Petrography Volcanic Rock : Volcanic Rock Alteration Study of Colo Volcano

Indonesia

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Abstract

The existence of Colo Volcano on the southwest side of the North Arm of Sulawesi Magmatic Arc show evidence of evolutionary difference plate under Tomini Bay. Colo Volcanism activity indicated a product of slab rollback final extension of the Gulf Gorontalo. This study aims to investigate the altered volcanic rocks of the Colo Volcano. In this study, petrographic analysis is used to determine mineral composition based on petroscopic. Several lava and pyroclastic outcrops, indicating an alteration of the Colo Volcano product. The analysis showed andesite lava on gray-green thin incisions, subhedral-anhedral shape, mineral composition consist of hornblende (10%), biotite (10%), quartz (15%), pyroxene (10%), orthoclase (10%), Plagioclase (10%), opaque minerals (20%) and glasses (15%). The Orthoclase, is white-blueish-gray, orthorhombic, low cleavage, twinning altered look. Locally shows colorless-blue-gray, subhedral-anhedral shape, mineral composition consisting of hornblende (10%), biotite (10%), quartz (50%), pyroxene (5%), orthoclase (5%), opaque minerals (15%) and glasses (5%). It might consist of cholorotisation of biotite. The lava exposed on Mount Ambu shows the presence of smectite alteration and pyrite mineralization, on thin incisions including blue-gray-brown, subhedral-anhedral shape, mineral composition consist of hornblende (10%), biotite (5%), quartz (10%), Olivine (5%), plagioclase (20%), orthoclase (15%), opaque minerals (15%) and glasses (20%).

Key Word : Petrography, Colo Volcano, Indonesia, volcanic rock, alteration.

Introduction

Colo Volcano is included in the administrative area of Una-Una Sub-district, Tojo Una-Una Regency, Central Sulawesi Province. Many community activities are in the vicinity of Colo Volcano in the form of food crop agriculture, plantation, animal husbandry and fishery. The population in Una-Una sub-district is 7,791 inhabitants of 153.43 km2, the population density is about 51 people / km2 (Central Agency on Statistics Tojo Una- Una Regency, 2016).

Gunung Colo is a solitary volcano because it is rather deviate from the series of Indonesian volcano path (Badan Geologi Indonesia, 2011). According to Broom-Fendley, et al. (2011), Una-Una and Togean Islands are the products of the final slab rollback extension of the Gorontalo Bay. Thus causing the upwelling
mechanism of pre metacomatism of the mantle.

In 1898 there was a normal eruption and produced a lava plug that became known as Gonung Colo. On July 23, 1983 there was an eruption that destroyed the lava plug and 2/3 Una-Una Island (Geological Agency of Indonesia, 2011).

Based of Bronto (2006), He stated a common problem is that researchers are usually less interested in exploring the volcanic geological environment in its development with the formation of gold deposits. Therefore, researchers are interested in exploring the petrography of the volcanic product of Colo Volcano discussing the possible alteration present and indicating the prospect of mineral resources.

The emphasis of this paper is to determine mineralogy and petrological characteristics of Colo Volcano rock products based on petrographical analysis, it being or not have altered. Which in the future will help the next researcher to discover the potential of mineral resources in Gunungapi Colo

Regional Geological Background

Colo volcano is located in Una-Una Island. It occurs within a many volcanic and volcaniclastic rocks, and alluvial deposits are locally intercalated with subvolcanic intrusive bodies of andesite and microdiorite. Normal fault that trails NW-SE, NE-SW and N-S Trending axis

Pleistocene Volcanics Unit (Rusmana, Et al, 1993) which is made up tuff breccia, andesite lava and microdiorite, is well distributed in the south-central part of Una-Una Island

Holocene Volcanics Unit is made up breccia, sand and mud. This formation is located locally covering the plistocene volcanic rock formations

Alluvium reff limestone and minor marl located on the northeastern edge of Una-Una Island

Geomorphology

From the results of geomorphological observations made geomorphology map that produces several geomorphology units, namely the caldera hill unit, the pyroclastic flow hill units, the lava flow lava units, and

Figure 1 Geomorphology of Colo Volcano (Amin A., K., M., Et al, 2017)

