PRELIMINARY STUDY OF ROCK GEOCHEMISTRY FOR GOLD MINERALIZATION IN AREA-"X", CENTRAL KALIMANTAN

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ABSTRACT

Area-"X" is located in the Central Kalimantan Province of Indonesia, one of several places in the Central Kalimantan region with a high potential for gold deposits. During the investigation, selected mineralized rock samples were collected, resulting in two rock outcrop samples and four rock float samples. All samples were analyzed for Au content at the local laboratorium using the Aqua Regia AAS method. The lithology of the investigation area can be classified into two different rock units: The sedimentary rock unit and the igneous rock unit. The rock outcrop samples assay return with gold (Au) content from 0.21 ppm to 1.43 ppm. At the same time, the rock floated Au content from 0.79 ppm, Au, to 3.86 ppm. One rock outcrop sample named "Outcrop-001" identified as Quartz Vein up to 40cm width with $N50^0E/85^0$ strike and dip. The other two rock outcrop samples designated "Outcrop-002" and "Outcrop-003" are the parallel quartz veinlet up to 8cm width with strike $N35^0E$ and unidentified dip. Based on field observation and assay results, this area-"X" has potential for gold mineralization as vein type.

Keywords: Quartz vein, vein type, gold mineralization, central Kalimantan.

INTRODUCTION

Regional Geology

The region of Area-"X" is part of the Geological map of Pangkalan Bun and Tumbang Munjul sheet, issued in 1993 by the Geological Research and Development Center, Directorate General of Geology and Mineral Resources, Ministry of Mines and Energy. The stratigraphical sequence from oldest to the youngest consist of (Fig.6):

- Kuayan Formation (Tivk) of Triassic age, composed of undifferentiated volcanic breccia, lava, dacite, rhyolite, andesite, and tuff.
- Granit Mandahan (Kgm) of late Cretaceous age, intrusion composed of granite, granite biotite, and diorite.
- Dahor Formation (TQD) of Middle Miocene to Plio-Pleistocene age, composed of conglomerate, sandstone, and alternating claystone that contains lignite layer
- Alluvial (Qa) of Quaternary age, unconsolidated material composed of mud, clay, sand, and gravel.

Tectonic Setting

Kalimantan Island is part of the Sunda microplate. According to Tapponnier (1982), the Southeast Asian plate is defined as a fragment of the Eurasian plate which rises to the Southeast as a result of the collision crust of India with the continental crust of Asia. The tectonic boundaries that are most important in the east are:

1. Subduction has the Northeast direction, starting from Java, and is currently forming Meratus mountains.
2. Major fault zone in East Kalimantan and North Kalimantan.
3. Lupar path is the path of subduction in North Kalimantan, Serawak and the Natuna Sea

Kalimantan was the southern margin of Sundaland, which had several magmatic arcs from Paleozoic until Tarsier time. Cretaceous occurred in NW and SE Kalimantan, forming two pairs of trench magmatic arc belts (e. Carlie and Mitchell,1994). In SE corner of Kalimantan subducted toward to northwestward created Meratus Mountain. Meanwhile, the southward subduction zone formed Schwaner Mountain in the NW Kalimantan. Those subducted have two-phase granitoid intrusion in early and late cretaceous.

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In Meratus Mountain, the Early Cretaceous granitoid is called Batang Alai Granit (118-101 Ma), while Late Cretaceous magmatism produced dominated volcanic rock named Haruyuan Volcanic.

In Schwaner Mountain, the Early Cretaceous I-Type granitoid (124-99Ma) forms in the Singkawang region and northern part of the Schwaner Mountains called Schwaner Arc (e.g., Carlie and Mitchell, 1994). These granitoid have magma affinity, predominantly medium K and high K granodiorite and tonalite (Sepauk Tonalite). The most likely I-type granitic rock was magnetic series, and metaluminous are associated with a spectrum of mineralization metal such as Cu, Au, Pb, and Zn.

Late Cretaceous I type granitoid (91-66 Ma) emplace south of older granitoids with magma affinity more alkaline than the older one. In the Ketapang region, this granite is called Sukadana Granite, while in some places such as Lamandu Cretaceous granite intruded by diorite and basalt dike of early tertiary age. Emplacement along with northern collision boundary of Schwaner Mountain named Menyukung Granite. The silicic volcanic rock in the Late Cretaceous was recently found in the Kelian district. Cretaceous magmatic arc terminated post-Late Cretaceous (65.5 Ma).

Central Magmatic Arc began at Eocene (51 Ma) which is predominantly acid volcanic rocks whose magmatic affinities are low-K(tholeiitic) to medium-K (calc Alkaline)

occupied from Singkawang to Dent Peninsula with thin width of around 50 km, it was recognized as Piyabung, Nyaan, Serantak, and Muller Volcanics formation.

