



Research Paper

Elemental Mineral Characterization by Scanning Electron Microscopy of Rock Samples of Quitupán, Jalisco, Mex.

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ABSTRACT

With the purpose of determining the possible presence of minerals of economic value, a study of elemental chemical analysis by scanning electron microscopy was carried out in rock samples from Llano Largo, Quitupán, Jalisco, of the location with coordinates 19°50'29.5"N 102°47'42.1"W. The result of the analysis indicates notable chemical composition values, which may be indicative of a geochemical anomaly, as well as the possible presence of minerals of economic value in the region.

Keywords: Mineral characterization, scanning electron microscopy

Received 25 Jan., 2023; Revised 07 Feb., 2023; Accepted 09 Feb., 2023 © The author(s) 2023.

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I. INTRODUCTION

For the study of mineral deposits, the generic determination of the laws of the elements that may be important according to the type of deposit is carried out. In this sense, the analytical techniques of minerals that provide this type of results acquire indisputable importance, one of these analytical techniques is microscopy, both optical and scanning electronics (SEM), which can even be useful in the design of mining processes. separation and extraction of some element of interest in the deposit under study (Melgarejo et al., 2010). The aforementioned is based on the fact that the determining properties of the degree of release of a rock component are the mineral species, its morphology and dimensions (Andara et al., 2011).

The SEM is based on obtaining an image of a sample obtained from scanning it with an electron beam. The interaction between the incident electrons and the sample originate the emission of secondary electrons, backscattered electrons and characteristic X-rays of the elements present in the sample, which is used for qualitative and semiquantitative chemical analysis. In the SEM, different detectors capture and amplify the signal emitted by the surface of the sample when it is swept by the electron beam. The intensity of the amplified signal is displayed on a conventional screen. Recent advances in both equipment and software make this technique a potentially very powerful tool and not yet widely used in earth sciences (Melgarejo et al., 2010).

MINERALOGICAL STUDY OF ROCK SAMPLES OF QUITUPÁN, JALISCO BY SCANNING ELECTRON MICROSCOPY

With the objective of determining the possible presence of minerals of economic value, a study of elemental chemical analysis was carried out by scanning electron microscopy by means of the method of comparison with a standard or standard substance (Almagro, 1999), to rock samples of Llano Largo, Quitupán, Jalisco of the location with coordinates 19°50'29.5"N 102°47'42.1"W (Google maps, 2023), which showed some notable crystals in their structure.

The equipment used was a Jeol model 66100LV scanning electron microscope.

The results of the samples are detailed below:

