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Petrography of the Maneah Granites

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Abstract

Granites are widely studied around the world in order to obtain petrographic, structural, mineralogical, geochemical, metallogenic information to name a few. However, some granites have not had up-to-date and/or extensive studies. To update and further studies on the granites of the Republic of Guinea, we have chosen to conduct petrographic and mineralogical studies of the open quarries on the granite massif of Manéah, south-west of the territory. A macroscopic field analysis and microscopic through thin sections in the laboratory was performed. The X-ray diffractometer (XRD) allowed us to observe the mineralogy of granites. These granites have a grainy texture and massive structure. They have quartz veins and pegmatite veins. A large metamorphic shale seam was exposed by the SOFAMAC quarry. Manéah granites consist of quartz, plagioclase, orthose, microcline, biotite, muscovite, sulphide, zircon, chlorite, sericite, garnet, carbonate and opaque minerals. Chlorite and garnet are minerals indicators of regional metamorphism, carbonate is a mineral indicator of hydrothermalism and finally sericite indicates an alteration of granites. These results allowed us to conclude that the Manéah granites were affected by a regional metamorphism of green shale facies to amphibolite and hydrothermalism.

Keywords: *Manéah, Granite, Petrography, Mineralogy*

Introduction

Granites are one of the magmatic rocks that have undergone several studies around the world. This is due to their abundance in the continental lithosphere. They are studied in order to obtain scientific information for a better exploitation of their deposits. Thus, [1] declare that the granites of the Andlau quarry at Bas-Rhin, in eastern France, were established in the mass of the Steige shales after their metamorphosis by the Hohwald granite. [2] classified the Nigerian granites of Mada as a possible source of economic minerals as this complex was affected by potassic metasomatism, which caused its recrystallization with microcline and albite, associated with mica, fluorine, cassiterite, colombite and thorite. [3] finds the tungsten deposit in the Xihuashan granite complex south of Jiangxi, China. [4] indicate that the genesis of the Liueryiqi deposit in the Taoshan granite complex in southeast China is related to hydrothermal fluids. [5] determined the petrographic and geotechnical characteristics of Tissalatin granites in south-eastern Algeria, after which they classified these granites as good building materials.

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The geology of the Republic of Guinea presents an important mineral heritage known for its richness and diversity, representing an African and world heritage. The study and knowledge of this geology is of inestimable scientific and economic interest to Guinea [6]. The Republic of Guinea is geologically characterized by tectonised, metamorphosed and granitized rocks of the Archean constituting its base and by sedimentary deposits of the Paleozoic, Mesozoic and Cenozoic constituting the cover [7], [8], [9]. Most granitic rocks in Guinea have had previous studies. [10], in their studies, have made a petrographic characterization of the granites that lie at the foot of Mount Nimba, southeast of the Republic of Guinea. the 1/200,000 geological survey conducted by [11] revealed the presence of a relatively cool two (2) mica granite massif around Manéah-Mangata (East Conakry leaf). These granites, represented by three isolated outcrops of isometric form with a total area of about 300 km2, were attached to the formation phase of the Upper Proterozoic (the terminal phase of Pan-African magmatism) from the determination of absolute age by the K/Ar method (585 Ma.) [12], [13]. The first studies carried out on the granite massif of Manéah were used only to open the quarries for the production of building materials, considered as development minerals. However, not only do we lack accurate and up-to-date information on the petrography and mineralogy of the Manéah granites, but we also notice a lack of information on geochemistry and metallogeny. The quarries open on the granite massif of Manéah give an opportunity to deepen studies on these granites. The main objective of this work is to make a petrographic and mineralogical characterization of granites present in these quarries of Manéah. More specifically, it will involve the macroscopic, microscopic and mineralogical characterization of these granites. The study area covered by this article is located in the southwestern part of the Republic of Guinea (Coyah prefecture, Manéah sub-prefecture) [14], [15]. It is bounded by parallels 9° and 10° north latitude and meridians 13° and 14° west longitude (Figure 1).

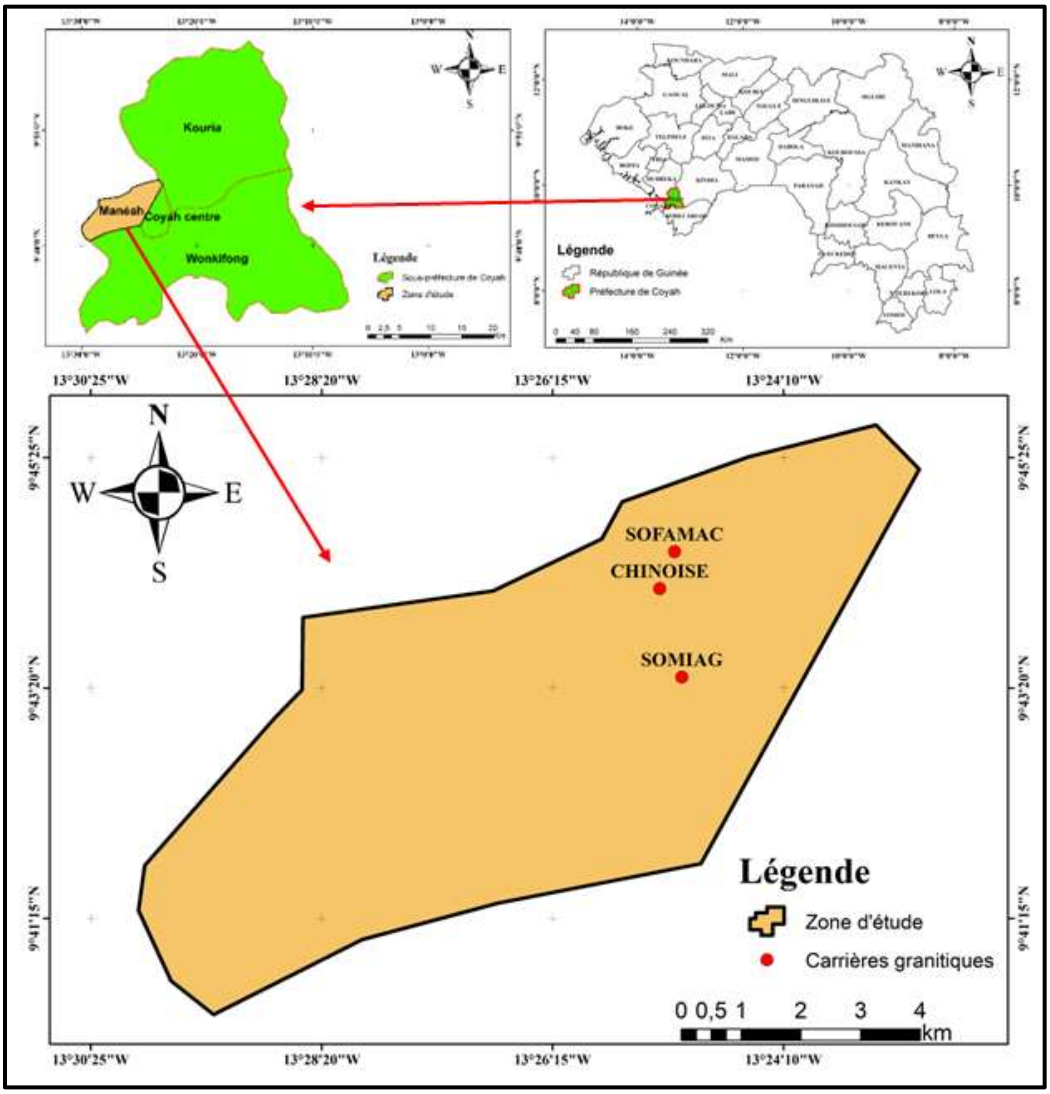


Figure 1: Geographical presentation map of the study area (**this work**)

2. Cadre Géologique

2.1 Geology of the study area

Outcrops of magmatic, sedimentary and metamorphic rocks of Archean, Proterozoic, Paleozoic, Mesozoic and Cenozoic ages can be observed in the study area (Figure 2). This indicates intense tectonic-magmatic activity [16], [13]. The Archean formations, grouped under the name of the Kassila series, consist of crystalline schists, granito-gneiss, amphibole gneiss, quartzites and sometimes migmatites. [15], [13]. Lower Proterozoic formations of the Marampa series consists of micaceous quartzites, muscovite quartz schists (sometimes with garnets), chloritized schists and phyllades [17]. The Upper Proterozoic deposits known in the literature as the Taban sandstone outcrop in bands. The Taban series consists of fine sandstones, aleurolites and argillites, conglomerates made up of pebbles and blocks of micaschists, pyroxene gneisses, ferruginous quartzites and quartz porphyries [15]. The Paleozoic formations, also known as the Ordovician of Pita Suite, are found to the north and northeast of the study area and are characterized by a predominantly sandstone facies. This suite forms a horizontal, cross-stratified azoic sandstone bed beginning with a layer of well-rounded quartz pebble conglomerate with siliceous cement [15]. Mesozoic formations are characterized by intrusive rocks. These are the dunites and peridotites. They extend from Coyah to Conakry and form the bedrock of Conakry [13]. According to [15], Cenozoic formations are Paleogene and Quaternary deposits. They result from the erosion of the weathering crust. They include marine sands, clays with carbonaceous remains, clayey soils, silts, sandy silts, sands with pebbles weakly lateritized on the surface, yellowish-grey, quartz-heterogranular sands, rich in quartz pebbles, often granitoids. Our study area is characterized by acidic, basic, ultrabasic and alkaline intrusions. The diversity of intrusive rocks in the region reflects its magmatic intensity. They were emplaced from the Precambrian to the Mesozoic [15].

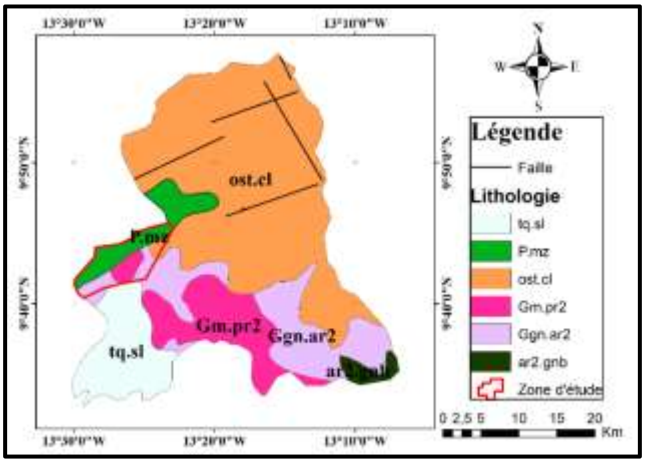
2.2 Overview of Granites

Granite is a massive, plutonic magmatic rock [4], [18]. It is sialic and consists mainly of quartz, potassic feldspars (orthosis, microcline), plagioclases (albite, anorthite), micas (biotite and muscovite) [5], [10], [18]. It may be accompanied by apatite, pyrite, zircon, muscovite, hornblende, garnet and pyroxene [19], [20], [21]. It is the most common plutonic rock and most distributed in the continental crust especially the upper crust. Its slow cooling has favoured the development of each component. The rock has a grainy appearance, with an average grain size around half a centimeter [21], [22]. Petrographically, granites are subdivided into several large groups called granitoids. They are called alkaline when they contain much more quartz, orthosis and albite; They are called calco-alkaline when they are variously coloured according to the impurities contained in feldspars [18], [23]; They are called monzonitics or monzogranites when they have a percentage of orthosis roughly equal to that of plagioclases [2], [18], [24]. Some granites may be either M type "Mantellic" from partial mantle fusion and fractional crystallization [10], [20], or type I "Igneous" from partial igneous rock fusion, or type S "Sedimentary" resulting from the partial fusion of a sedimentary rock (meta), either of type A «Anorogenic» resulting from placement in intracontinental or intraoceanic environment [21]. Granite is a strong natural material widely used in the construction of basic infrastructure, railway ballast, paving, decoration, sculpture. On the other hand, and as building materials, granite has interesting properties in particular its compressive strength, abrasiveness and high hardness [5].

3.Materials and Methods

The material on which this study focuses is the granite of Manéah. To facilitate the realization of this thesis, we used several tools in the field and in the laboratory. Several analytical methods were used for data processing. This is the field study and petrographic and mineralogical studies in the laboratory.