Unit of caldera hills around the crater with an altitude of about 10–15 meters, Lava flow hills are indicative of lithology i.e intrusion rock (andesite), Lava flow found around the river body with varying thickness and pyroclastic flow hills in characterized by the material yield Eruption i.e tuf, di some observation stations. Fumarola availability found around the crater and solfatara found around Mount Ambu

**Geology of Colo Volcano**

Based on Mulyana et al (2004) lithology, stratigraphical and geological structure data, the geological map of Gunungapi Colo devided 16 units of lithology in sequence of from youngest to oldest is Colo Pyroclastic Flow 1 (Col), Colo Pyroclastic Flow 2 (Cop2), Colo Pyroclastic Flow 3 (Cop3), Colo Pyroclastic Flow 4 (Cop4), Colo Pyroclastic Flow 5 (Cop5), Colo Lava Flow 1 (Col 1), Bulukuda Lava Flow (Bkl), Colo Lava Flow 2 (Col2), Colo Lava Flow 3 (Col3), Colo Lava Flow 4 (Col4), Bendera Lava Flow (Bel), Sokora Lava Flow (Sol), Colo Pyroclastic Fall (Cjp), Colo Pyroclastic Flow 6 (Cop6), Lava Sediment (Al) and Alluvial Deposits (Ea).

Volcanostratigraphy, the activity of eruption of Colo Volcano occurred as much as six times the activity of eruption it is based on field data and previous research

*Figure 2 Geology of Colo Volcano (Collaboration and modification from Mulyana et al (2004))*
by Mulyana et al (2004) with various products of volcano produced, either lava or pyroclastic material with its spreading clearly illustrated in Geological Map of Colo Volcano.

**Analytical technique**

All rock samples are prepared for intact rock analysis by being made in chip as glass preparations, to be polished thin with carborundum powder of various grain sizes, ranging from 150-400-800-2000-4000-6000 polished in media barupa plate Steel to chip size is 0.3 mm, to produce a ready sample in petrographic analysis.

Minerals such as biotite, pyroxene, quartz or non-metallic minerals can be clearly seen with either the crosslink or the corresponding nikol. As for the metallic minerals we observed based on the general literature guide the appearance of minerals using parallel nikol characterized by the quintessential metallic mineral properties. Such as pyrite minerals that form like triangles or isometric crystalline crystals that look only dark in the microscope but can be drawn the conclusion that it is pyrite.

**Petrographic Features, Alterationa and Mineralization**

The results of petrographic analysis show that some samples have experienced high alteration in the active hydrothermal zone both in Ambu Mountain and Bulukuda Mountain which is a parasiteric cone from the main crater of Colo Volcano.

Around Ambu Mountain the sample on the blue-gray-brown petrography appearance, the subhedral-anhedral shape, contains opaque minerals. Biotite (5%) potassic, related minerals associated with ankerite, calcite, orthoclase, muscovite, pyrite, quartz. Orthoclase relief is low, with an alternated twin. Hornblende with
medium relief, cleavage, tabular form, seen alteration, green, moderate paleochroism (dwikroisme-trichroisme). There is also Smectite Alteration pyrite mineralization.

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H2.1 (Near Ambu Mountain)

H2.2 (Near Ambu Mountain)

H2.4a (Near Ambu Mountain)

H2.4b (Near Ambu Mountain)

H2.5 Near Bulukuda Mountain
mineral composition consist of hornblende (10%), biotite (5%), quartz (10%), Olivine (5%), plagioclase (20%), orthoclase (15%), opaque minerals (15%) and glasses (20%).

Around Mount Bulukuda there is also pyrite mineralization with the appearance of Orthoclase, white-bluish-gray, orthorhombic, low hemisphere, twin seen alteration, Opaque, and biotite that is chlorized. mineral composition consisting of hornblende (10%), biotite (10%), quartz (50%), pyroxene (5%), orthoclase (5%), opaque minerals (15%) and glasses (5%).

**Conclusion**

In this research can be explained that the existing alteration and mineralization in the form of smectite mineralization in the zone of andesitic volcanism. Pyrite, diopside formed from magmatic processes of mafic and ultramafic plutonic in the magmatic environment or metamorphism contacts of rocks allegedly also associated with gold minerals, Biotite formed by hydrothermal processes and magmatism, Potassic which is part of the alteration zone characterized by the presence of minerals Alterations such as secondary biotite.

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**References**