Sample 1

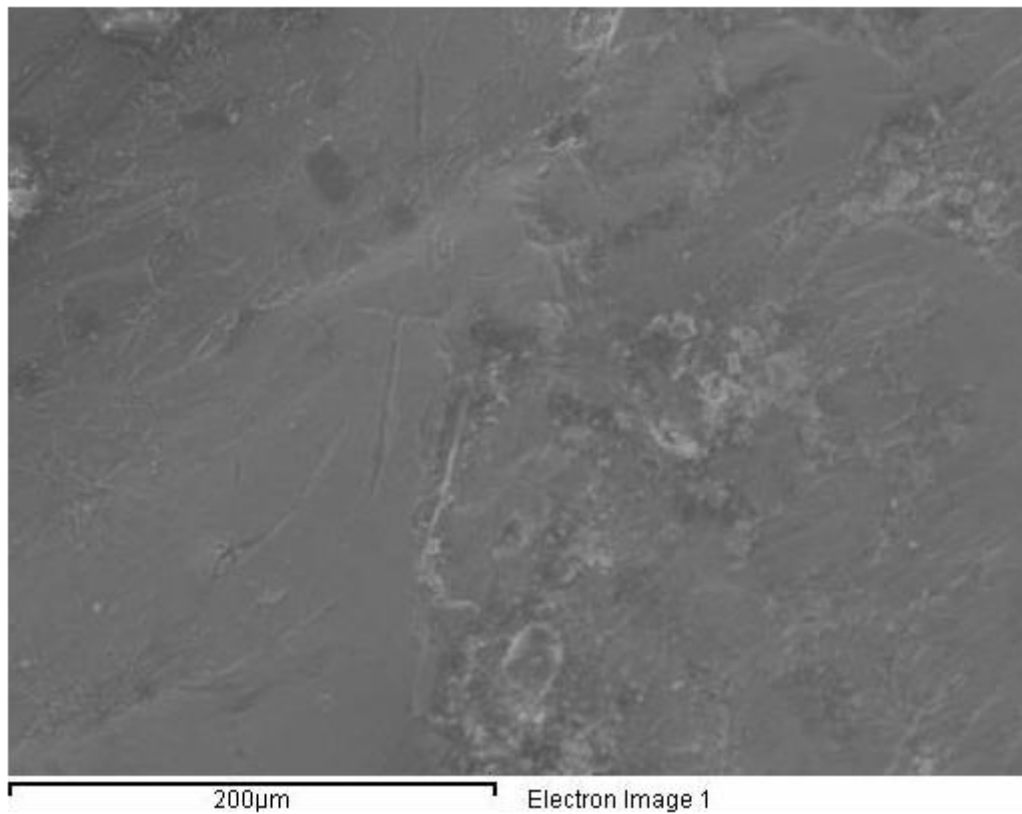


Figure 1: morphology of rock sample number 1 of Quitupán, Jal., obtained by scanning electron microscopy.

Analysis technique: All elements analyzed (normalized)

Number of iterations: 4.

Standard:

C CaCO₃ 1-Jun-1999 12:00 AM

O SiO₂ 1-Jun-1999 12:00 AM

Al Al₂O₃ 1-Jun-1999 12:00 AM

Si SiO₂ 1-Jun-1999 12:00 AM

S FeS₂ 1-Jun-1999 12:00 AM

Fe Fe 1-Jun-1999 12:00 AM

Cu Cu 1-Jun-1999 12:00 AM

Zn Zn 1-Jun-1999 12:00 AM

Table 1: Analysis Results of the rock sample number 1 of Quitupán, Jal., obtained by scanning electron microscopy

Element	Weight%	Atomic %
C K	35.78	62.82
O K	8.92	11.76
Al K	0.46	0.36
Si K	0.37	0.28
S K	18.40	12.10
Fe K	15.88	6.00
Cu K	18.63	6.18
Zn K	1.55	0.50
Total	100.00	

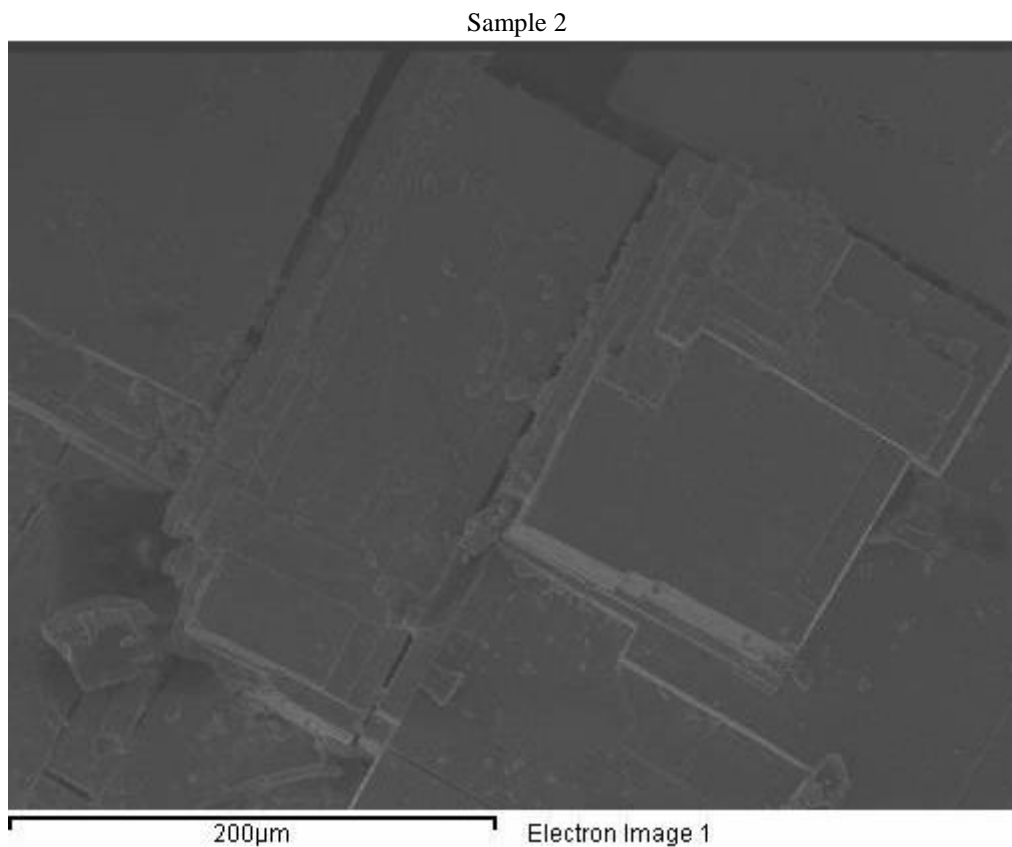


Figure 2: morphology of rock sample number 2 of Quitupán, Jal., obtained by scanning electron microscopy.

