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O 36. GEOLOGICAL AND PETROGRAPHICAL INVESTIGATIONS OF THE GÜMELİ VILLAGE (ALAPLI-ZONGULDAK-TURKEY)

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ABSTRACT: The study area covers around the Gümeli Village, located in the Zonguldak Basin which is the Turkey's most important coal basin, approximately 70 km west of the Zonguldak city centre and 20 km southeast of Alaplı District. In this study, it is aimed to investigate of the geological features of the region, stratigraphic sequence of rock units outcropping in the region, the lithological, mineralogical and petrographical properties of different units.

Sedimentary, metamorphic and magmatic units formed from Palaeozoic to today are exposed in the study area according to field and laboratory studies conducted in the region. The Lower Ordovician-Lower Devonian aged Hamzafakılı Formation which forms the basement of the study area, consists of clayey-quartzite, microconglomerates, metasandstone, arkose and conglomerates. Devonian aged Göktepe Formation, which is overlay on the Hamzafakılı Formation with low angular unconformity, is represented by chalc schist, phyllite, sandstone, siltstone and claystone. The Medium-Late Devonian aged Belen Granitoid is mainly composed of granite, granodiorites, quartz diorite and leucogranites cut the Hamzafakılı and Göktepe formations. The Late Cretaceous Alaplı formation overlying the older units with an angular unconformity is represented by marl, clayey limestones, limestones and tuff/tuffites. The Early-Middle Eocene aged Çaycuma formation overlying by the angular unconformity the on the Alaplı formation is composed of sandstone, siltstone, claystone, mudstone and volcanic sandstone alternation. All these units covered by the old and new alluviums.

Keywords: Geology, Petrography, Alaplı, Zonguldak, Granitoid

1. INTRODUCTION

The study area covers an area of 60 square kilometers, located in and around Gümeli Village, 20 km southeast of Alaplı district, 70 km southwest of Zonguldak (Fig. 1). There are magmatic, metamorphic and sedimentary rocks in the study area. As is known, many metallic and industrial raw material deposits occur with volcanic and metamorphic rocks.

Many geological studies are conducted in the western and central Black Sea regions, including the study area and preliminary studies on geological, stratigraphic, structural geological and petrographic properties of the region was carried out by Tokay (1949, 1952, 1954), Bayramgil (1949), Altınlı (1951), Akartuna (1952), Ketin (1953), Fratschner (1953), Baykal (1954), Ketin and Gümüş (1963).

Including study area, numerous studies have been carried out in Zonguldak region to investigate mining exploration, reserve and technological properties. The vast majority of these studies are related to the coal deposits in the region and studies on topics like clay, chifon, sand, quartzite, iron, phosphorus, bauxite, etc. Nowak (1920) stated that there is a small amount of iron under the diabase outcrop located under the Devonian limestones between Ereğli and Bolu. Yergök et al. (1987) stated that in the south of Alaplı in the Hamzafakılı formation vessel-type hematite, magnetite and limonite-weighted iron enrichments are found.

Arni (1939), who studied the Zonguldak Kokaksu bauxite deposit, states that the formation of bauxite occurs with the re-washing of terra-rosas formed by lateritization of conglomerates and limestones in Cenomanian. Arni (1940) stated in Kozlu Valley that Upper Carboniferous, which is known as Karadon series, had an extremely deformed irregular fire-clay due to tectonic reasons. Göksu (1958) who was studying Kokaksu bauxites determined that the bauxites in the region were found between the base coal

limestones and the sandstones of the ground. Yergök et al. (1987) stated that bauxite formations are terrestrial enrichments and they show enrichment in the contacts of Velibey formation.

This study was carried out to investigate of the geological and petrographic features of Gümeli Village (Alaplı-Zonguldak) and its vicinity on an area approximately 60 square kilometers. In this study, petrographic and geochemical studies were carried out on the rock units exposed in the region, in order to find natural resources such as metallic mineral deposits and industrial raw materials which are likely to be found in different geological units in the region.