According to Soeria-Atmadja et al. (1999) and Priadi (2010), there was no new subduction zone along with NW Kalimantan (the boundary between Indo and Malay). In some places, in late Eocene to Miocene probably existed two volcanic chains with magmatic affinity predominantly Calk alkaline comprising igneous rock andesite, dacite, and rhyolite with view basalt.

The Cretaceous Eocene dominates the northern portion of the Miocene Croker-Rajang-Embaluh accretionary complex. This consists primarily of turbidites shed northeastward to off the Schwaner and younger volcanic arcs parallel to a deep marine trench basin. These sediments were imbricated, deformed, and weakly metamorphosed during Cretaceous and Tertiary subduction and finally were intruded by late-stage post subduction intrusion of the Oligo-Miocene Sintang Group. The Malawi-Ketungau basins and Kutei basin (Fig.4) formed along the southern margin of this complex during the Late Eocene and are separated from it by the Lupar-Lubok Antau and Boyan melange-ophiolite zones. Scattered exposures of Cretaceous marine sediments adjacent to these basins likely record the Cretaceous fore-arc basin to the Schwaner arc.

Gold Metallogeny

The Magmatic arc in Central Kalimantan is recognized from erosional remnants of late Oligocene to early Miocene andesitic to trachyandesitic volcanic center, many with associated gold deposits and prospect. Deposits are associated with medium – K intrusive suites.

The volcano-magmatic arc is related to Late Oligocene-earliest Miocene southward subduction in a trench situated mainly in and northward of Sarawak. The belt of late Eocene to Oligocene sediments in the Ketungau, Malawi, and mandali basins of central Kalimantan appear to occupy a forearc basin that preserves a succession deposited initially over much of Kalimantan.

Volcanic rock includes 23 Ma trachyandesites near Kelian, 25 ma andesites from Masuparia, and 14 – 24 Ma andesite and basalt between Kelian and Indo Muro. The belt possibly continues into West Kalimantan, where 21-28 Ma tonalites occur at the Serantak and Banyi gold prospect.

Late Miocene to Quaternary basalt, widespread in Kalimantan, is the youngest eruptive rock, with related basalt dykes that cut mid-Tertiary arc volcanic rocks. The basalt is locally associated with gold mineralization in isolated quartz veins like Long Laai. The eastern and central portion of the Central Kalimantan arc is well mineralized over a 200 km by 30 km wide NE trending volcanic corridor. Transitional epithermal to porphyry deposits occur at

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Kelian with low sulfidation epithermal deposits, Indo Muro, Masupa Ria, Mirah, and Muyup.

The EKM project is in the line with other gold prospect in Central Kalimantan, such as Kelian, Mt. Muro, Seruyung and Indo Muro . This belt is tentatively projected from NE Kalimantan southwards through central to west Kalimantan and into Sarawak (Fig. 5). Gold mineralization which is predominantly by low-sulphidation Au-Ag (Jelay), high sulphidation Au (Seruyung), sediment-hosted Au (Bau Sarawak), porphyry Cu-Au (Beruang, Mansyur, and Mamut), and skarn Au (Buduk) spatial correlation with Sintang intrusions. Sintang comprises hundreds of stock, sill, and dike. This intrusion has a unique Adakites character resulting from the melting of basaltic sources such as oceanic crust derived from older subduction and basalt underplate. Another interesting gold mineralization in Central Magmatic arc spatial correlation or coincidence with the event of counterclockwise rotation from 20 Ma - 9 Ma.

RESEARCH AND METHODOLOGY

Several approaches have been used to identify the gold mineralization potential in area-"X", such as :

a) Literature study

Literature study regarding mineralization occurrences, tectonic setting, and regional geology in the observation area.

b) Field observation

The field observation was conducted to collect the area's primary data-"X". The preliminary data include a ground check and rock sampling rock outcrop and rock float.

c) Laboratorium analysis

Seven samples were assayed in a local laboratorium in Kalimantan for Au content. The assay process used aqua regia and was detected by AAS equipment.

RESULT AND DISCUSSION

Geology

In general, the lithology of Area-"X" consists of siltstone and sandstone, locally mudstone that is overlain by volcanic material of tufaceous siltstone and intruded by dioritic rock and youngest material of alluvial. The sedimentary formation is relatively NE-SW trending and dipping 30-40^{o} NW.

Mineralization and Alteration

Based on the field investigation result of Area-"X", the mineralization in this area is identified by the occurrence of outcrops of the ore zone. The mineralized outcrops can be found at outcrop-001 as a quartz vein, outcrop-002, and outcrop-003 samples as parallel quartz veinlets. The gold mineralization here is also supported by discovering four mineralized rock float samples containing gold.

This Area-"X" has a potential for primary gold deposit proven by surface geochemical rock sampling both rock outcrop and rock float. The mineralization type in this area-"X" is interpreted as a Vein type with some sulfide content.