Number of iterations: 3.

standard:

O SiO₂ 1-Jun-1999 12:00 AM
 Al Al₂O₃ 1-Jun-1999 12:00 AM
 S FeS₂ 1-Jun-1999 12:00 AM
 K MAD-10 Feldspar 1-Jun-1999 12:00 AM
 Fe Fe 1-Jun-1999 12:00 AM
 Zn Zn 1-Jun-1999 12:00 AM
 Pb PbF₂ 1-Jun-1999 12:00 AM

Table 2: Analysis Results of the rock sample number 2 of Quitupán, Jal., obtained by scanning electron microscopy

Element	Weight %	Atomic %
O K	5.98	30.23
Al K	0.42	1.27
S K	14.44	36.42
K K	0.41	0.84
Fe K	0.47	0.68
Zn K	0.00	0.00
Pb M	78.27	30.55
Totals	100.00	

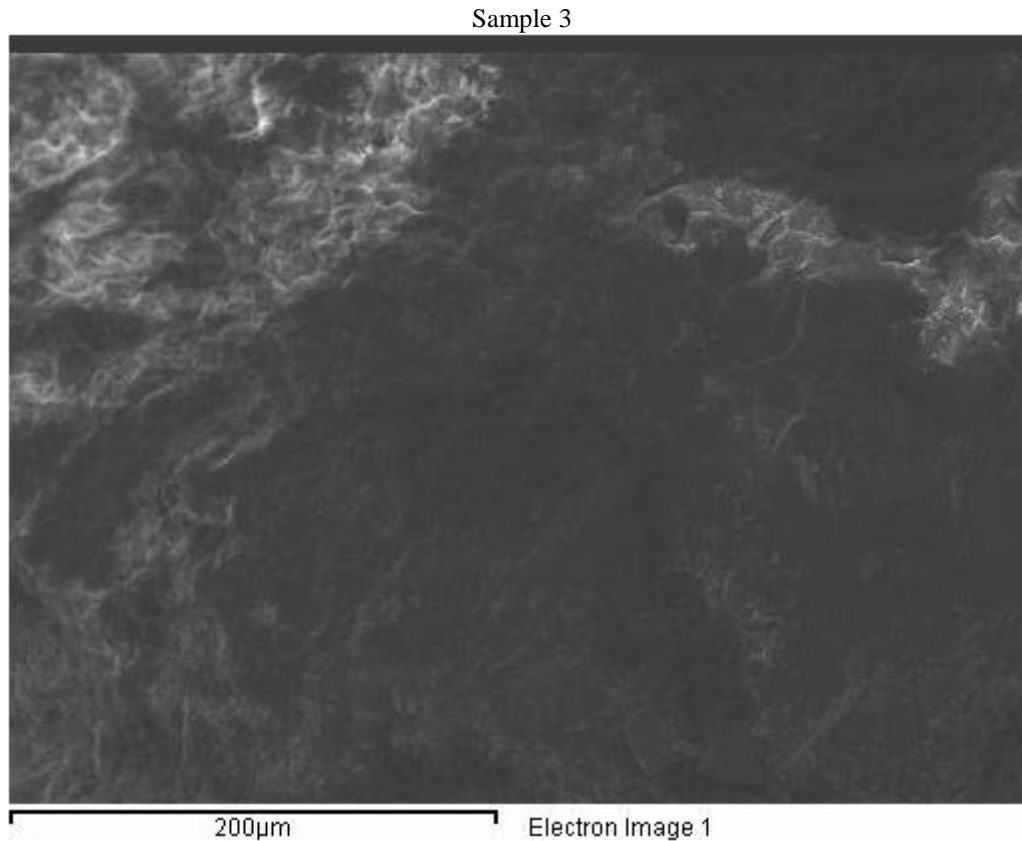


Figure 3: morphology of rock sample number 3 of Quitupán, Jal., obtained by scanning electron microscopy.