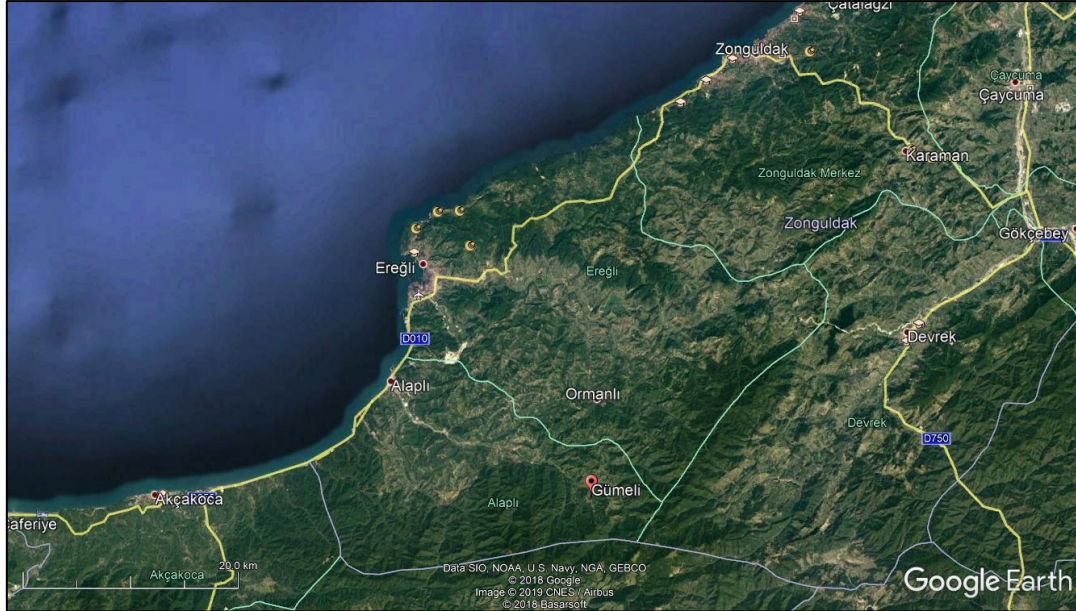


Figure 1. Location map of the study area (Google Earth Pro, 2019).

2. MATERIAL AND METHOD

In order to carry out mineralogical petrographic analyzes of the rock samples collected during field studies, petrographical thin sections were made and the structure-texture and mineral paragenesis were determined by polarizing microscopy and the rock determinations were made.

3. RESEARCH FINDINGS

3.1. Geology

In the study area, sedimentary, metamorphic and magmatic units formed from Paleozoic to the present day are exposed (Fig. 2). The Silurian aged Hamzafakılı formation, which forms the basis of the study area, composed of purple, red, orange and yellow quartzite, metasandstone, microconglomerate, arkose and conglomerates and shale and limestone bands. The Devonian Göktepe formation, represented by laminated claystone, mudstone, siltstone, carbonated claystone, bituminous shale and carbonate sandstone alternation is gradually overlain by the Hamzafakılı formation. The Devonian age Belen Granitoid, which is composed of granite, granodiorite, quartz diorite and leucogranites, and semi-depth rocks such as quartz porphyry and diabase, cuts the Hamzafakılı and Göktepe formation. The Alaplı formation represented by Upper Cretaceous white, light green, light yellow, rarely pink, red and green colored limestone are unconformably and angularly overlying the other units. The Tertiary aged Çaycuma formation overlying the Alaplı formation with angular unconformity is composed of light yellow-white colored, thin medium layered sandstone, siltstone, claystone intercalation agglomerate, tuffite and marl intercalations. All these units cover alluviums (Deveciler, 1981; İplikçi, 1983, Fig. 2).