The field study was conducted in the study area from September 31 to October 24, 2021. It consisted of collecting samples using the estwing geologist hammer, recording the coordinates of the sampling points through the Garmin 64s GPS, to measure the directions of the veins and veins observable on some outcrops using the Suunto type mine compass, to observe certain minerals in the field using the Euromex 6 x -20 mm, to take images of geological formations in the field with the digital camera. Appropriate bags were used to store the collected samples for easy transport. These activities were carried out in all the granite quarries (Société de Fabrique des Agrégats et Matériaux de Construction (SOFAMAC), Société de Minage des Agrégats de Guinée (SOMIAG) and Société Chinoise (Hung Shong Fei)). A macroscopic description by quarry was performed. A Toyota 4x4 vehicle was used for the movement between the different quarries of the study area and the rest of the course was carried out while walking.



tq.sl	Coastal and marine deposits
P.mz	Peridotite and dunite
Ost.cl	Silurian ant Ordovician, sandstone, siltstone and argilite
Gm.pr2	Monzo-granite of Maneah
Ggn.ar2	Undifferentiated complex of migmatic, nebulitic and porphyroblastic gneisses of granitic and/or granodioritic composition.
ar2.gnb	Biotite gneiss

Figure 2: Geological map of the prefecture of Coyah (Berind et al., 1998**)** modified after

The petrographic study in the laboratory consisted in the manufacture of thin sections of 30 samples or 10 per site, the Laboratory of Geology of the Basement and Metallogeny (LGSM), the Training and Research Unit of Earth Sciences and Mining Resources, from the University Félix Houphouët-Boigny of Abidjan-Cocody (Republic of Côte d'Ivoire); to the observation of thin-film sections through an Optika B-159 ALC polarizing microscope, binocular, DIN, HC-achromatic at the Applied Research Laboratory in Geoscience and Environment, of the Higher Institute of Mines and Geology of Boké (Republic of Guinea). The mineralogical study was carried out on 3 samples or 1 per site. It consisted of X-ray diffraction using the Bruker-AXS-D8 diffractometer, at the Centre Universitaire Régional d'Interface (CURI), Sidi Mohamed Ben Abdellah-Fès University (Kingdom of Morocco).

4. Results and discussion

The surface of this granite massif is altered, it is in the quarries (SOMIAG, SOFAMAC and CHINESE) that our observations were made.

4.1 SOMIAG Quarry

Our macroscopic observations allowed us to notice some granite intrusion outcrops in the form of slab and dome (Figure 3 (A) and (B)). These outcrops have centimetric pegmatite veins and millimetric quartz veins. Granitic rock outcrops have a massive structure and grainy and micro-grained textures. They are characterized by high crystalline homogeneity and predominant leucogranite facies (Figure 4 (A)). Some have sulphide inclusions (Figure 4 (B)). These crystals are all millimetric in size.

Microscopic study of samples from the Somiag quarry shows an abundance of plagioclase, quartz, muscovite, microcline, orthoclase, biotite and opaque minerals. Plagioclase exists as zoned plagioclase (Figure 5 (A) and (B)) and polysynthetic plagioclase (Figure 6 (A) and (B)). Quartz minerals exist in micro and phenocrysts (Figure 7 (A) and (B)). Chlorite minerals (Figure 8 (A) and (B)), microclines (Figure 9 (A) and (B)), muscovite phenocrystals (Figure 10 (A) and (B)), feldspar alteration resulting in sericitization (Figure 11 (A) and (B)), biotite microcrystals (Figure 12 (A) and (B)) and orthoclase crystals (Figure 13 (A) and (B)) are also present. The mineralogical result from the DRX analysis of the sample of this quarry is represented by this diffractogram below (Figure 14). The estimate of the abundance of each mineral in the thin blades of this quarry is presented in this table 1.

4.2 SOFAMAC Quarry

Practically, this quarry has the same aspect as the first. In addition, there is a large vein about 10 m wide, exposed by the exploitation of granites. This seam consists of relatively darker rocks than granite and has a shale facies. It has NW – SE direction and fractures in various directions: N292°, N202°, N196° with an average dip of 67.5° (Figure 15). These different dislocations are certainly due to the blasting of the quarry.

Quartz minerals are the most abundant in this quarry. They occur as phenocrysts with inclusions of biotite, chlorite and orthoclase microcrystals (Figure 16 A) and (B)). Plagioclase is less abundant than quartz. It exists in phenocrysts and microscales with inclusions of quartz, biotites and opaque minerals (Figure 17 (A) and (B)). Chlorite is less abundant in the rock. It is derived from the alteration of biotite (Figure 18 (A) and (B)). Sericite occurs as a phenocrystal. It is derived from the alteration of feldspars and contains inclusions of biotite microcrystals and opaque minerals (Figure 19 (A) and (B)). Biotite exists in both microcrystals and phenocrysts with inclusions of opaque minerals (Figure 20 (A) and (B)). Muscovite crystals are embedded in feldspars (Figure 21 (A) and (B)). Orthoclase minerals with inclusions of chlorite minerals are also present (Figure 22 (A) and (B)). The DRX analysis of the sample of this quarry is represented by this diffractogram below (Figure 23). The estimate of the abundance of each mineral in the thin sections of this SOFAMAC quarry, is presented in this (Table 2) below.

4.3 CHINESE Quarry

This quarry is located at a higher altitude than the first two. Its granites have the same grainy texture (millimeter) and leucogranite facies as the previous ones. They have several centimetres of pegmatite veins (Figure 24 (A)) and sulphide inclusions (Figure 24 (B)). Its particularity is the presence of pink granites (Figure 24 (C)) and granites containing greenish minerals (Figure 24 (D)).

Microscopic study reveals that the granites from this quarry are characterized by quartz phenocrysts with muscovite inclusions and opaque minerals (Figure 25 (A) and (B)). Plagioclase occurs as a phenocrystal, surrounded by quartz and muscovite crystals (Figure 26 (A) and (B)). Muscovite is found in contact with quartz and biotite minerals (Figure 27 (A) and (B)). Sericite occurs as phenocrysts with opaque mineral inclusions (Figure 28 (A) and (B)). Biotite occurs as large, elongated crystals with opaque mineral inclusions (Figure 29 (A) and (B)). Chlorite forms a mesostasis around muscovite. This mineral is characterized by opaque mineral inclusions (Figures 30 (A) and (B)). Orthoclase is less abundant in this rock, and is characterized by the inclusion of opaque minerals (Figure 31 (A) and (B)). Microcline occurs as a phenocrystal beach with inclusions of quartz microcrystals (Figure 32 (A) and (B)). The garnet ends up as a phenocrystal with a cracked shape (Figure 34 (A) and (B)). The mineralogical result by the DRX method of the Chinese quarry sample is represented by this diffractogram below (Figure 34) The minerals are classified in this (Table 3) below according to their abundance in each thin blade of the granites of the CHINESE quarry

By projecting the various samples from Maneah's granite quarries into the Streckeisen triangle (Figure 30), we were able to determine the name of each granite type (Table 4).

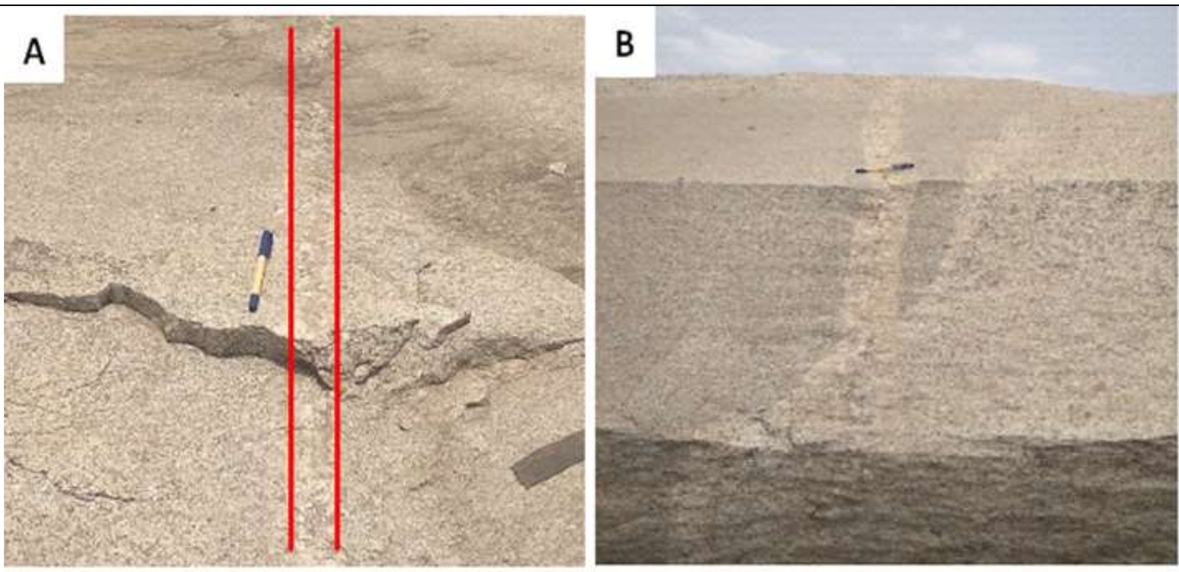


Figure 3: Outcrop of slab (A) granite with quartz vein and dome (B) granite with pegmatite vein

Figure 4: (A) Macroscopic appearance of SOMIAG quarry granites, (B) Inclusion of sulphide in a granite sample from the SOMIAG quarry

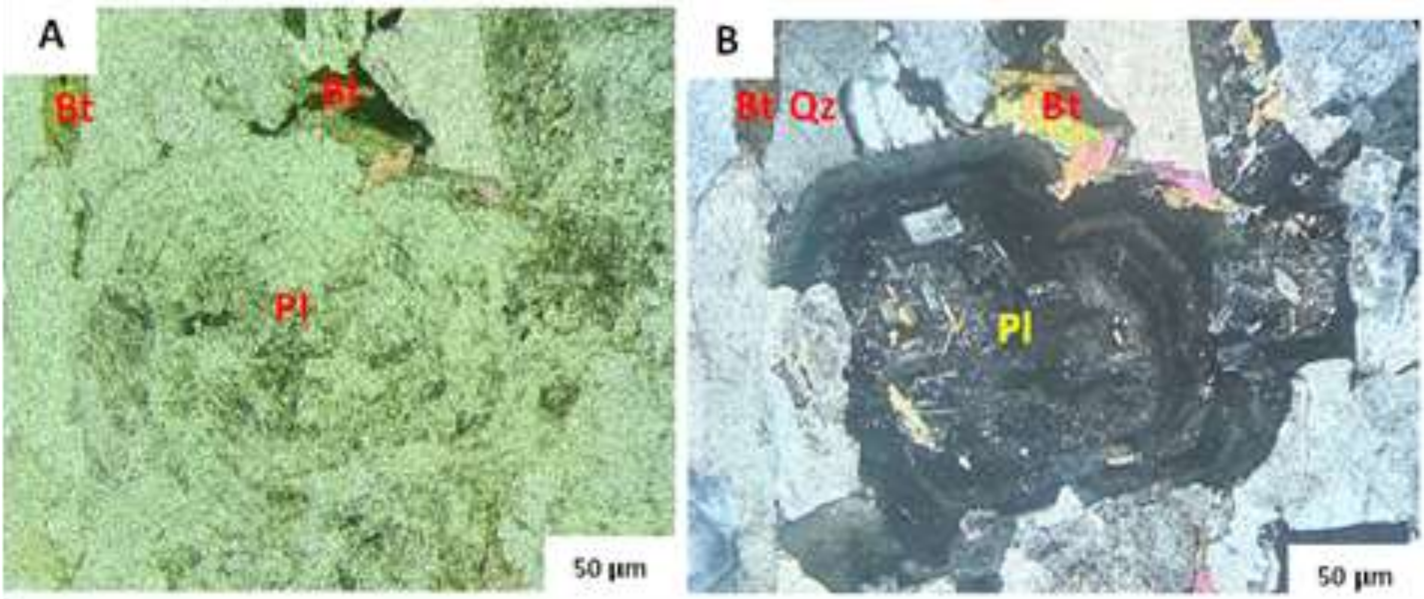


Figure 5: Microscopic aspect of zoned plagioclase (Pl), (A) in LPNA, (B) in LPA

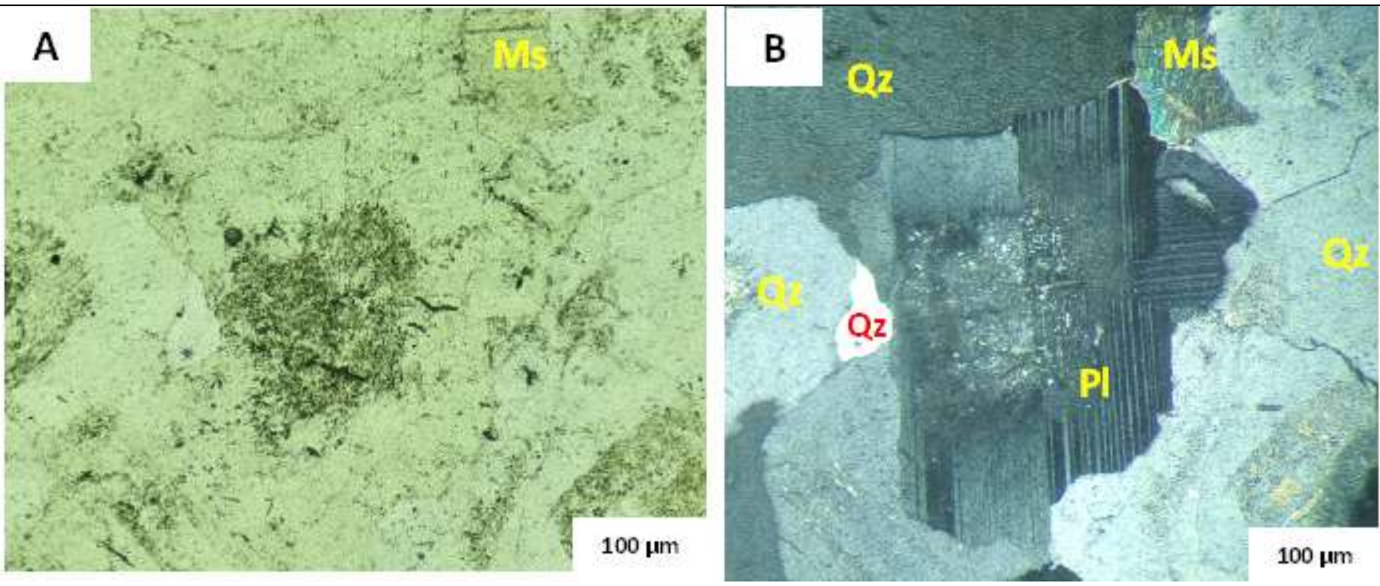


Figure 6: Microscopic aspect of polysynthetic plagioclase (Pl), (A) in LPNA, (B) in LPA

