08:30 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Scandium [g/t] | 20-May-10 | 08:30 | 18 | 1.0 | 18 | 18 | 18 | 2.8 | 4.0 | 2.9 |
| Samarium [g/t] | 20-May-10 | 08:30 | 6.2 | 3.7 | 5.9 | 6.1 | 6.5 | 1.3 | 1.4 | 1.2 |
| Strontium [µg/g] | 20-May-10 | 08:30 | 140 | 130 | 180 | 130 | 140 | 330 | 320 | 310 |
| Tantalum [g/t] | 20-May-10 | 08:30 | 3.4 | 1.3 | 2.8 | 2.8 | 2.6 | 3.1 | 2.8 | 2.5 |
| Terbium [g/t] | 20-May-10 | 08:30 | 0.75 | 0.39 | 0.72 | 0.75 | 0.80 | 0.061 | 0.085 | 0.046 |
| Thorium [g/t] | 20-May-10 | 08:30 | 11 | 0.05 | 11 | 11 | 10 | 1.1 | 2.2 | 1.6 |
| Titanium [µg/g] | 20-May-10 | 08:30 | 5200 | 4700 | 5200 | 5300 | 4900 | 450 | 800 | 610 |
| Thallium [g/t] | 20-May-10 | 08:30 | 0.68 | 0.67 | 0.68 | 0.81 | 0.88 | 0.07 | 0.08 | 0.05 |
| Thulium [g/t] | 20-May-10 | 08:30 | 0.33 | 0.14 | 0.31 | 0.33 | 0.34 | < 0.001 | < 0.001 | < 0.001 |
| Uranium [g/t] | 20-May-10 | 08:30 | 3.1 | 3.1 | 3.3 | 3.5 | 3.4 | 1.4 | 1.2 | 1.0 |

OnLine LIMS

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|---|---|---|---|---|---|---|---|---|---|---|
| Vanadium [µg/g] | 20-May-10 | 08:30 | 120 | 120 | 110 | 120 | 120 | 11 | 19 | 15 |
| Tungsten [g/t] | 20-May-10 | 08:30 | 1.5 | 1.4 | 1.4 | 1.4 | 1.5 | 0.26 | 0.32 | 0.25 |
| Ytterbium [g/t] | 20-May-10 | 08:30 | 2.6 | 1.5 | 2.6 | 2.8 | 2.8 | 0.45 | 0.57 | 0.42 |
| Yttrium [g/t] | 20-May-10 | 08:30 | 21 | 4.0 | 20 | 21 | 24 | 6.4 | 6.7 | 4.9 |
| Zinc [µg/g] | 20-May-10 | 08:30 | 71 | 73 | 63 | 62 | 58 | 4.5 | 7.1 | 5.2 |
| Zirconium [g/t] | 20-May-10 | 08:30 | 110 | 110 | 110 | 100 | 98 | 14 | 24 | 19 |

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