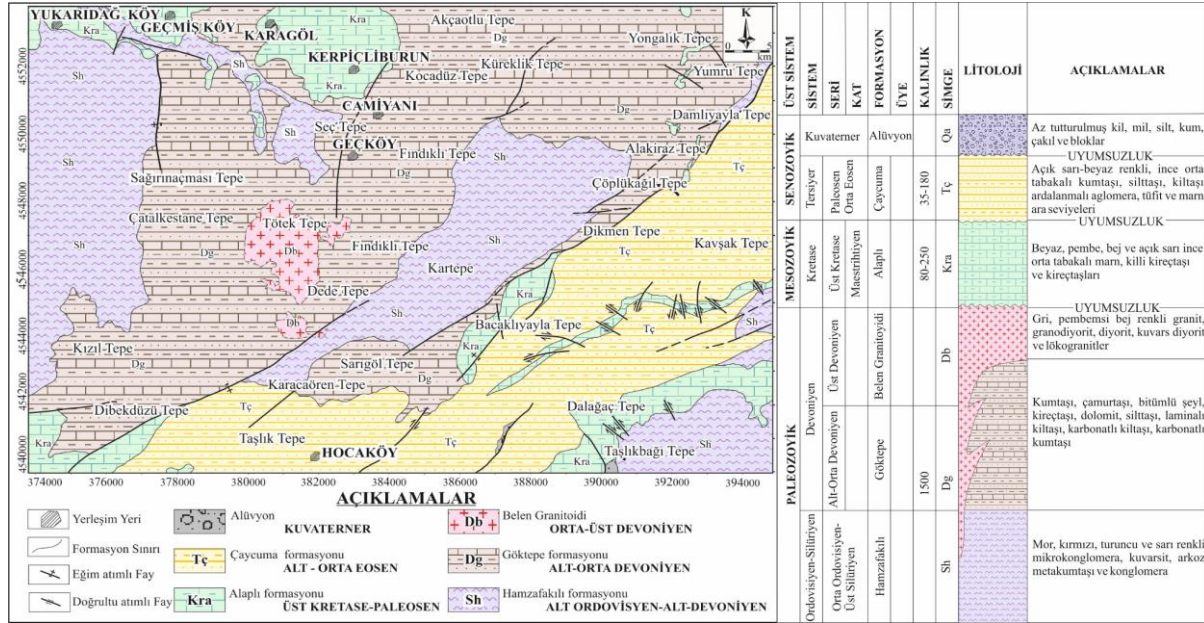


Figure 2. Geological map and lithostratigraphic columnar section of the study area (modified from Devciler, 1981 and İplikçi, 1983).

3.2. Petrography

In the petrographic observations of the quartzites taken from the Hamzafakılı formation, it was observed that the rock mainly consists of quartz and very little mica, opaque mineral, rock fragments, sericites. Granoblastic textured rock due to common quartz is called quartzite. Quartz crystals are anhedral (Fig. 3).

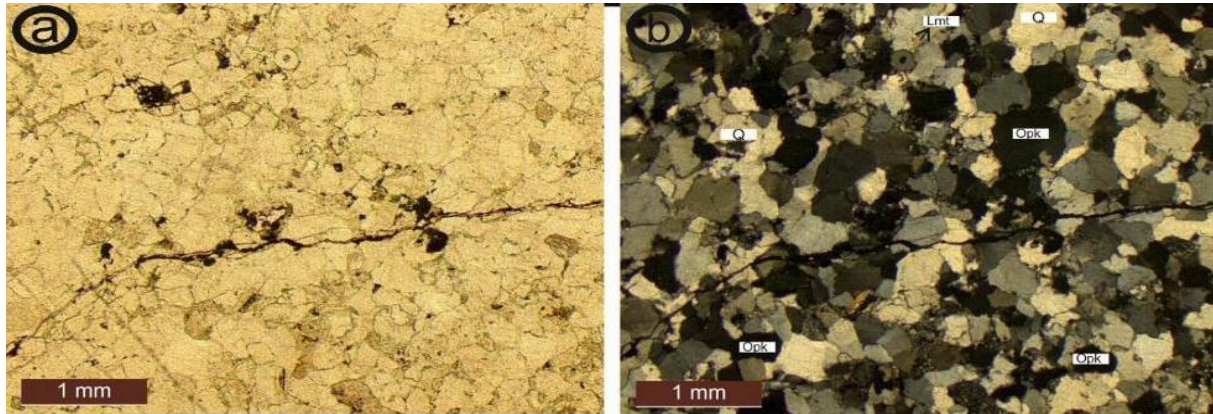


Figure 3. The quartz (Q), limonite vein (lmt) and opaque minerals (opk) in granoblastic quartzite of Hamzafakılı formation, (a: //N, b: +N)

Petrographic investigations of metasandstones from the Göktepe Formation yielded clastic texture. The rock contains quartz, alkali feldspar, rock fragments, mica, calcite, plagioclase, chlorite and opaque minerals. Quartz is from different sources and has polygenic properties. The grains are generally orbicular and semi-orbicular shaped and the grains are connected to each other with partially contacted and partly by a fine-grained matrix. According to the mineralogical and textural characteristics of the sample, it was named as sandstone (Fig. 4).