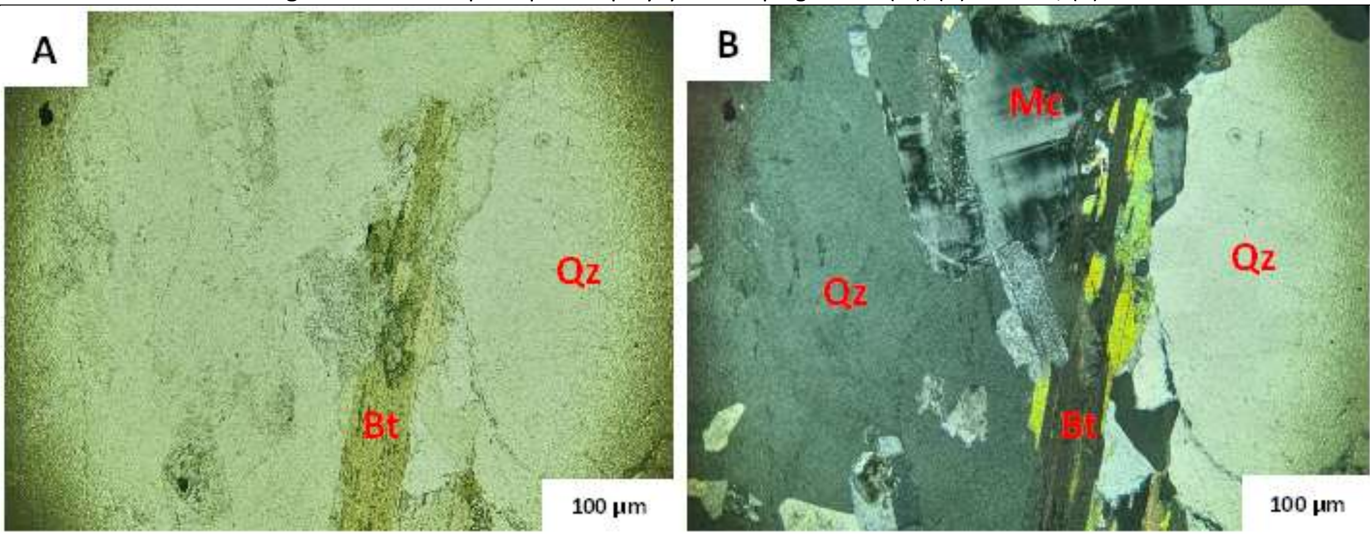


Figure 7: Microscopic appearance of quartz (Qz), (A) in LPNA, (B) in LPA

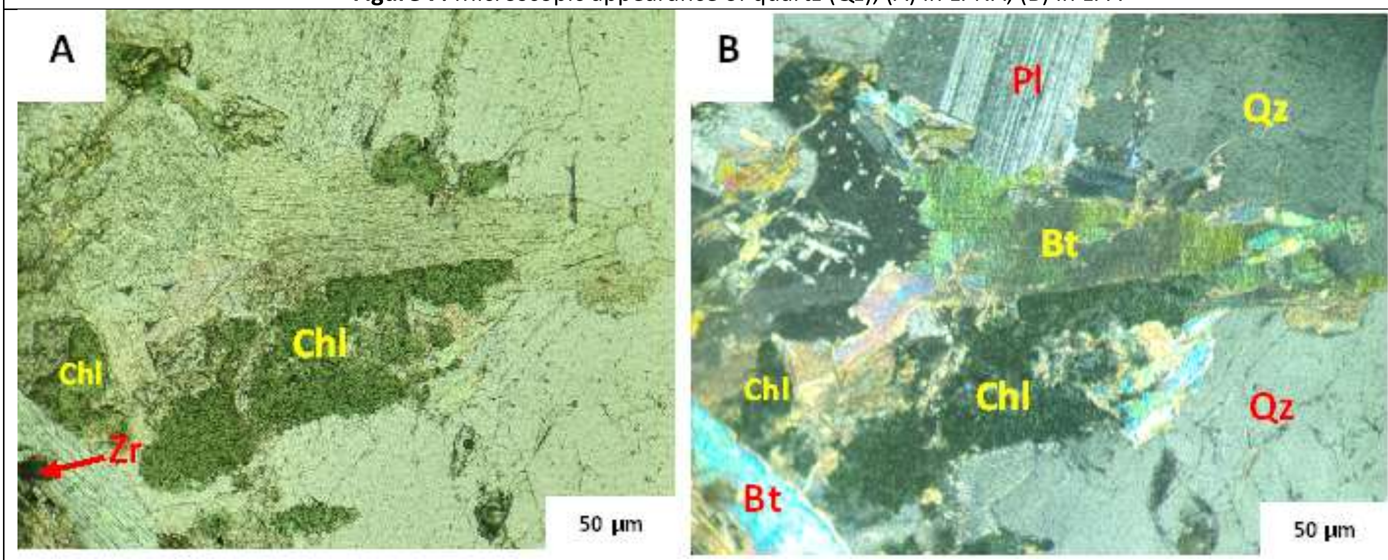


Figure 8: Microscopic appearance of chlorite (Chl), (A) in LPNA, (B) in LPA

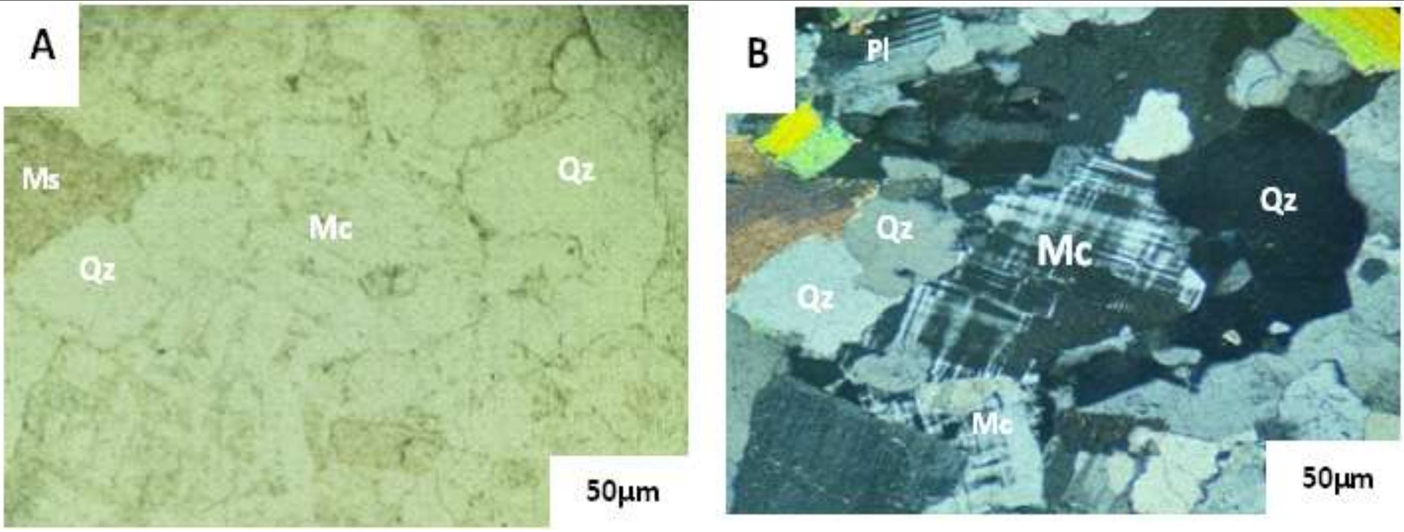


Figure 9: Microscopic aspect of microcline (Mc), (A) in LPNA, (B) in LPA

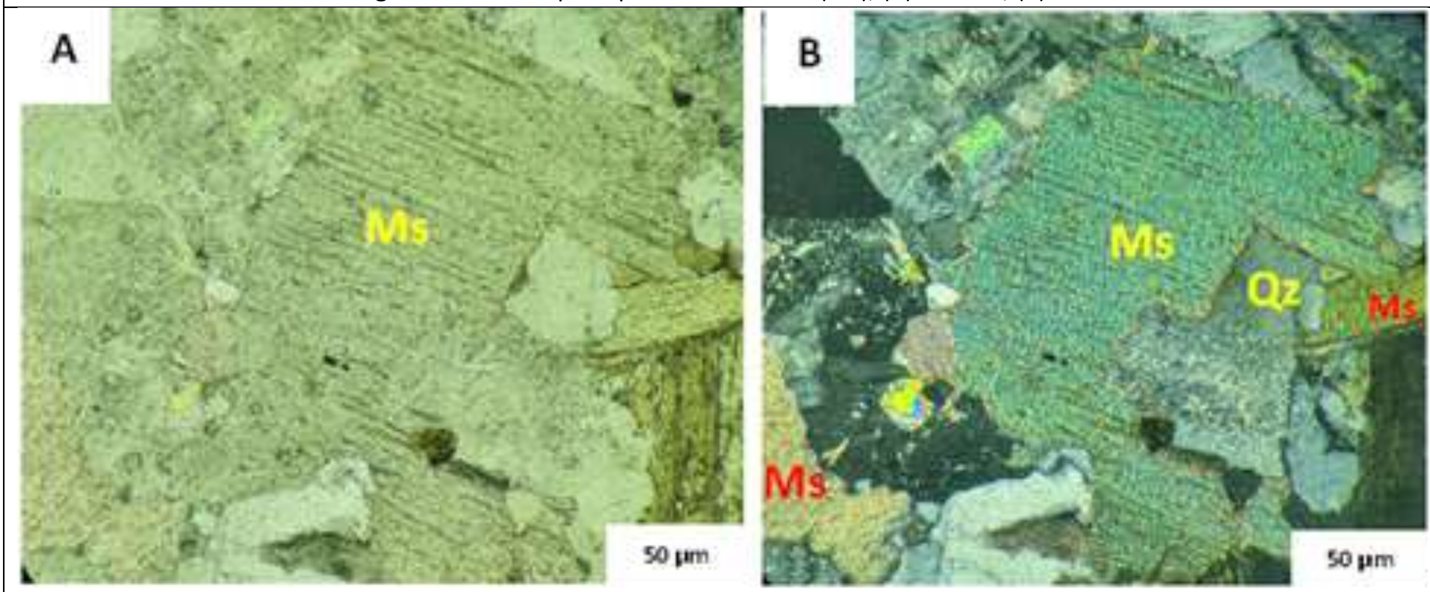


Figure 10: Microscopic aspect of muscovite (Ms), (A) in LPNA, (B) in LPA

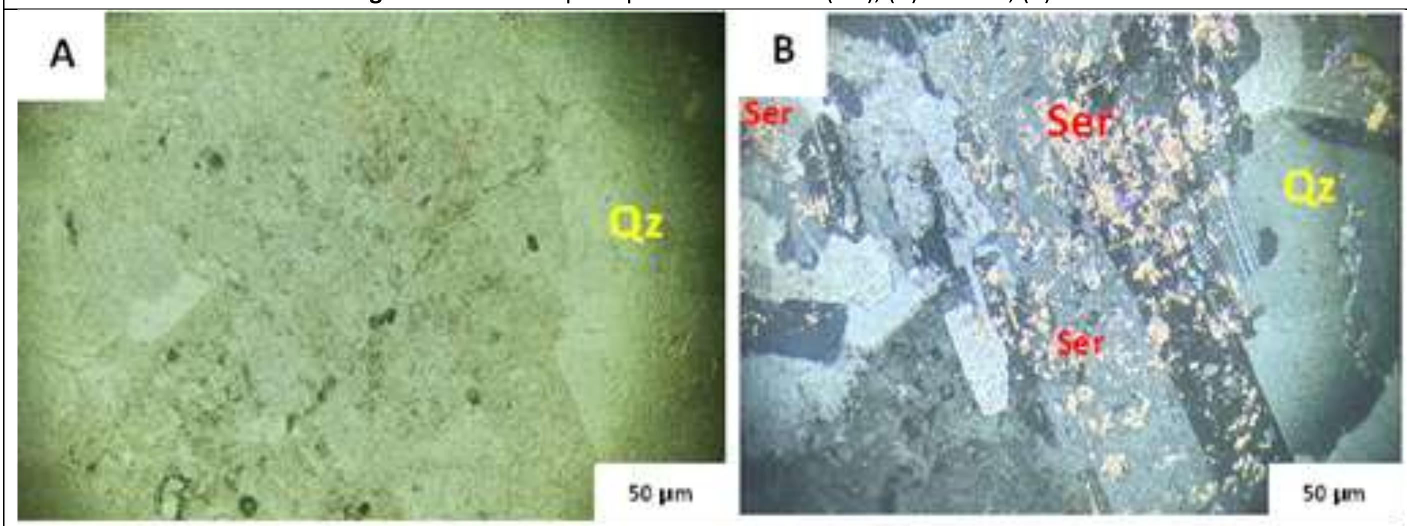


Figure 11: Microscopic appearance of sericite (Ser), (A) in LPNA, (B) in LPA

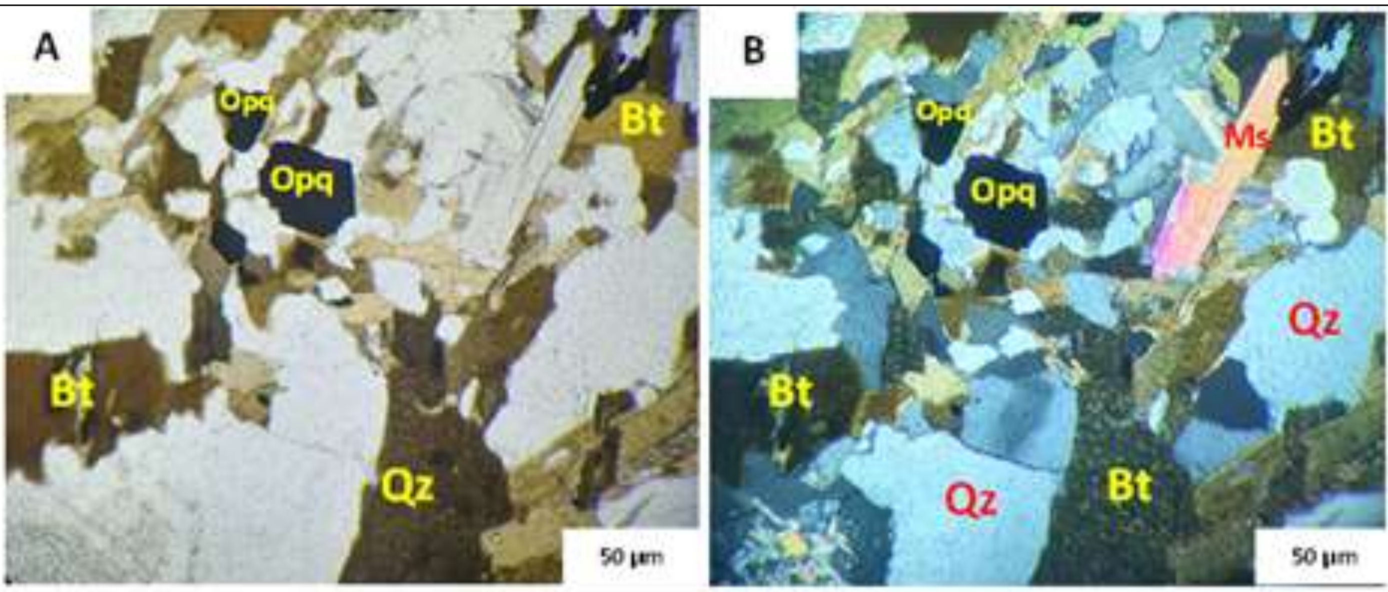


Figure 12: Microscopic aspect of biotite (Bt), (A) in LPNA, (B) in LPA

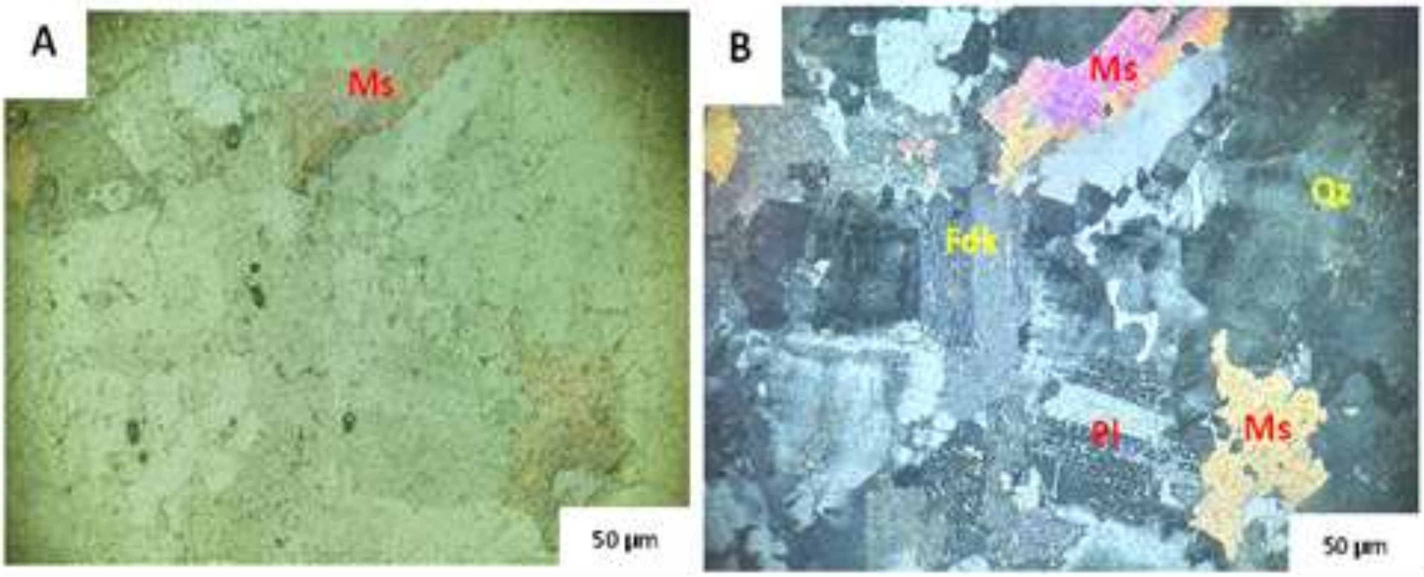


