

Rock Types Classification and Distribution on Anabanua Village, Barru Regency, South Sulawesi

Muhammad Resky Ariansyah*, Muhammad Fawzy Ismullah Massinai, Muhammad Altin Massinai

*Department of Geophysics, Mathematics and Natural Science Faculty,
Universitas Hasanuddin*

**reskyariansyah97@gmail.com*

ABSTRACT

Anabanua Village, Barru Regency is one of the areas in South Sulawesi that has quite unique geological conditions. This condition inseparably comes from the complicated geological process that took place during the formation of the island, Sulawesi. In Anabanua Village, there are many types of rocks such as sedimentary rocks, metamorphic rocks and igneous rocks. This paper aims to map and classify the types of rock by taking samples on different places in the research area. Then we observe the samples physical properties. The results showed, from taking 10 rock samples in different places, they have various characteristics. 8 of them were sedimentary rocks, they are Limestone Quartz, Limestone Sand, Shale, Sandstone, Coal, Limestone Bioturbation, Breccia, and Chert Stone. The other 2 samples were metamorphic rocks, they are Greenschist and Quartzite.

Keywords: Anabanua, Rocks Classification, Mineral Classification, South Sulawesi, Rock Physical Properties

SARI

Desa Anabanua, Kabupaten Barru merupakan salah satu daerah di Sulawesi Selatan yang memiliki kondisi geologi yang cukup unik. Kondisi tersebut tentu saja tidak lepas dari proses geologi yang rumit yang berlangsung pada saat pembentukan pulau Sulawesi. Di Desa Anabanua, terdapat begitu banyak jenis batuan seperti batuan sedimen, batuan metamorf dan batuan beku. Paper ini berfungsi untuk memetakan dan mengklasifikasikan jenis batuan dengan mengambil sampel pada beberapa tempat berbeda di area penelitian. Kemudian kami mengamati sifat fisik dari masing-masing sampel. Hasil penelitian menunjukkan, dari pengambilan 10 sampel batuan di tempat yang berbeda, 8 diantaranya merupakan batuan sedimen, seperti gamping kuarsa, gamping pasir, batuserpih, batupasir, batubara, gamping bioturbasi, breksi dan batu rijang.

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Dua sampel lainnya merupakan batuan metamorf seperti sekis hijau dan kuarsit.

Kata kunci: Anabanua, Klasifikasi Batuan, Klasifikasi Mineral, Sulawesi Selatan, Sifat Fisik Batuan.

INTRODUCTION

Judging from the history of its formation, Indonesia is a treasure for geologists and geophysicists to conduct research. Being in the Ring of Fire and flanked by continental and oceanic plates causes Indonesia to have an interesting geological structure to study (Hasan et al., 2019).

Barru is one of the regency in South Sulawesi that has quite unique geological conditions. Geographically, Barru Regency is located at 4°24'42.6"S 119°37'01.8"E with an area of 1,174.71 km² (Priyono et al., 2014; Manalu, 2019; Nuransil, 2018). The unique conditions in Barru Regency certainly cannot be separated from the geological process that took place at the time of the formation of the island of Sulawesi.

Based on Koolhoven W.C.B. report on Malili's map sheet (Mark, 1961, as cited in Purawardi, 2008), Compounding rocks in Barru regency are composed of several types of rocks including ultramafic rocks, metamorphic rocks, melange rocks, Balangbaru Formation, Mallawa Formation, Tonasa Formation, Gunungapi Volcano Breakthrough rocks and alluvium deposits. Ultramafic breakthrough rocks are mostly found in the area of South Sulawesi, but large outcrops are found in the area of Southeast Sulawesi

In geological map sheet Pangkajene and Watampone scale 1: 250,000 (Sukanto, 1982, as cited in Purawardi, 2008), the stratigraphy of the regions of Barru, Pangkajene, Pangkep, South Sulawesi Province from old to young as follows:

- The oldest rocks are the Bantimala Tectonic Complex which consists of ultramafic rocks, Metamorphic rocks, and Melange groups, each of which touches each other structurally.
- Ultramafic rock, a Peridotite rock that undergoes serpentinization, dark green, foliated structure, in some places containing chromite nodules, chromite lenses, and iron, is estimated to be Triassic.
- Metamorphic rocks, composed by glaucophane schist, gneiss, quartz, feldspar, experience an upward fault that is directed to the southwest, in contact with the surrounding rocks. Based on the dating of Kalium / Argon, the absolute age of 111 million years, or Yura. This rock is closely related to schist and mica minerals.
- The Melange complex, a tectonic jumble of rocks, consists of greywacke, breccias, conglomerates, sandstones, gray flakes, red flakes, red radiolaria flakes, slate stone, schist, ultramafic basalt, diorite, and clay. This group generally has a leafy structure, aged Yura. This melange complex is closely related to chert, jasper, and manganese.