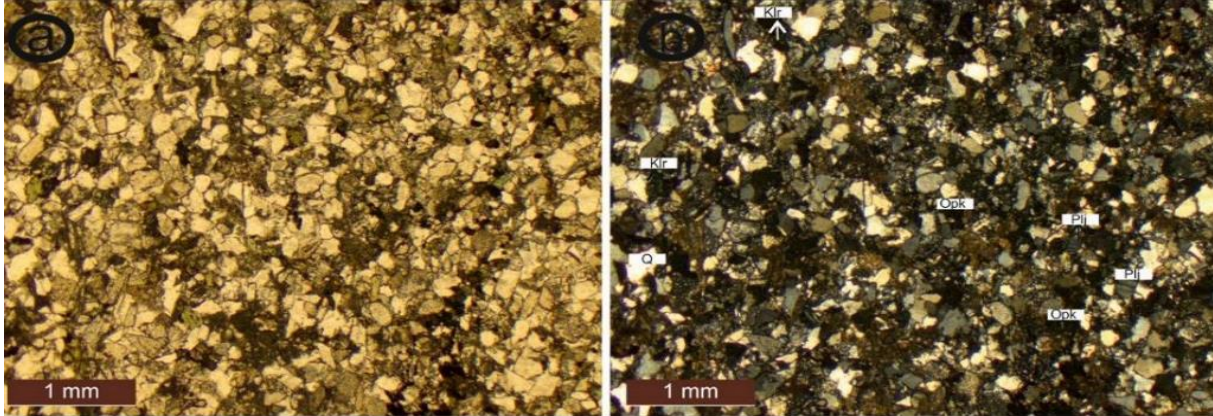


Figure 4. Plagioclase (plj), chlorite (clr), opaque minerals (opk), quartz (Q), minerals in the sandstone sample collected from Göktepe formation (a: //N, b: +N)

Petrographic investigations of the Belen Granitoid samples revealed that the rocks had holocrystalline porphyritic texture. The minerals present in order of multiplicity in the rock are plagioclase, amphibole, epidote, carbonate minerals, quartz, chlorite and opaque minerals. Plagioclases were intensely carbonized and partially epidotized, with very few specimens showing zoned tissue and polysynthetic twinning. Amphiboles in the rock are carbonated. Epidotes are euhedral and medium-grained. From amphiboles, there are intense chlorite formations. There are also small amounts of anhedral fine crystalline quartz. The sample examined according to mineralogical composition and textural properties is called diorite porphyry (Fig. 5).