Figure 13: Microscopic aspect of orthosis (Fdk), (A) in LPNA, (B) in LPA

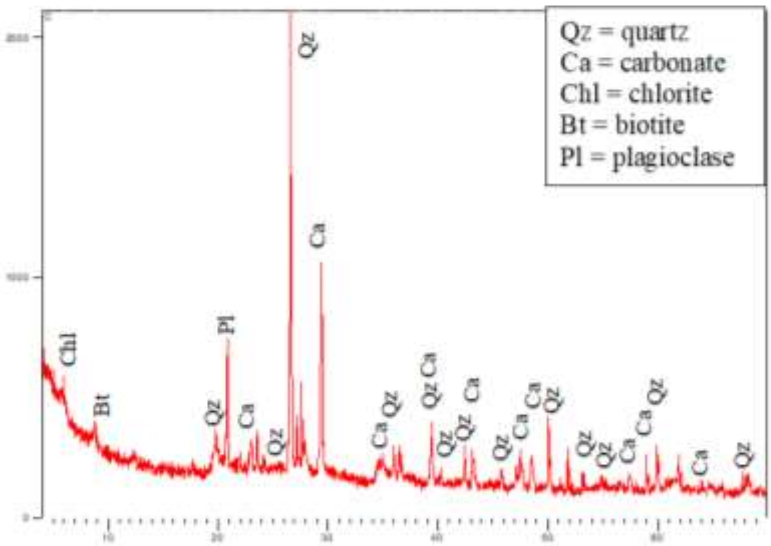


Figure 14: SOMIAG quarry sample diffractogram

Table 1: Model estimation table of the SOMIAG quarry granites

Samples / Minerals	SOM1	SOM2	SOM3	SOM4	SOM5	SOM6	SOM7	SOM8	SOM9	SOM10
Quartz	++++	+++	++++	++++	+++	+++	+++	++++	+++	+++
Feldspath potassique	+++		+	++						
Plagioclase	++++	++++	++++	++++	++++	++++	++	+++	+++	++++
Biotite	+++	++	+					++	+	
Muscovite	+	++	++			+	++	+	++	+++
Microcline	+	++	+++	++		++	+	++	+	+++
Chlorite	++	+++	+++	+++	+++	+++	+++	+	+	+
Minerals opaques	+	+	+	+			++	+	++	+
Séricite	++						+++	++	++	+
Legend	**SOM = somiag ; ++++ = abondant ; +++ = moyen abondant ; ++ = peu abondant ; + = rare**									