Number of iterations: 5.

standard:

C CaCO₃ 1-Jun-1999 12:00 AM
 O SiO₂ 1-Jun-1999 12:00 AM
 F MgF₂ 1-Jun-1999 12:00 AM
 Al Al₂O₃ 1-Jun-1999 12:00 AM
 Si SiO₂ 1-Jun-1999 12:00 AM
 S FeS₂ 1-Jun-1999 12:00 AM
 Cl KCl 1-Jun-1999 12:00 AM
 K MAD-10 Feldspar 1-Jun-1999 12:00 AM
 Fe Fe 1-Jun-1999 12:00 AM
 Zn Zn 1-Jun-1999 12:00 AM

Table 3: Analysis Results of the rock sample number 3 of Quitupán, Jal., obtained by scanning electron microscopy

Element	Weight %	Atomic %
C K	23.18	32.19
O K	43.86	45.72
F K	11.25	9.87
Al K	6.33	3.92
Si K	10.29	6.11
S K	1.23	0.64
Cl K	0.31	0.15
K K	2.66	1.14
Fe K	0.87	0.26

Zn K	0.00	0.00
Total	100.00	

Sample 4

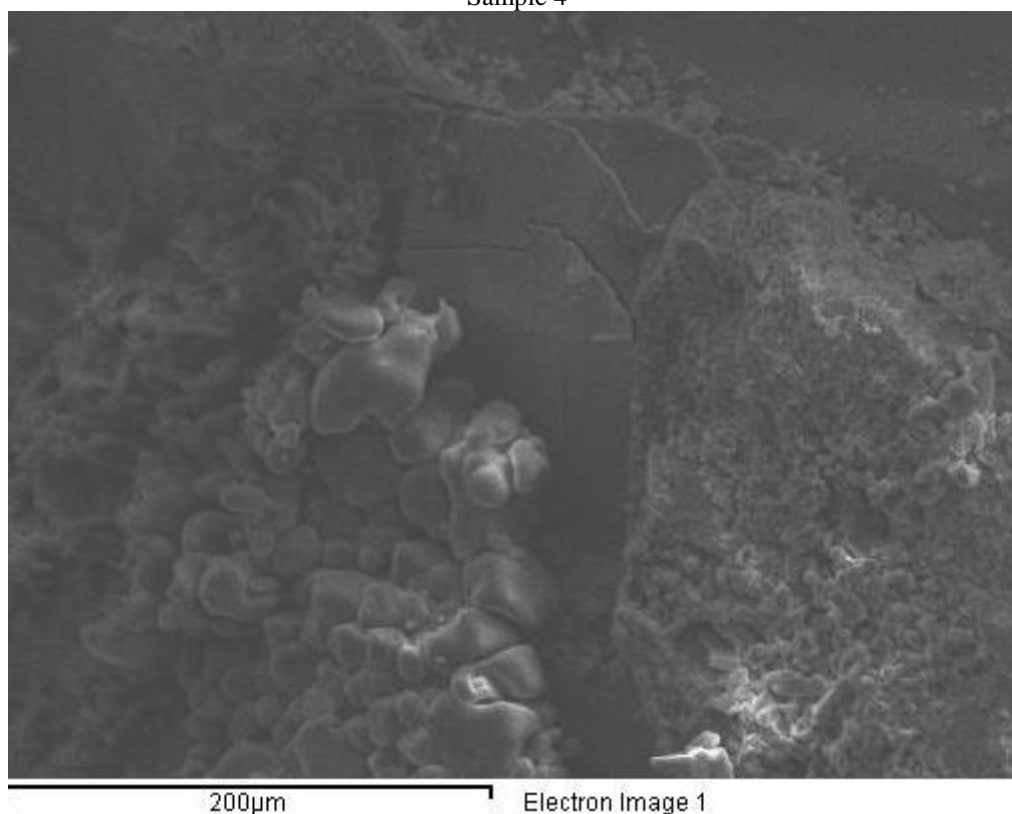


Figure 4: morphology of rock sample number 4 of Quitupán, Jal., obtained by scanning electron microscopy.

Number of iterations: 4.

standard:

- C CaCO3 1-Jun-1999 12:00 AM
- O SiO2 1-Jun-1999 12:00 AM
- Mg MgO 1-Jun-1999 12:00 AM
- Al Al2O3 1-Jun-1999 12:00 AM
- Si SiO2 1-Jun-1999 12:00 AM
- S FeS2 1-Jun-1999 12:00 AM
- Ca Wollastonite 1-Jun-1999 12:00 AM
- Fe Fe 1-Jun-1999 12:00 AM

Table 4: Analysis Results of the rock sample number 4 of Quitupán, Jal., obtained by scanning electron microscopy