Several previous research also discusses rock and/or mineral identifications, for example (Ariansyah et al., 2019) and (Massinai et al., 2014). Limitations in both researches can be seen from the physical rock properties of their sample. Beside that, various successful case studies using macroscopical method have been reported (Calogero, 1991; Crandell, 2005). Based on the same principle, in this study, we will examine several other properties, all of which can be observed macroscopically from color to permeability and also porosity of the rock itself. Also, in this research, we will focus on discussing the types of rocks in the Anabanua Village in Barru District. This village is one of the villages in Barru that has great potential for geological study due to Barru's unique geological conditions. Unfortunately, it's only a small amount of available research that discusses this village. Therefore, the purpose of this research is to map and classify rock types in Anabanua village and then identify the physical properties of each rock.

METHODS

The method used in this research is the method of direct observation of rock samples (macroscopic). Rock samples were taken from 9 different locations in the village where we named the location "Pos 1-9" using a geological hammer. Sampling at 9 different locations is intended to determine the type of rock and the distribution of rocks in Anabanua Village. The physical properties of rocks observed in this research were fresh and weathered colors, texture, structure, hardness, minerals, permeability and porosity (Chen et al., 2018; Sudarningsih et al., 2012; Umar et al., 2018). To test the permeability and porosity of the rock (Beckingham, 2017), we used water that we drop directly to the samples

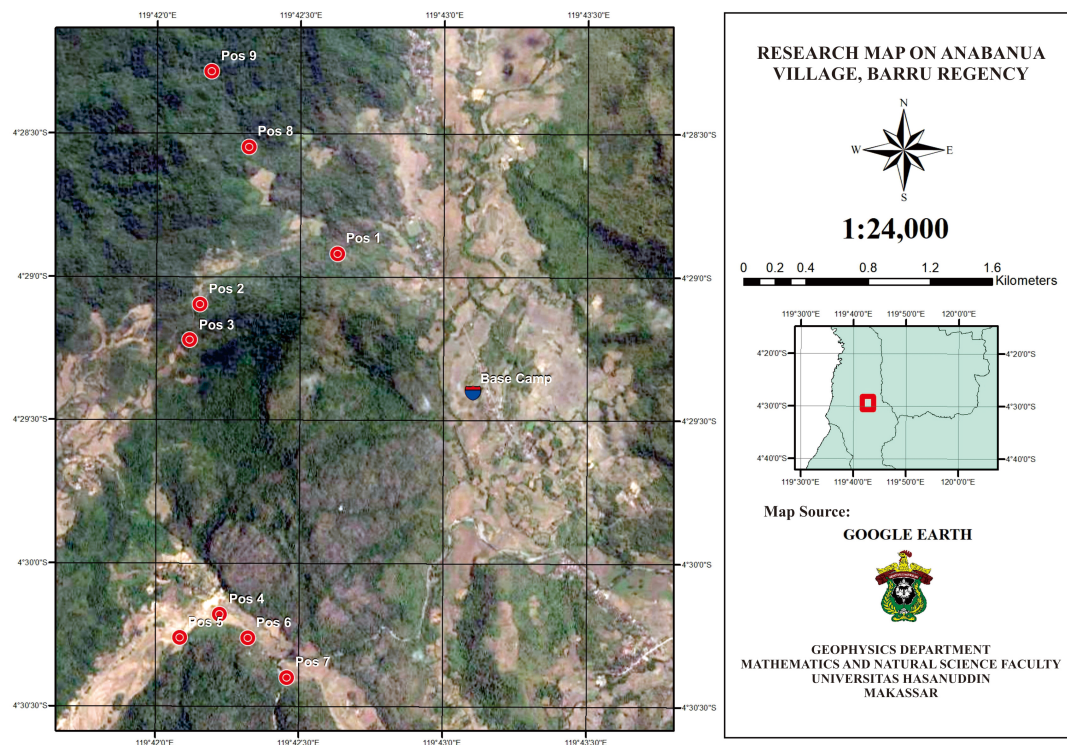


Figure 1. Research map location (Pos 1-9)

RESULTS AND DISCUSSION

10 rock samples were taken from 9 different locations in the Anabanua village. Each location has different characteristics. In fact, all rock samples taken are different types of rocks.

- Sample 1 in Pos 1 is limestone quartz which on this rock there are fossils of shells and small sea creatures. Limestone Quartz has a weathered color in brownish orange and the fresh color is white bone. The position of these rocks is at 119°42'37.8"E and 4°28'55.1"S, the vegetation around is teak wood, with a steep topography with an elevation of 260 masl.



Figure 2. Sample 1, Limestone Quartz

- Sample 2 in pos 2 is limestone sand, with steep topography and lots of tree and moss vegetation. This pos 2 is rather muddy with a rather clay soil. Limestone sand has a weathered golden brown color and for the fresh color is gray. This rock was formed due to mechanical sedimentation in the shallow seas from the past, limestone sand was found at position 119°42'9.1"E and 4°29'5.8"S.



Figure 3. Sample 2, Limestone Sand

- Sample 3 in Pos 3 is a shale with its discovery position on the edge of a cliff. This shale rock is formed from the process of mechanical sedimentation in the deep sea because it appears in its clastic texture. Shale have a fresh color in black-purple and the weathered color is dark gray. Located in 119°42'7"E and 4°29'13.2"S with 127 masl, the vegetation is teak woods and steep topography.