Figure 15: Large shale-faced rock seam in the SOFAMAC quarry

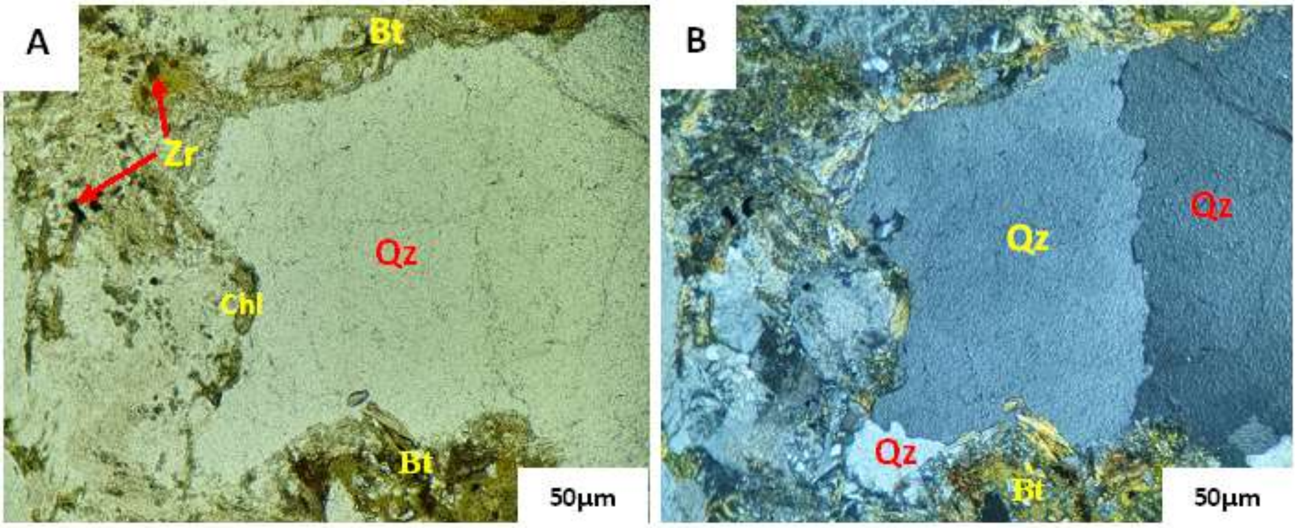


Figure 16: Microscopic appearance of quartz (Qz), (A) in LPNA, (B) in LPA

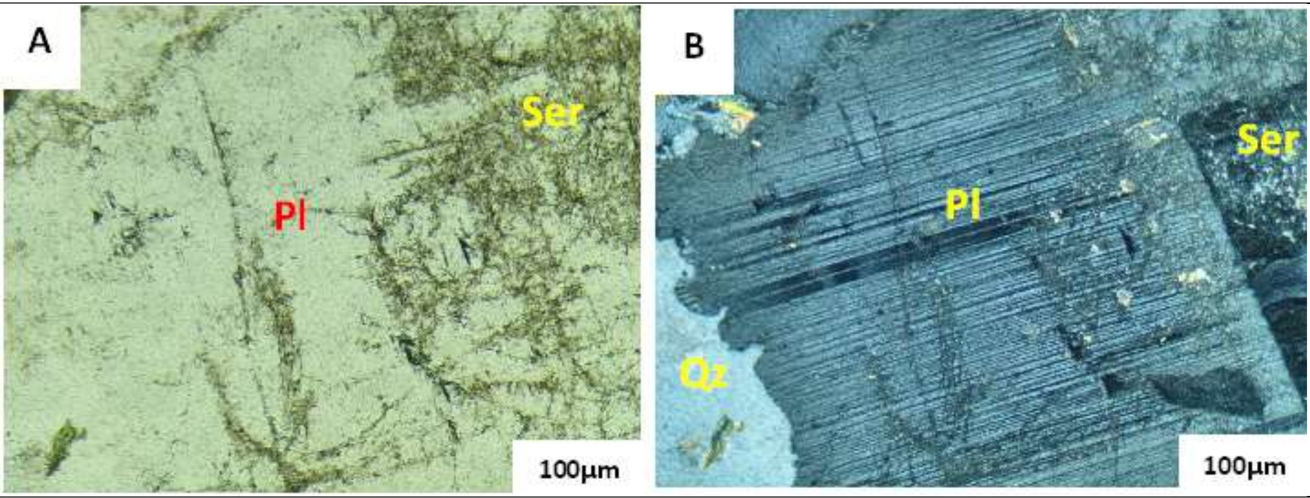


Figure 17: Microscopic aspect of plagioclase (Pl), (A) in LPNA, (B) in LPA

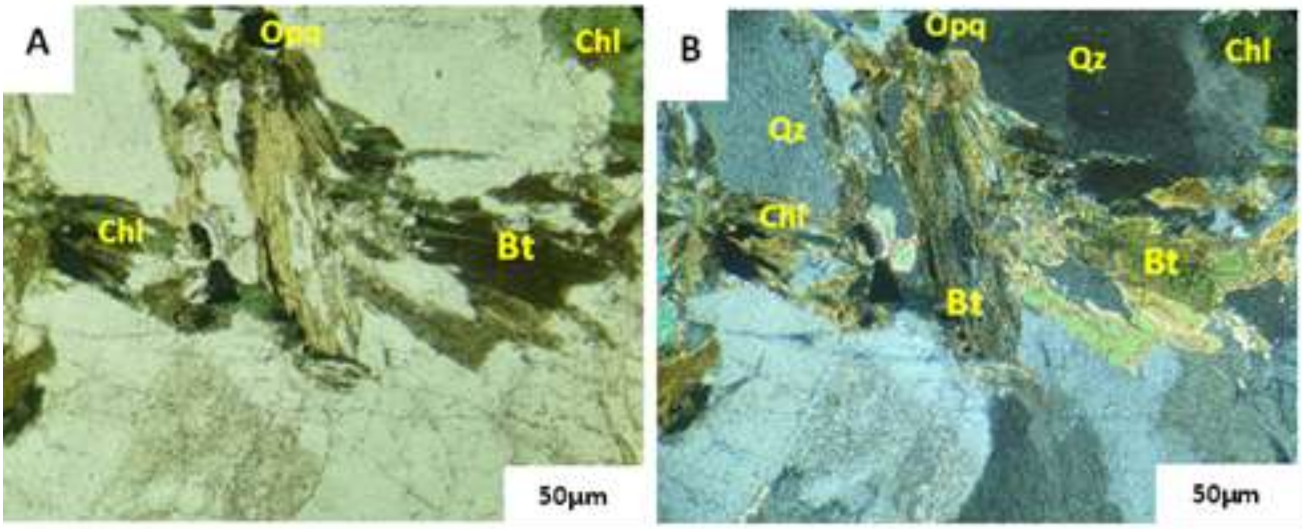


Figure 18: Microscopic appearance of chlorite (Chl), (A) in LPNA, (B) in LPA

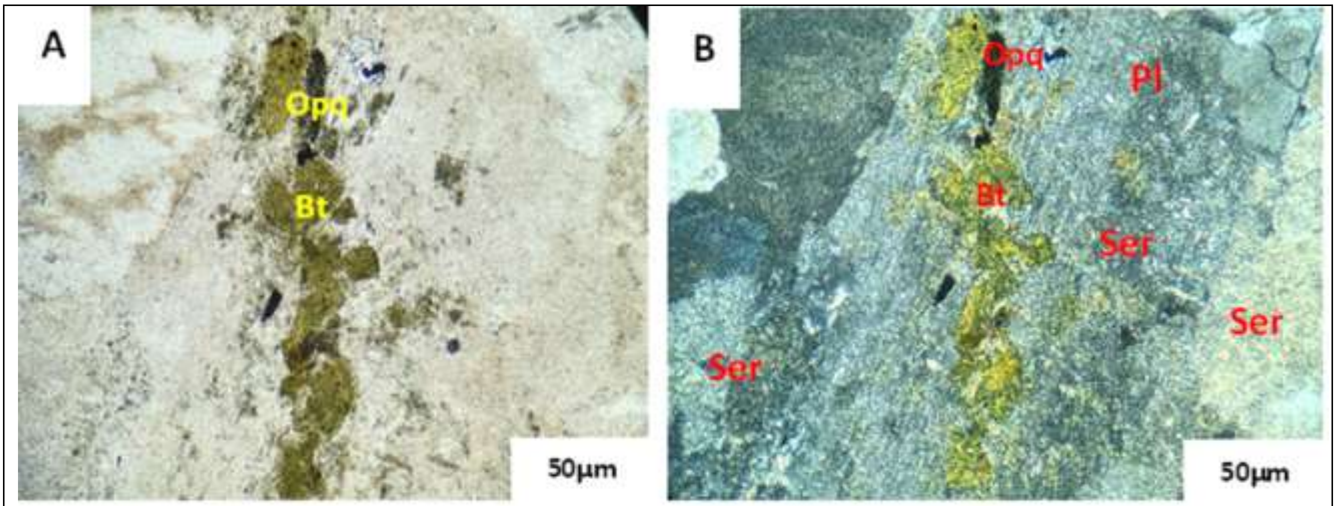


Figure 19: Microscopic appearance of sericite (Ser), (A) in LPNA, (B) in LP
A

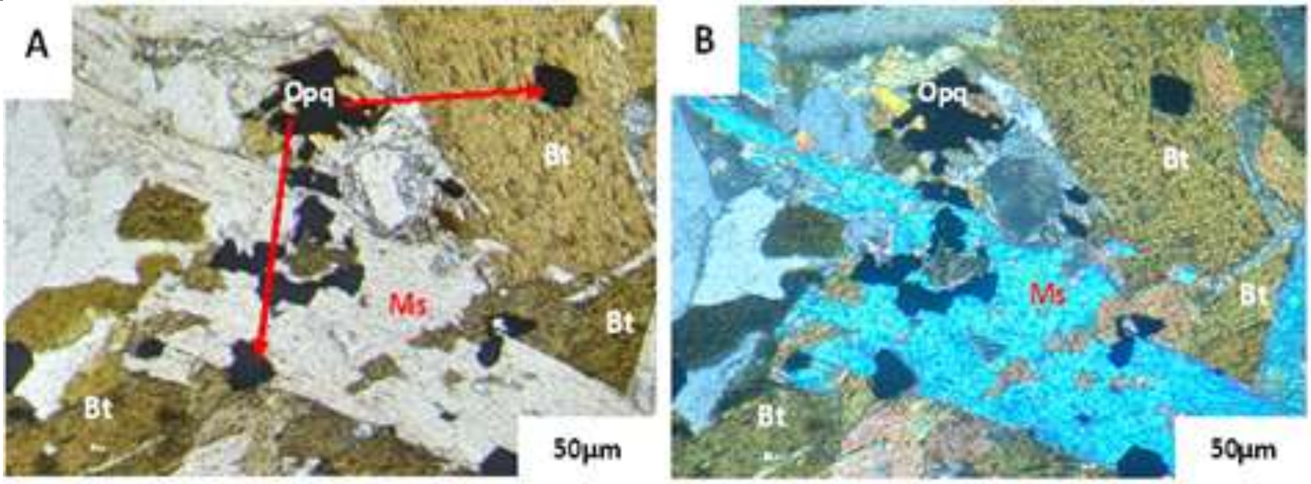


Figure 20: Microscopic aspect of biotite (Bt), (A) in LPNA, (B) in LP
A

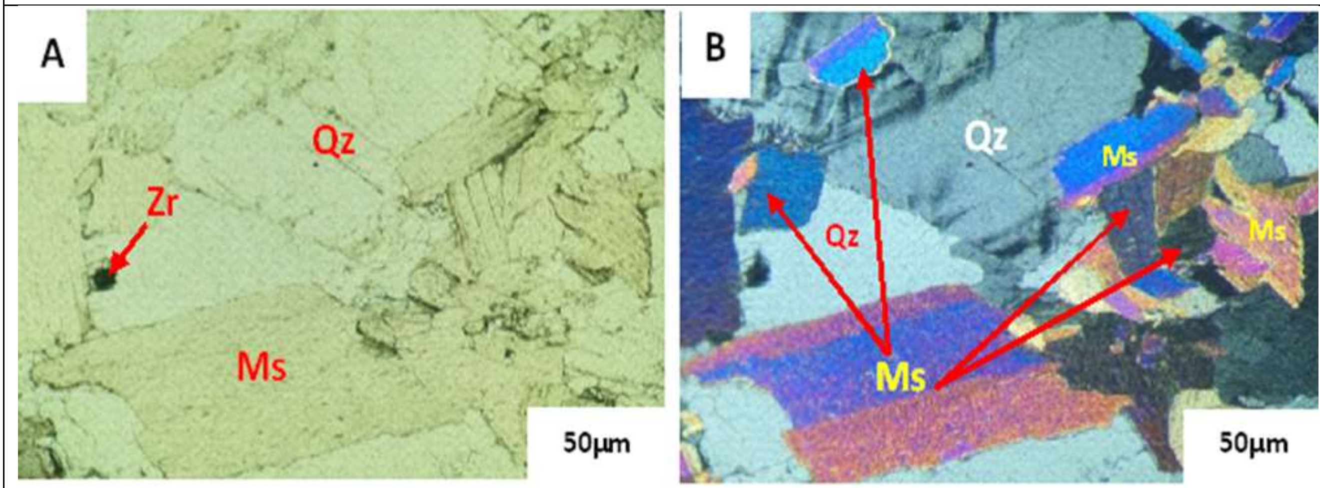


Figure 21: Microscopic aspect of muscovite (Ms), (A) in LPNA, (B) in LPA

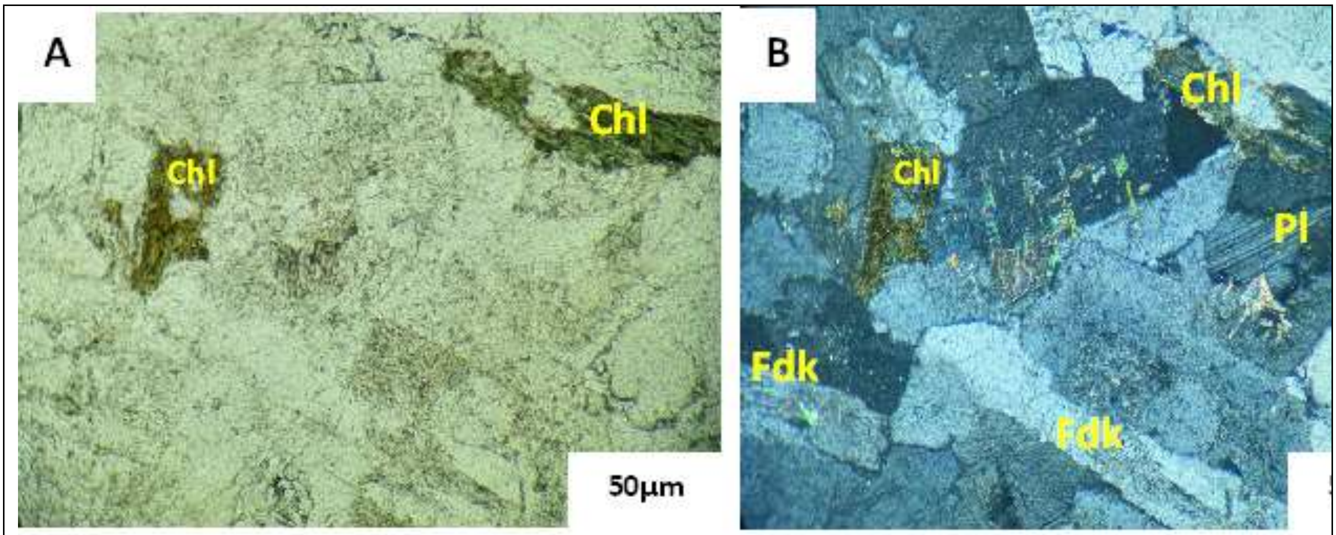