Element	Weight %	Atomic %
C K	22.88	36.58
O K	38.08	45.71
Mg K	0.77	0.60
Al K	0.61	0.43
Si K	1.13	0.78
S K	11.88	7.11
Ca K	2.23	1.07

Fe K	22.42	7.71
Total	100.00	

Sample 5

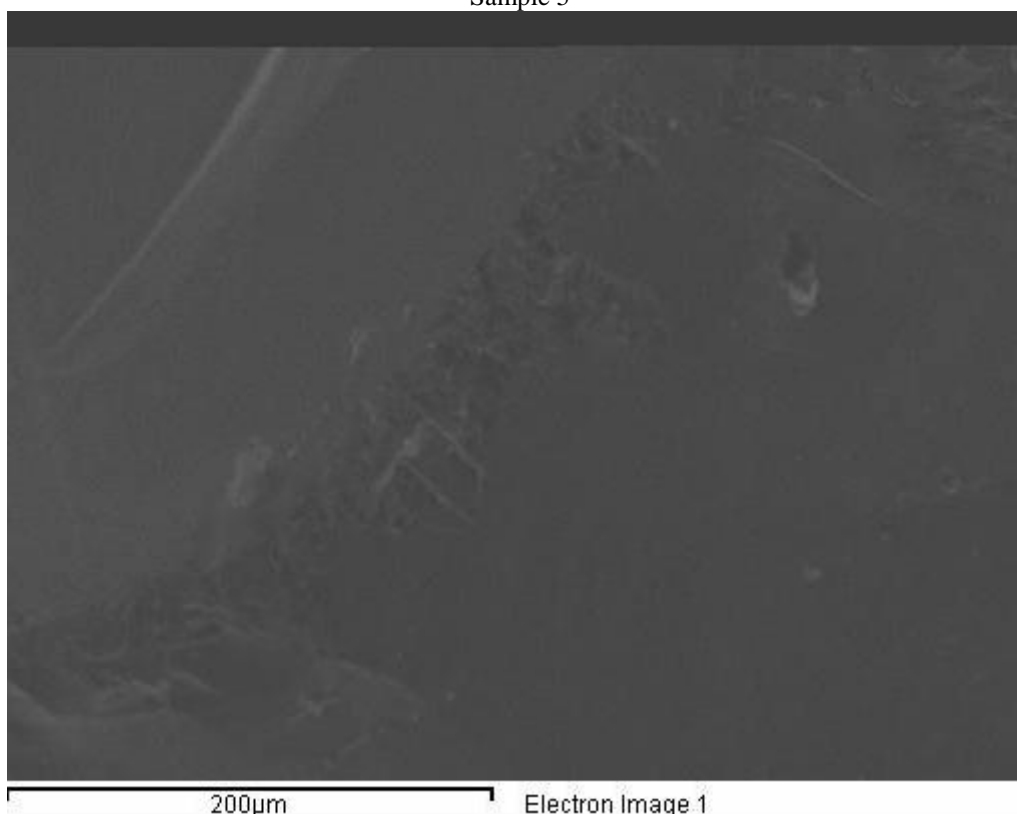


Figure 5: morphology of rock sample number5 of Quitupán, Jal., obtained by scanning electron microscopy.

Analysis technique: All elements analyzed (normalized)

Number of iterations: 4.

standard:

C CaCO₃ 1-Jun-1999 12:00 AM

O SiO₂ 1-Jun-1999 12:00 AM

Al Al₂O₃ 1-Jun-1999 12:00 AM

Si SiO₂ 1-Jun-1999 12:00 AM

S FeS₂ 1-Jun-1999 12:00 AM

Fe Fe 1-Jun-1999 12:00 AM

Table 5: Analysis Results of the rock sample number 5 of Quitupán, Jal., obtained by scanning electron microscopy

Element	Weight%	Atomic%
C K	23.52	48.56
O K	4.78	7.41
Al K	0.18	0.17
Si K	0.21	0.19
S K	36.47	28.20
Fe K	34.84	15.47
Total	100.00	

The result of the analysis of rock sample of Llano Largo, Quitupán, Jal., indicates clearly notable values, which may be indicative of a geochemical anomaly, as well as the possible presence of Fe, Cu, F and Pb minerals of probable economic value in the region (Gass et al., 2002; Viladevall, 2008)

II. CONCLUSIONS

Through elemental chemical characterization by scanning electron microscopy, the presence of iron, copper, fluor and lead minerals can be identified, in rock samples from Llano Largo, Quitupán, Jalisco, Mex. of the location with coordinates 19°50'29.5"N 102°47'42.1"W, with possible economic value.

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