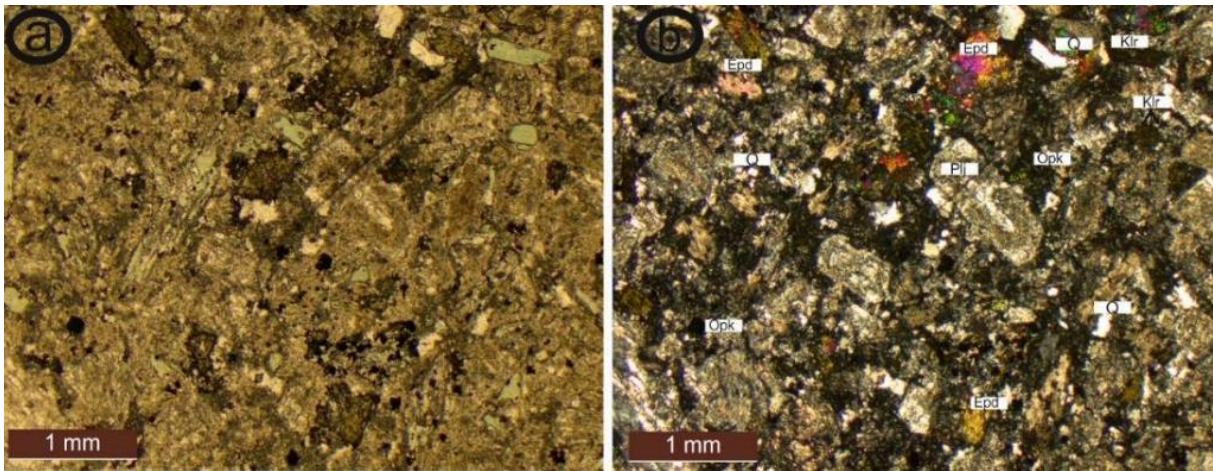


Figure 5. Plagioclase (plj), chloride (klr), epidote (epd), opaque minerals (opk) and quartz (Q) in the diorite porphyries of the Belen granitoid; (a: //N, b: +N)

In the petrographic study of the sample taken from the siltstones of the Çaycuma formation, it was observed that the rock had clastic texture. The main minerals observed are sericite, plagioclase, amphibole, quartz, chlorite and opaque minerals. The rock contains 0.05 mm thick opaque + quartz + chloride veins and the rock are named as siltstone (Fig. 6).

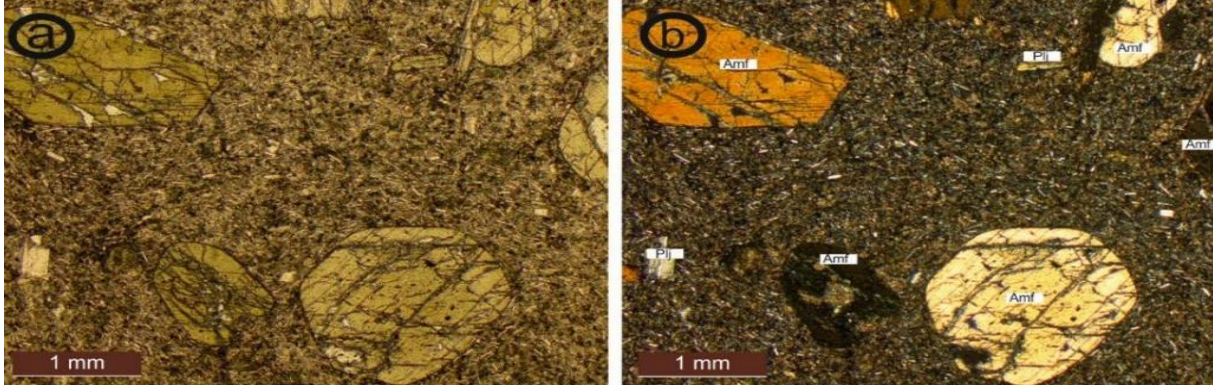


Figure 6. Plagioclase (plj), amphibole (amf), sericite and quartz in siltstones of Çaycuma formation, (a: //N, b: +N)

4. CONCLUSION

In this study, it is determined that different lithostratigraphic units formed from the Paleozoic to the present in the study area covering the Gümeli (Alaplı-Zonguldak) village and its environs. The Upper Ordovician-Lower Devonian aged Hamzafakılı formation at the bottom of the study area is composed of red, purple quartzite, microconglomerate and metasandstone. The Devonian aged Göktepe formation, which is gradually transitive, partially unconformably overlies the Hamzafakılı formation, consists mainly of laminated phyllite, calcschist, claystone and siltstone. Hamzafakılı and Göktepe formations are cut by Devonian aged Belen granitoid, consisting of light-colored granite, granodiorite, quartz diorite and leucogranites. Alaplı formation composed of Upper Cretaceous aged light-colored marls, clayey limestones and claystones unconformably covers older units. Çaycuma formation, which is represented by light yellow-white colored, thin medium layered sandstone, siltstone, claystone intercalation agglomerate, tuffite and marl interiors, covers other units with angular unconformity. All units are unconformably covered by the Quaternary-actual aged Alluvium.

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