Figure 22: Microscopic aspect of orthosis (Fdk), (A) in LPNA, (B) in LPA

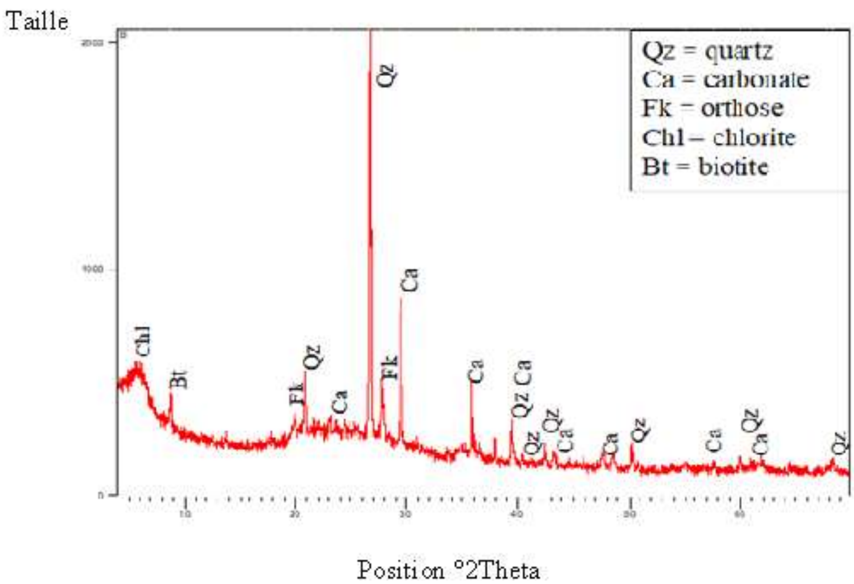


Figure 23: Diffractogram of the SOFAMAC quarry sample

Table 2: Modal estimation table for SOFAMAC quarry granites

Samples / Minerals	SOF1	SOF2	SOF3	SOF4	SOF6	SOF8	SOF9	SOF10
Quartz	++++	++++	+++	++++	++++	++++	++++	++++
Feldspath potassique	+		+				+	
Plagioclase	++++	+++	+++	++	++	++	++	+++
Biotite	++	++	++	+	+	++	+	+
Muscovite	++	++	++				++	
Chlorite	++	++	++	+++	+++	++	+++	++
Minerals opaques	+	+	+	+	+	+	+	+
Séricite	++	+++	+++	+++	+++	++	++	++
Legend	**SOF = sofamac ; ++++ = abondant ; +++ = moyen abondant ; ++ = peu abondant ; + = rare**							

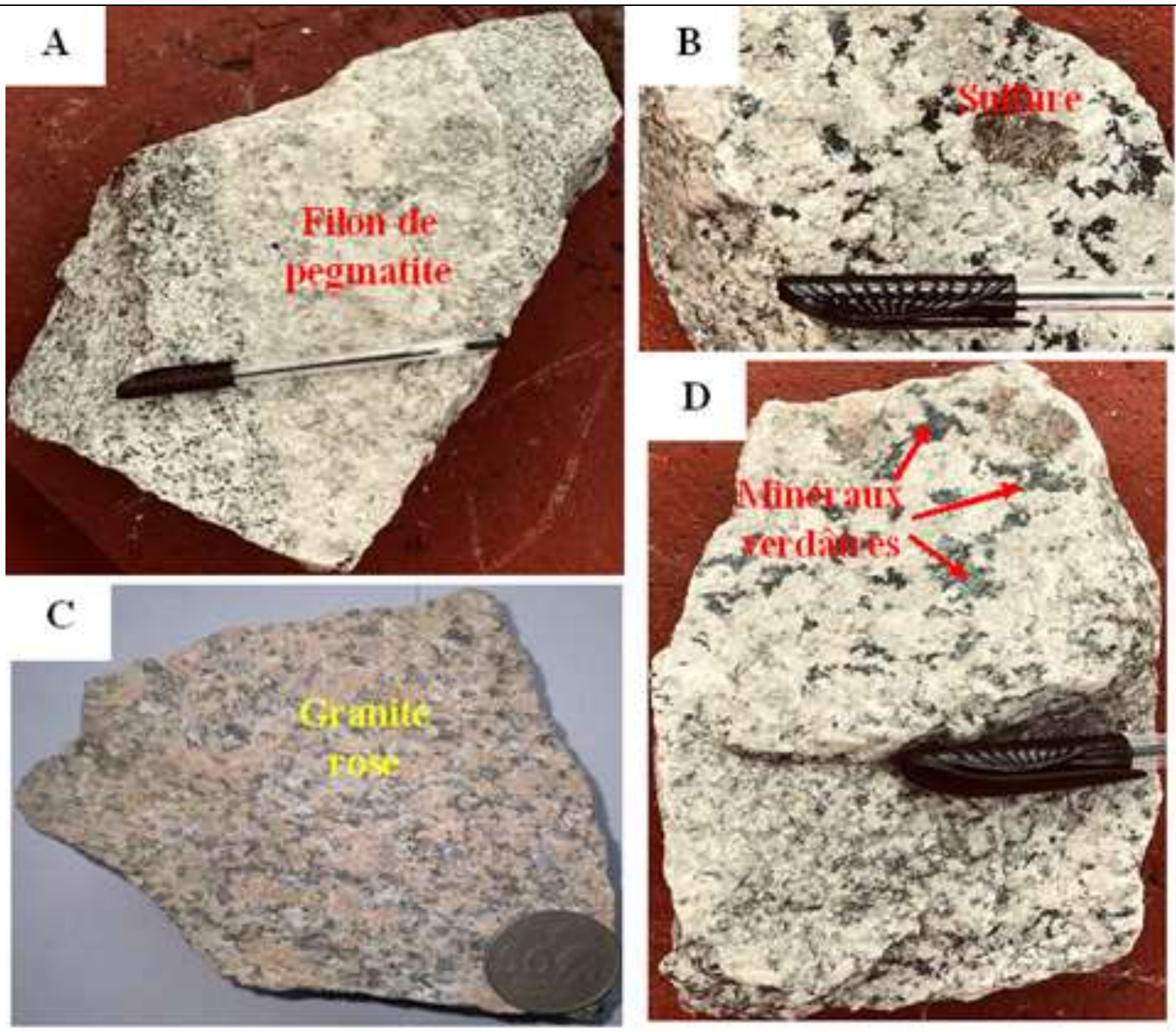


Figure 24: Macroscopic appearance of CHINESE quarry granites, (A) pegmatite vein, (B) sulphide inclusion, (C) pink granite, (D) greenish minerals in granite

