Petrography and ore mineral study at Beruang Kanan Site, Gunung Mas Regency, Central of Kalimantan Province

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Abstract. The methodology mainly includes four parts: pre-field studies, field investigations, laboratory analysis, and data analysis and interpretation. Laboratory analysis to be carried out is petrographic analysis and ore microscope. Research methods relating to petrography analysis studies and ore mineral that will be evaluated for genetic models and the origin of copper deposition mineralization. The rock units in the study area are differentiated based on the type of lithology, uniformity of rocks, the distribution of rocks and rock geometry found in one region and the stratigraphic position of the units below it or above it. In general, the stratigraphy of the research area is divided into 3 rock units that can be seen on the geological map, sequences from old to young, namely lithology of Sandstone Unit, Dense Tuf Unit, and Andesite Unit. ore mineralization generally occurs as a massive form, vein. Pyrite, enargite, luzonite, sphalerite, covellite, chalcopyrite, tennantite and tetrahedrite are common sulfides and sulfosal minerals

1. Introduction

1.1. Background
The archipelago consists of volcanic arcs with a total arc length of about 7000 km, most of which are segments containing mineral deposits. There are six magmatic arc paths in Indonesia which are the main routes of metal mineralization, one of which is the Lime of Central Kalimantan's Upper Limit [1]. Volcanic rocks and associated volcanoes are older than intrusions, possibly aged Cretaceous and exposed together with all three contacts [2]. The prospect of Cu mineral deposits in Kalimantan lies in the same geologic structure setting [3].

1.2. Location and Accessibility
It is about 190 kilometers north and slightly west of Palangkaraya, the capital of Central Kalimantan. The BKM project (centered at Long 113 25 00 E, Lat. 00 37 00 S) is in the mountains of a plains forest in the upper reaches of southern Kahayan and Samba streams in a remote area where no permanent villages exist. Daily air flights connect Jakarta with Palangkaraya, the capital of Central Kalimantan with a travel time of 2 hours 45 minutes, then headed to the prospect of the Beruang Kanan is takes about eight hours by vehicle (approx 350 km), or 50 minutes by helicopter from Palangkaraya. Road logging gives access to this previously remote area.
2. Research Method
The methodology mainly includes four parts: pre-field studies, field investigations, laboratory analysis, and data analysis and interpretation. Pre-field studies include literature reviews and secondary data. Field work will be carried out mapping, data collection and sampling. Laboratory analysis to be carried out is petrographic analysis and ore microscope. Research methods relating to petrography analysis studies and ore mineral that will be evaluated for genetic models and the origin of copper deposition mineralization.

2.1. Petrographic Study
The petrographic method uses a polarizing microscope where this tool is used to confirm rock types and alteration minerals as well as to study the mineralogical evolution of alteration minerals, mineralogical characteristics and texture of relationships from host rocks (host rock). Petrographic studies using a polarizing microscope, using this microscope tool, we are able to evaluate the characteristics of the lithology unit. Polarization microscopes will be used to confirm rock types and alteration minerals and to study the mineralogical evolution of alteration minerals, mineralogical characteristics and texture relations of host rock.

2.2. Ore Microscope
The ore microscope is the basic instrument for petrographic examination of a large group of economical minerals important referred to as "ore" minerals. Microscopes Ore is similar to conventional petrographic microscopes in the system but differs in the main method of lighting, the light source above the sample to allow inspection by light reflected from a polished surface (polishing incision). Ore microscopes have very important industrial applications. This facilitates identification of valuable minerals and minerals that are difficult to observe during beneficiation or during the final stages of...
extraction, information is available about particle size, intergrowth properties and the nature of boundaries. The mineral paragenesis of the deposition sequence based on the mineral texture can be identified using an ore microscope.

![Map of Central Kalimantan Province](image)

**Figure 2.** Access to the Beruang Kanan from Palangkaraya, capital of Central Kalimantan Province [5]

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3. **Results and Discussion**

3.1. **Lithology**

The rock units in the study area are differentiated based on the type of lithology, uniformity of rocks, the distribution of rocks and rock geometry found in one region and the stratigraphic position of the units below it or above it. In general, the stratigraphy of the research area is divided into 3 rock units
that can be seen on the geological map, sequences from old to young, namely lithology of Sandstone Unit, Dense Tuf Unit, and Andesite Unit.

3.1.1. Sandstone units. Microscopically a thin incision of pyroclastic rock; Brown; clastic texture; granules supported by fragments; grain size 0.5 - 1.5 mm; the shape of the grain is rather rounded - angled; sorted out badly; open container; contact float contact, long contact; compiled by quartz, opaque, glass. Has a brown color; clastic texture; granules supported by fragments; grain size 0.5 - 1.5 mm; the shape of the grain is rather rounded - angled; sorted out badly; open; contact float grain contact, long contact. Mineral composition in this unit: Glass (45%), Opak (10%), quartz (20%), and clay minerals (15%).