From surface geochemical rock sampling, the coverage of the potential area is about 2 ha to be a prospect area.

Some of surface mineralization data :

a. Outcrop-001 as Quartz Vein up to 40cm width, N50^{0}E/85^{0} strike, and dip.
b. Outcrop-002 and Outcrop-003 as parallel veinlet up to 8cm width, N35^{0}E strike, and unidentified dip.

Figure 1. Quartz Vein at Outcrop-001.

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Figure 2. Oxidized parallel quartz veinlet at Outcrop-002 and Outcrop-003.

The surface mineralized outcrop was also found as the rock float as shown at Float-001, Float-002, Float-003, and Float-004.

Figure 3. Mineralized rock float at Float-002 sampling point.

In megascopically observation, the quartz vein texture is milky massive, fine crystallin, comb, vuggy, and contains sulfide minerals such as pyrite, chalcopyrite, and rare galena. The secondary copper is also observed as covellite. The host rock for the mineralization on the surface is siltstone and diorite, altered due to hydrothermal and weathering. The gold contained in the rock sample ranges from 0.21 ppm to 3.86 ppm.

Figure 4 Area-"X" condition, Central Kalimantan.

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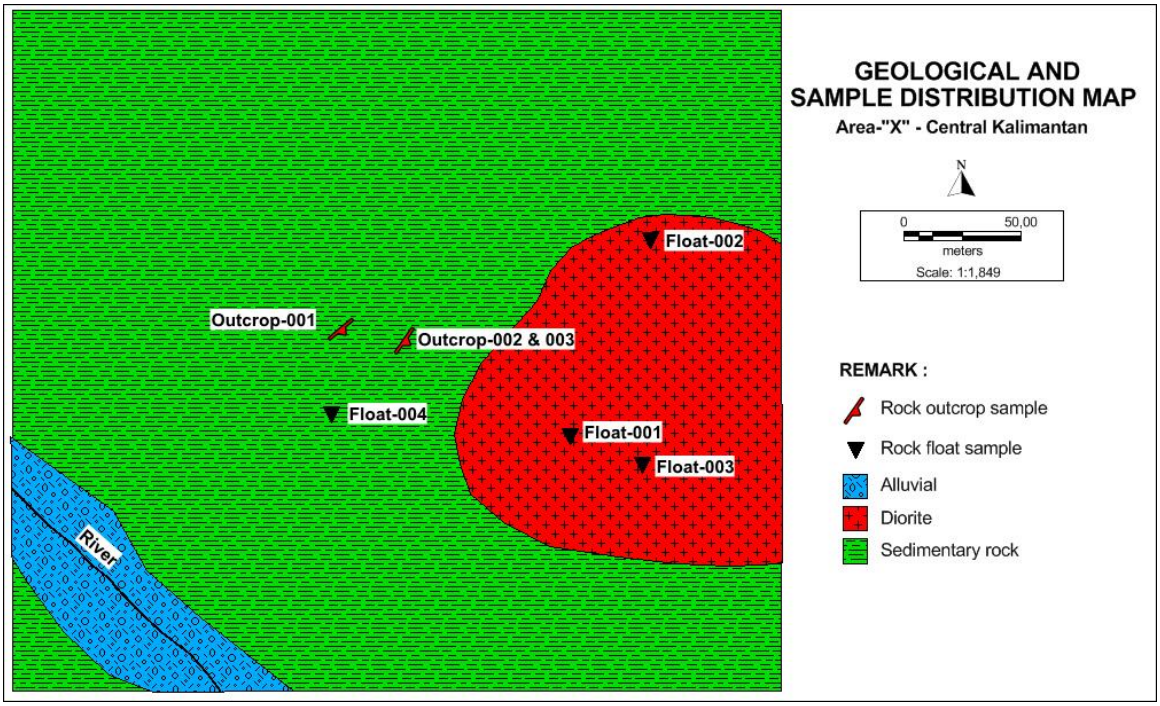

Figure 5 Geological and sample distribution map

Table 1 Sample assay result.

No.	Sample Code	Au (ppm)
1	Outcrop-001	0,21
2	Outcrop-002	1,14
3	Outcrop-003	1,43
4	Float-001	3,86
5	Float-002	3,85
6	Float-003	0,79
7	Float-004	0,93

CONCLUSION

Area-"X" has a high gold mineralization potential based on field observation and sample analysis. This area is covered by sedimentary rock dominated by siltstone and a tiny sandstone. This sedimentary rock was intruded by the dioritic intrusion. The gold occurrences in this Area-"X" was found as quartz vein type as shown in the rock outcrop sample with NE trending. The gold content was proved by laboratory assay using the aqua regia AAS method up to 3.86 ppm Au. The quartz texture is milky massive, fine crystallin, comb, vuggy, and sulfide minerals such as pyrite, chalcopyrite, and rare galena. The secondary copper is also observed as covellite.

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