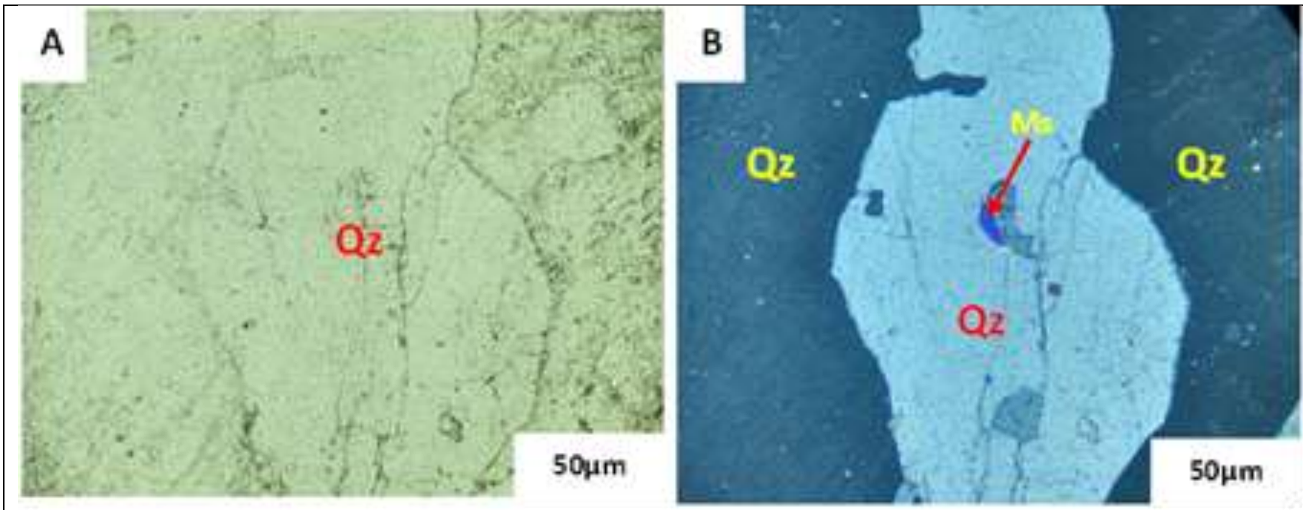


Figure 25: Microscopic appearance of quartz (Qz), (A) in LPNA, (B) in LPA

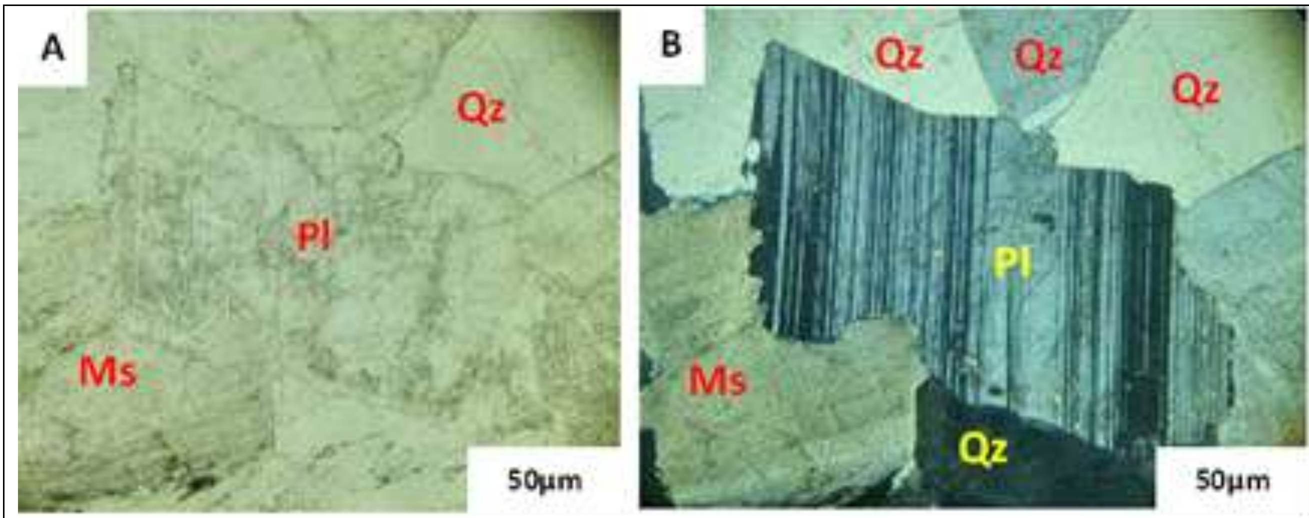


Figure 26: Microscopic aspect of plagioclase (Pl), (A) in LPNA, (B) in LPA

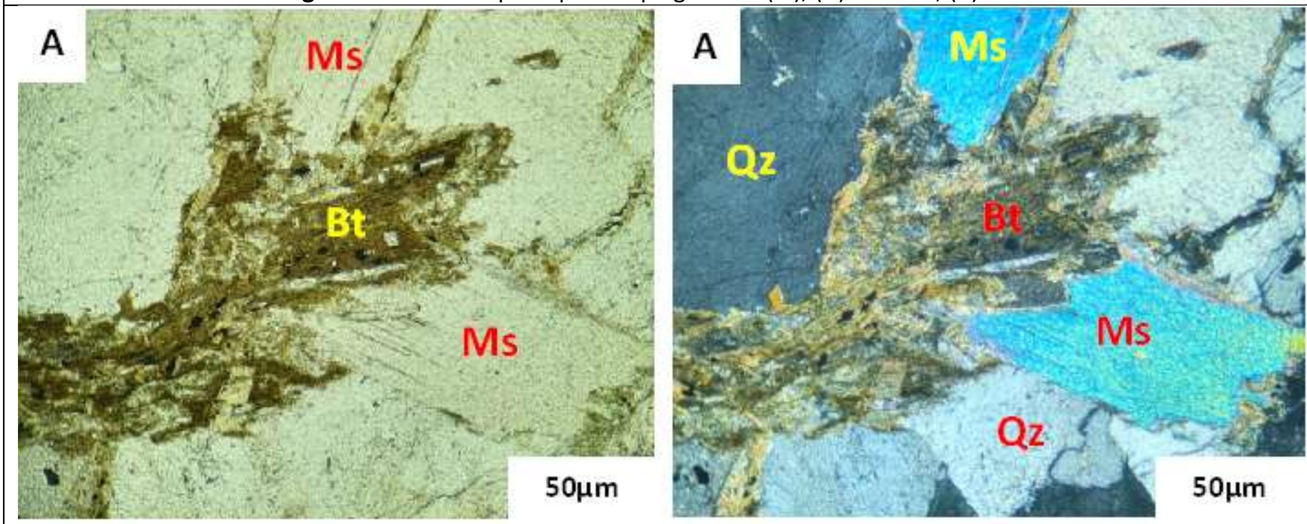


Figure 27: Microscopic aspect of muscovite (Ms), (A) in LPNA, (B) in LPA

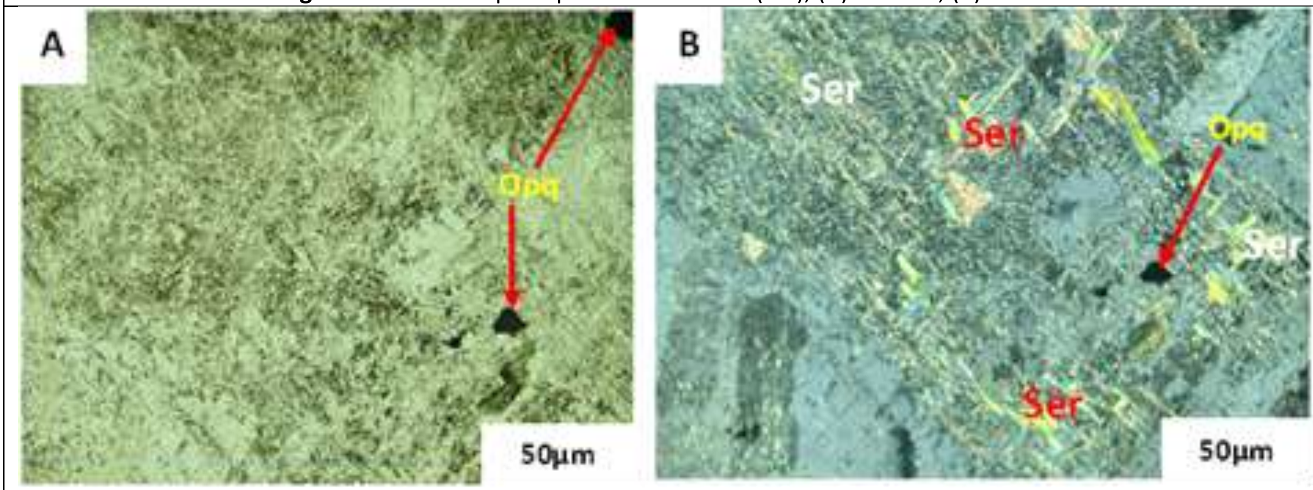


Figure 28: Microscopic appearance of sericite (Ser), (A) in LPNA, (B) in LPA

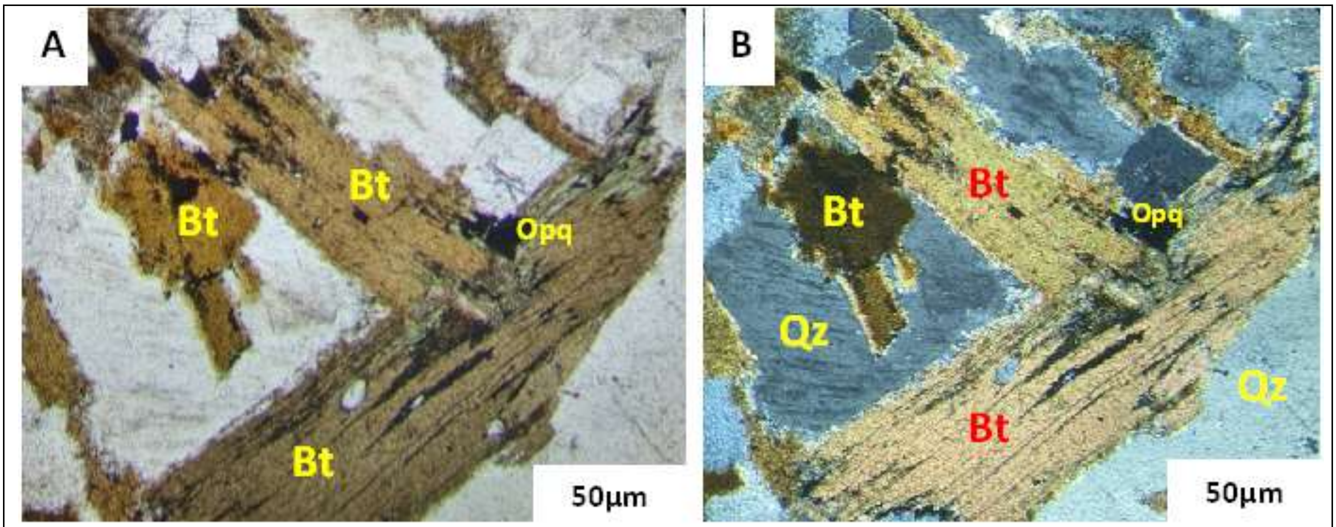


Figure 29: Microscopic aspect of biotite (Bt), (A) in LPNA, (B) in LPA

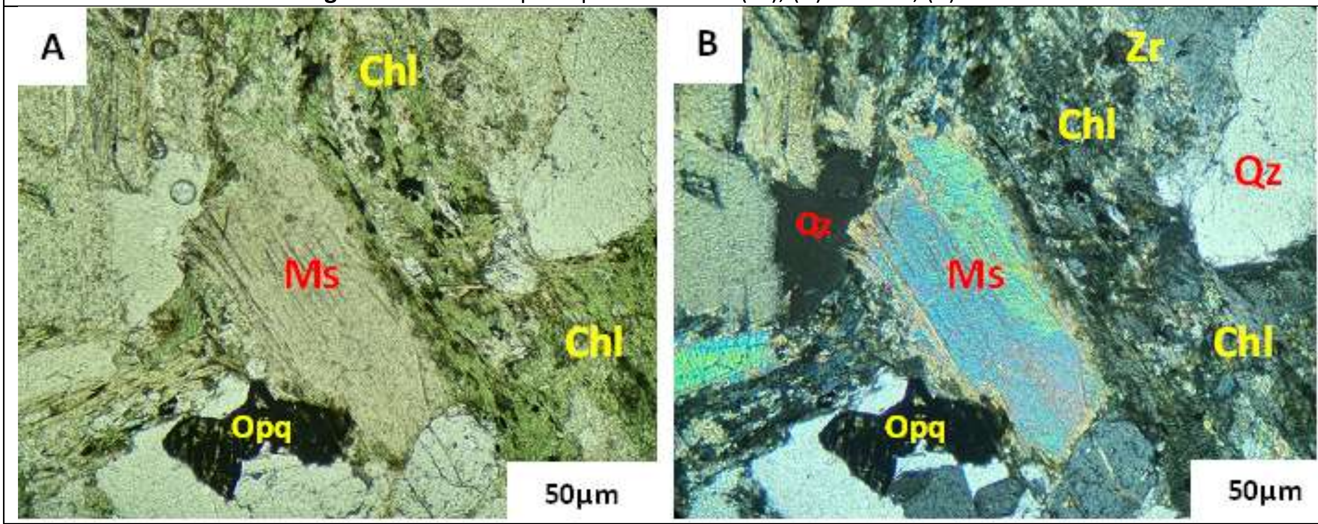


Figure 30: Microscopic appearance of chlorite (Chl), (A) in LPNA, (B) in LPA

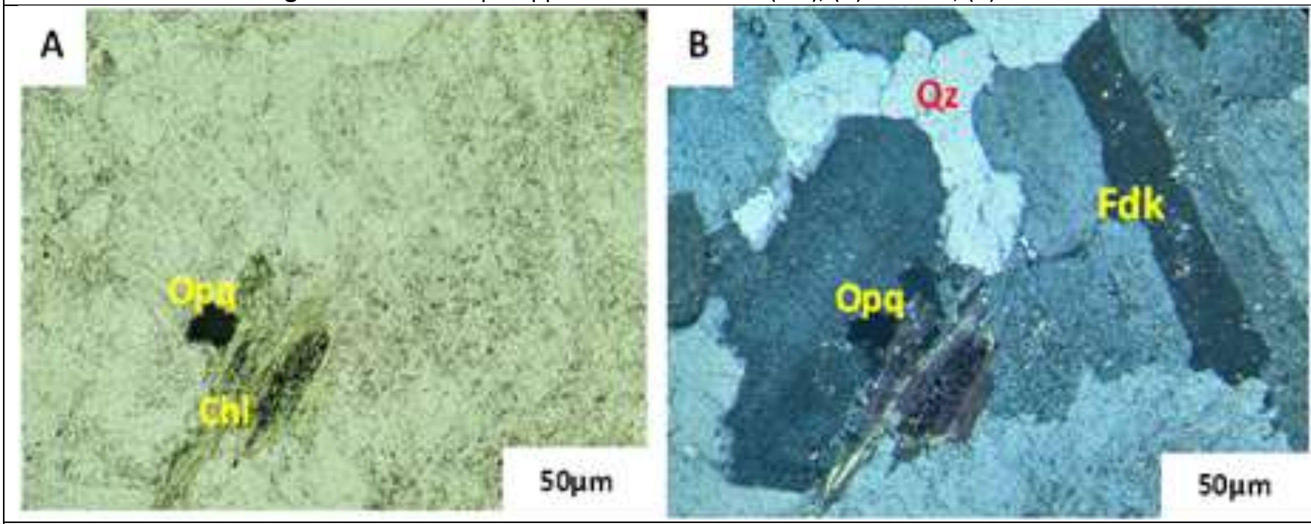


Figure 31: Microscopic aspect of orthosis (Fdk), (A) in LPNA, (B) in LPA

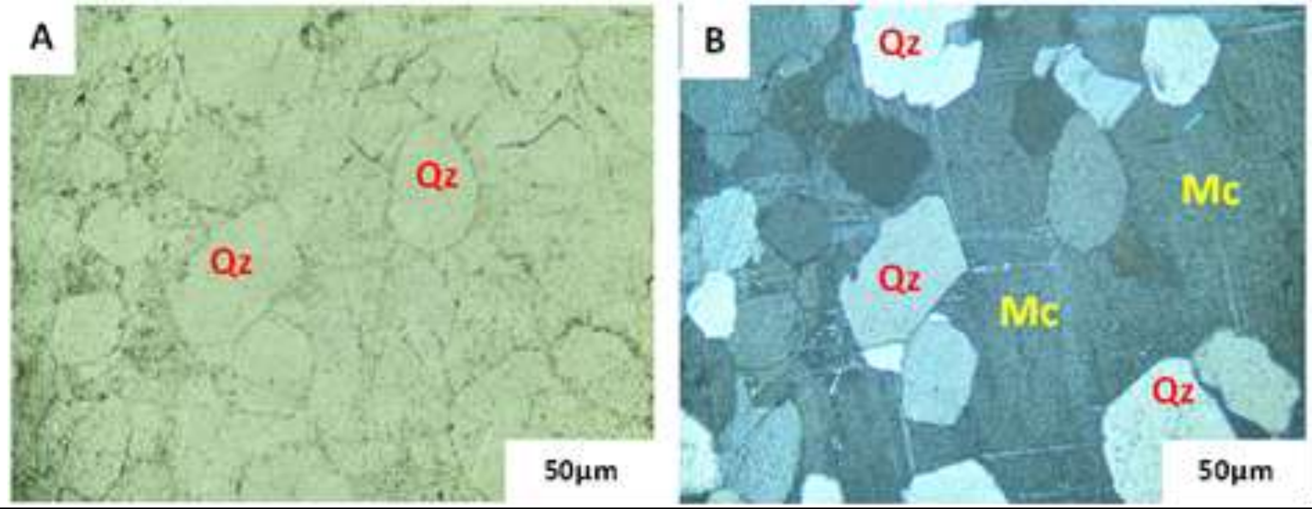


Figure 32: Microscopic aspect of microcline (Mc), (A) in LPNA, (B) in LPA

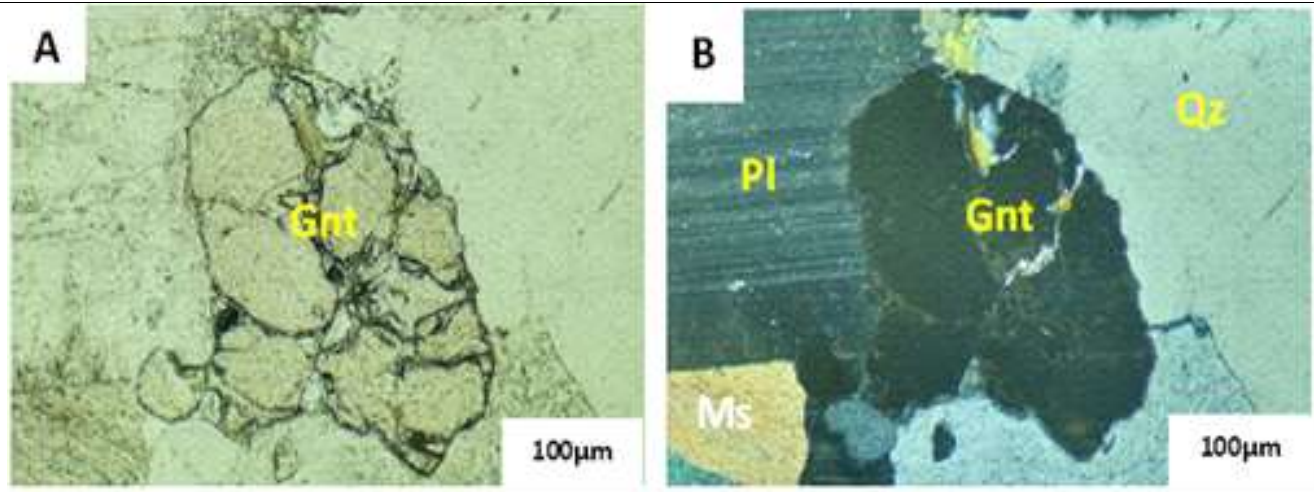


Figure 33: Microscopic appearance of garnet (Gnt), (A) in LPNA, (B) in LPA

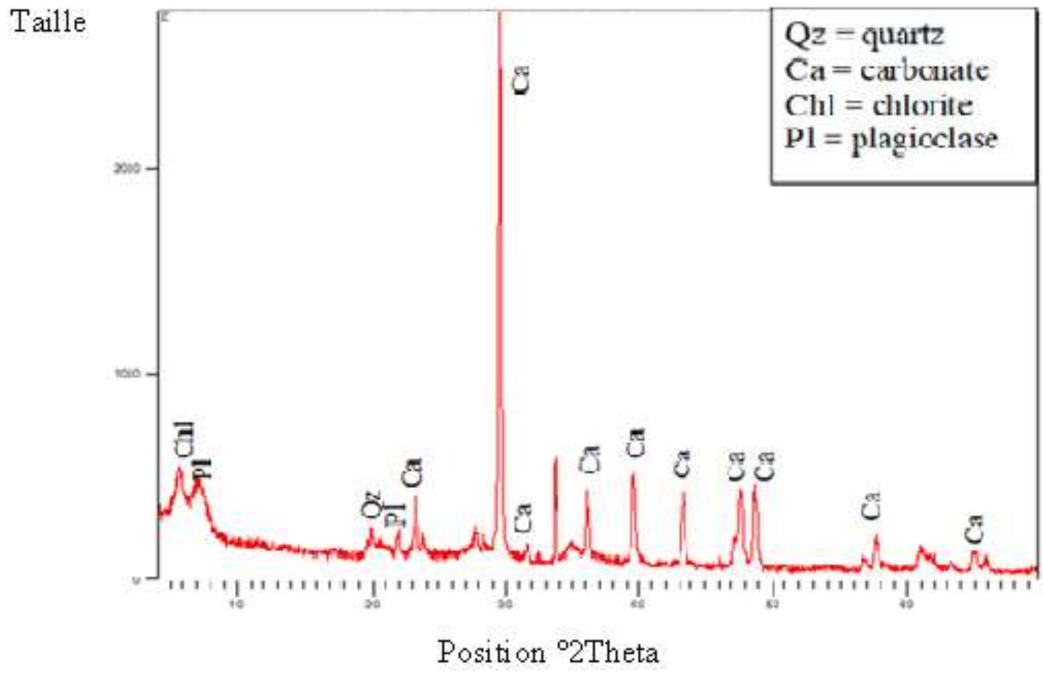


Figure 34: Diffractogram of the CHINESE quarry sample

Table 3: Modal estimation table of granite from the CHINESE quarry

Samples / Minerals	CHI1	CHI2	CHI3	CHI4	CHI5	CHI6	CHI7	CHI8	CHI9	CHI10
Quartz	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++
Feldspath potassique	+	+	+	++	+	++		+	+	++
Plagioclase	+++	+++	++	++	++	+++	++	++	++	+++
Biotite	++	++		+++	++	++++	+	++	+	+
Muscovite	++	+++	++	++	+++	++	++	+	++	++
Microcline			+			+				
Chlorite	++	++	+++	+	+		++	+++	+	+
Minéraux opaque	+	+	+	+	+	+		++		+
Séricite	++	+	+++	++	+	++	+++	+++	+	+
Grenat					++		++			+
Legend	**CHI = chinoise ; ++++ = abondant ; +++ = moyen abondant ; ++ = peu abondant ; + = rare**									

By projecting the various samples from Maneah's granite quarries into the Streckeisen triangle (Figure 34), we were able to determine the name of each granite type (Table 4).

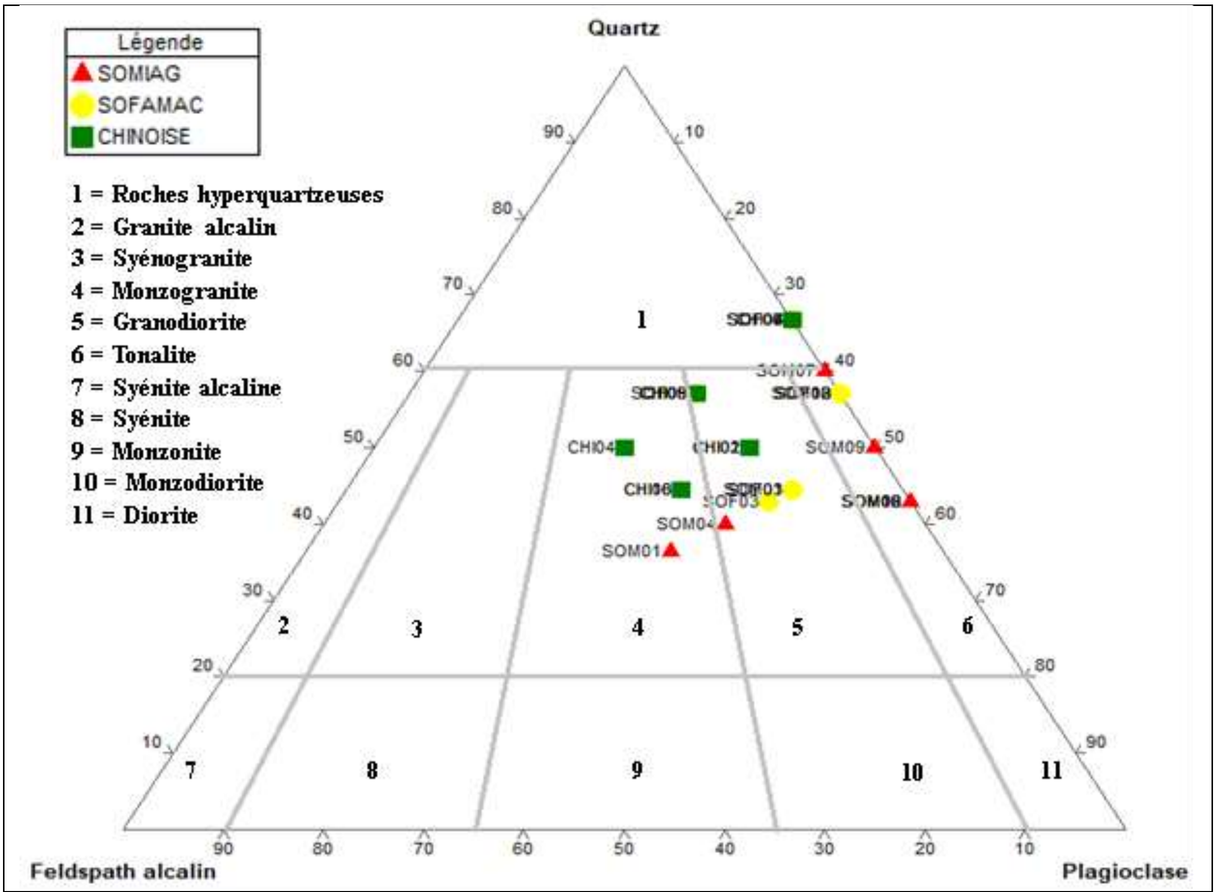


Figure 34: Streckeisen triangle after plotting samples

Table 4: Nomenclature of the various granite samples granite maneah

N°	SOMIAG	SOFAMAC	CHINOISE
1	Monzogranite	Granodiorite	Granodiorite
2	Tonalite	Tonalite	Granodiorite
3	Granodiorite	Granodiorite	Granodiorite
4	Granodiorite	Roche hyperquartzeuse	Monzogranite
5	Tonalite		Granodiorite
6	Tonalite	Roche hyperquartzeuse	Granodiorite
7	Tonalite		Roche hyperquartzeuse
8	Tonalite	Roche hyperquartzeuse	Monzogranite
9	Tonalite	Granodiorite	Granodiorite
10	Tonalite	Tonalite	Granodiorite

5.Discussion

The outcrops of granite rocks of Manéah present a massive structure with grainy and microgrid textures. They are characterized by a high crystalline homogeneity and a leucogranite facies containing some sulphide inclusions. These granites are rich in feldspar, quartz and biotite with the presence of enclaves and veins of different directions in some outcrops. The same texture and structure observations were made on Tissalatin granites in south-eastern Algeria by [5], as well as by previous studies on Manéah granites [13]. Our petrographic studies revealed that Manéah granites are characterized by the presence of xenomorphic quartz crystals with rolling extinction; plagioclases to zoned and polysynthetic macle; microcline with inclusion of biotite microcrystals, muscovite and quartz; orthose to macle simple; muscovite often coupled with biotite which is chloritizing with some zircon inclusions in the form of halo; garnet and opaque minerals. Calcosodic feldspars and potash feldspars are in a fairly advanced state of