Figure 4. Sample 3, Shale

- Sample 4 in Pos 4 is sandstone. The sandstones sample have a grayish-white fresh color with weathered colors of orange and purple. In weathered colors there are two colors

because it indicates that in this rock the oxidation process occurs so that the color changes. The vegetation is grass with the sloping topography. The position of this rock is 119°42'13.4"E and 4°30'10.7"S.



Figure 5. Sample 4, Sandstone

- Sample 5 in Pos 5 is young coal. This coal is young because it's taken from the outer side. While the old coal is at the very bottom, and it is possible that in the future it can be turned into mining material. Coal has a fresh color in black and weathered color in blackish brown. Coal is formed by organic sedimentation processes in swamps, lakes and shallow seas in the past. The rock position is at 119°42'5.1"E and 4°30'15.6"S at 142 masl.



Figure 6. Sample 5, Coal

- Sample 6 in Pos 6 is limestone bioturbation whose outcrops are scattered, looking at the shape and presence of fossil shells and snails found, it is probable that this area was once the deep sea, besides that many rocks resembled the rocks hiding sea animals. Limestone bioturbation has a white bone fresh color and brownish orange weathered color. The vegetation of this rock is teak wood and grass, with a sloping topography. The position of these rocks is 119°42'19.3"E and 4°30'15.6"S which is formed from chemical and organic sedimentation.



Figure 7. Sample 6, Limestone Bioturbation

- Sample 7 in Pos 7 is breccia, which was found in the river area. The position of these rocks is $119^{\circ}42'27.5''\text{E}$ and $4^{\circ}30'23.9''\text{S}$.



Figure 8. Sample 7, Breccia

- Sample 8 in Pos 8 is greenschist which is a metamorphic rock. The vegetation is in the forest, with a sloping topography. This greenschist has a weathered color in brown with a fresh color in dark gray. The position of this stone is $119^{\circ}42'19.27''\text{E}$ and $4^{\circ}28'32.72''\text{S}$ which contains mica minerals and is anhedral in shape.



Figure 9. Sample 8, Greenschist

- Sample 9 in Pos 9 is quartzite which is a metamorphic rock. This rock is very hard, the dominant mineral contained in it is quartz. Quartzite itself has a weathered color in brown and fresh color in white bone. The position of this stone is in $119^{\circ}42'11.43''\text{E}$ and $4^{\circ}28'16.94''\text{S}$.



Figure 10. Sample 9, Quartzite

- Sample 10 in Pos 9 is a chert. This rock is located on the river bank or this sample is classified as secondary sources as described in (Crandell, 2005). The chert itself has a brick red fresh color and maroon in weathered color which is formed from the process of organic and chemical sedimentation in shallow seas. The position of this rock is 119°42'11.43"E and 4°28'16.94"S.



Figure 11. Sample 10, Chert stone

Beside the weathered and fresh color, we also identified another rock physical properties from the samples by direct observation. Another rock physical properties from the samples that we identified can be found in Table 1.

Table 1. Rock Physical Properties of Rock Samples

Sample	Rock Name	Location	Weathered Color	Fresh Color	Texture	Structure	Hardness	Mineral	Permeability	Porosity	Rock Type
1	Limestone Quartz	Pos 1	Brownish Orange	White Bone	Non Clastic	Unstratified	>5.5	Quartz	Fair	Fair	Sediment
2	Limestone Sand	Pos 2	Golden Brown	Gray	Non Clastic	Unstratified	>5.5	Quartz	Fair	Good	Sediment
3	Shale	Pos 3	Dark Gray	Black-purple	Clastic	Stratified	<2.5		Poor	Poor	Sediment
4	Sandstone	Pos 4	Orange-Purple	Grayish white	Clastic	Unstratified	<2		Great	Great	Sediment
5	Coal	Pos 5	Blackish brown	Black	Non Clastic	Stratified	<2	Carbon	Good	Good	Sediment
6	Limestone Bioturbation	Pos 6	Brownish Orange	White Bone	Non Clastic	Unstratified	>5.5	Quartz	Fair	Fair	Sediment
7	Breccia	Pos 7	Diverse	Diverse	Clastic	Unstratified	2.5≤x≤7	Diverse	Fair	Good	Sediment
8	Greenschist	Pos 8	Brown	Dark Gray	Heteroblastic	Foliated	>5	Mica	Poor	Poor	Metamorph
9	Quartzite	Pos 9	Brown	White Bone	Homoblastik	Non-foliated	7	Quartz	Poor	Poor	Metamorph
10	Chert stone	Pos 9	Maroon	Red Brick	Non Clastic	Unstratified	>7		Poor	Poor	Sediment

CONCLUSIONS

In this research, 10 rock samples that were taken from 9 different places in Anabanua Village have various characteristic and each one of them is a different rocks. 8 of them were sedimentary rocks, they are Limestone Quartz, Limestone Sand, Shale, Sandstone, Coal, Limestone Bioturbation, Breccia, Chert stone. And the other 2 samples were metamorphic rocks, they are Greenschist and Quartzite.

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