3.1.2. Dacitic Tuff units. Microscopically a thin incision of pyroclastic rock; Brown; clastic texture; granules supported by fragments; grain size 0.5 - 1.5 mm; the shape of the grain is rather rounded - angled; sorted out badly; open container; contact float contact, long contact; compiled by quartz, opaque, glass. Has a brown color; clastic texture; granules supported by fragments; grain size 0.5 - 1.5 mm; the shape of the grain is rather round - angled; sorted out badly; open; contact float grain contact, long contact. Mineral composition in this unit: Glass (45%), Opak (10%), quartz (20%), and clay minerals (15%).

3.1.3. Andesite Unit. The whitish brown incisions on the nicol are parallel and dark gray is crossed with nicol, the crystal size is 0.1-2 mm, and the base mass is <0.1 mm. Form of subhedral cristal, holocrystalline. This rock has a general texture of aneroporifiritik and intergranular special texture. Large rock structure. The composition of partially anesthetized plagioclase (Oligoclase) and (Andesine) phenocrysts, and opaque minerals and basic mass in the form of plagioclase microlite and secondary calcite results from plagioclase alteration. Fenokris: Orthoclasts have a colorless color, size 2 mm, euhedral crystal shape, perfect 1 direction hemisphere, uneven fraction, low relief, n mineral <n balm, no pleocroism, gray interference color, parallel darkness, albite twin, 25% abundance. Andesin has colorless color, size 2 mm, subhedral crystal shape, perfect 1 direction hemisphere, uneven fraction, medium relief, mineral <n balm, no pleocroism, gray interference color, sloping darkness, albite twinning, 50% abundance. - Opak mineral, has black color, size 1-2 mm, tabular crystal shape, has no cleavage, fractions, and pleocroism, high relief, opaque light burst, black interference color (Order1), no darkness and twinning, 5% abundance . Base mass: Plagioclase microlite has colorless color, size <0.1 mm, anhedral crystal shape, no pleocroism, moderate relief, n mineral <n balm, gray interference color, 12% unobserved darkness and twinning. Secondary calcite, has brown color, size <0.1 mm, anhedral crystalline form, no pleocroism, unobserved hemisphere, low relief, n mineral> n balm, yellow interference color (order 4), unobserved darkness and twinning, abundance 8%. Based on the description of the megaskopis, this rock is called Andesit porphyry [7]

3.2. Ore Mineral
In this study area, ore mineralization generally occurs as a massive form, vein. Pyrite, enargite, luzonite, sphalerite, covellite, chalcopyrite, tennatite and tetrahedrite are common sulfides and sulfosal minerals [4]. Here are ore minerals found in the field.

3.2.1. Pyrite (FeS2). Pyrite is the most common sulfide mineral in the study area. Most exhibits of pyrite are euhedral to anhedral forms. This occurs as coarse grained pyrite in the vein (Figure 3.1). Small and fine grained pyrite occurs in hydrothermal breccia. It fills in vugs associated with hydrothermal changes especially with sericite and illite. Pyrite shows a light yellow color. In general, pyrite occurs as a substitute, filling the fracture and forming tendons (figure 3.1.A).

3.2.2. Chalcopyrite (CuFeS2). This is also one of the abundant ore minerals. Some chalcopyrite occurs in sphalerite as a chalcopyrite disease / inclusion. Some were replaced (figure 3.1.B).
3.2.3. Covellite (CuS). Covellite (CuS): Covellite occurs as a secondary mineral in the area of the Beruang Kanan. These are commonly found in silica containers. Some covellite replaces chalcopyrite, pyrite and sphalerite (figure 3.2.A).

3.2.4. Iron Oxide. Minerals brownish red, low reflex, weak anisotropic (gray brownish ash), anhedral shaped, no pleokroisme, internal deep-blood red reflex, mineral size <0.01 mm. abundance 3-5% slightly abundant (figure 3.2.B).

![Figure 3.1](image1.png)

**Figure 3.1.** (A) The appearance of Pyrit on the Poles incision in the study area. (B) Photomircographs show (a) chalcopyrite with granular spread forms and (b) euhedral-anhedral pyrite grains in tissue from laths alunite (Py = pyrite, Alu = alunite, Cp = chalcopyrite).

![Figure 3.2](image2.png)

**Figure 3.2.** (A) Mineral pyrite-covelit-calcosite in a container of silica alteration (Py = pyrite, Cc = kalkosit and Cv = kovelit). (B) Apparition of Iron Oxides on a sample slope of RA 118, with an abundance of 3-5%, with a small abundance of electrum.

4. Conclusion

The rock units in the study area are differentiated based on the type of lithology, uniformity of rocks, the distribution of rocks and rock geometry found in one region and the stratigraphic position of the
units below it or above it. In general, the stratigraphy of the research area is divided into 3 rock units that can be seen on the geological map, sequences from old to young, namely lithology of Sandstone Unit, Dense Tuf Unit, and Andesite Unit. The ore mineralization generally occurs as a massive form, vein. Pyrite, enargite, luzonite, sphalerite, covellite, chalcopyrite.

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