sericitization in some granites. During previous studies on Manéah granites [13], chloritization of biotites and sericitization of feldspars added to this the presence of garnets was not described while our studies revealed these phenomena. According to [5], the opaque minerals present in Tissalatin granites are represented by magnetite. This same information was given by [1] on the granites of the great quarry of Andlau (Bas-Rhin) to which, they add the presence of ilmenite. This information allowed us to assume that the opaque minerals present in our granites could be magnetites and/ or ilmenites that add to the sulphides already observed. According to [13], plagioclase is most abundant in Manéah granites followed by microcline, quartz, biotite and muscovite. This is contrary to our analyses which show that the most abundant mineral in the Manéah granites is quartz followed by plagioclase then comes chlorite, muscovite, biotite, sericite, microcline. Chlorite and garnet are indicators of regional metamorphism from green to amphibolite shale facies. The chloritization of biotites and the presence of garnet in the granites of Manéah accompanied by a mineral rearrangement, means that the latter (granites) were affected by a regional metamorphosis. Our mineralogical studies showed the presence of carbonates in Manéah granites. Previous studies of [13], did not reveal the presence of these carbonates. However, some granites present on the national territory especially in the Southeast [10], are made of carbonates precisely of dolomite. This presence of carbonate indicates that the Manéah area has been affected by hydrothermalism. Despite previous studies on Manéah granites, there are no indicators of the different petrographic compositions. The presence of thin blades indicating petrographic composition is a scientific advancement on the knowledge of Manéah granites. Chloritization of biotites, sericitization of feldspars, presence of garnets and carbonates revealed by our petrographic and mineralogical results, is another scientific advancement because they indicate that these Manéah granites have been affected by two types of metamorphisms (regional and hydrothermal).

6. Conclusion

It appears at the end of our studies that these granites present at the petrographic level a grainy texture, a massive structure and a leucogranite facies. These granites are of several colors depending on their plagioclase percentage. Quartz veins and pegmatite veins can be seen in places. A large metamorphic shale seam intersects the massif with a direction from North-west to South-east. These granites consist of quartz, plagioclases, orthoses, microclines, biotite, opaque minerals and some zircon inclusions. We also observe the presence of garnets and the chloritization of biotites. These minerals (chlorite and garnet) being indicators of regional metamorphism, allow us to conclude that the granites of Manéah underwent a regional metamorphosis. The presence of carbonates, revealed by mineralogical analysis, proves that the area has experienced hydrothermalism. This proves the presence of veins observed during the macroscopic study. The study of Manéah granite intrusions provides new information on their petrographic and mineralogical composition. The thin blades of these granites give more precision on the behavior of minerals. They can also be used as a specimen during exhibitions and/or courses on the granite rocks of Guinea. The results of this research are conclusive and of scientific interest.

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