Sulphide Minerals in Limestone: Trap rock of Buton Asphalt (Asbuton) on Block Kabungka Mine C PT Wikaya Karya Bitumen, Buton Regency, South East Sulawesi

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Abstract. We present data to analysis presence the sulphide mineral from three sample from, two sample limestone trap rocks with low grade asphalt and one sample asbuton rock. Sulphide minerals found from all three samples were Pyrite (FeS2), Chalcopyrite (CuFeS2), Bornite (Cu3FeS4), and Covellite (CuS). There were no traces of hydrothermal solusion such as altered rock or quartz veins, but the composition of the analized sulphide minerals had similarities to the sulphide mineral composition in porphyry type andesite rocks from Central Lombok. The presence of sulphide minerals in asbuton trap rocks has the potential to produce pollution in the form of acid mine drainage (AMD), so it needs proper treatment so that water pollution does not occur.

Key Words : Sulphide, Asbuton, limestone

1. Introduction

The sulphide minerals are the major source of world supplies of a very wide range of metals and are the most important group of ore minerals. In addition to their concentrated occurrence in ore deposits and areas of mineralization, a limited number of sulphide minerals are found as accessory minerals in rocks. Pyrite (FeS_2) is by far the most abundant sulphide mineral. The very fine particle iron sulphides found in reducing environments beneath the surfaces of Recent sediments and soils, although transient species, are also volumetrically important (Vaughan, 2013).

In mining, it is important to know the presence of sulfide minerals in rock, especially in open mine area. It is important to know the trace of mineralization. In adition, the existence of sulphide minerals in open mine area, potential to produces water pollution known as the acid mine drainage (AMD) (Akcil and Soner, 2006).

In this paper, conducted research on the Buton asphalt (asbuton) mining area of PT Wijaya Karya Bitumen which located in Block Kabungka Mine C, Pasarwajo District, Buton Regency, South East Sulawesi Province to know the presence of sulphide minerals so that they can be a reference for preventing contamination of acid mine drainage and possible trace mineralization.

2. Geological Setting

The research location lies in the Sampolakosa Formation (Figure 1). According to Sikumbang et.al. (1995), the Sampolakosa Formation is composed by marl, thick bedded-massive, intercalated by calcarenite in the middle and upper part of formation. It contains Globorotalia plesiotumida, Globorotalia acostaensis, Globorotalia multicamerata, Globigerina venezuelana, Globigerinoides ruber, Globigerinoides extremus, Hastigerina siphonifera, Globoquadrina altispira, Sphaeroidinesllopsis subdehiscens, Sphaeroidinellopsis seminulina. Oil and asphalt seepages are found in this formation in the Kabungka, Pasarwajo and Lasalimu villages, Buton. Type locality is in Sampolakosa River. The formation is Late Miocene to Early Pliocene in age, deposited in neritic-bathyal environment. Many found a typical mollusk fossil for deep sea environment (Hetzel, 1936, in Hadiwisastra, 2009).

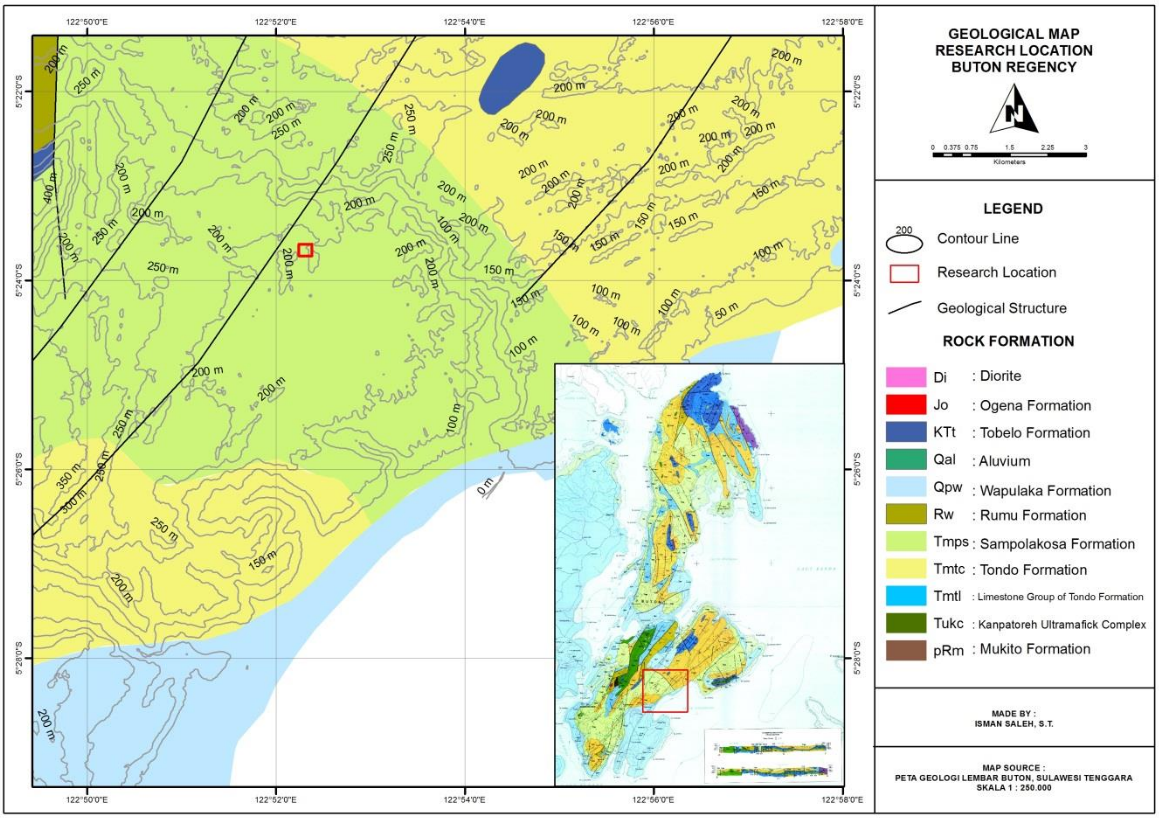


Figure 1. Regional geological map of research location

3. Sample Description and Analytical Method

The sample were analyzed consisted of two trap rocks with low asphalt content and one Buton asphalt sample (Figure 2).

Figure 3(a) shows the scattered asphalt content on the limestone body which is marked with a darker color than the white limestone. Figure 3(b) shows the liquid asphalt filling the brown limestone crack. Figure 3(c) shows a high asphalt content characterized by black rock throughout the rock body.

All sample were petrographically to determine mineral assemblages. The method used is the polish section of the three rock sample (TR1-003, TR2-001, and ATC-002). Analysis of polish section sample was carried out using microscope polarized Nikon Eclipse LV 100N POL in Preparation Laboratory Faculty of Engineering, Hasanuddin University.

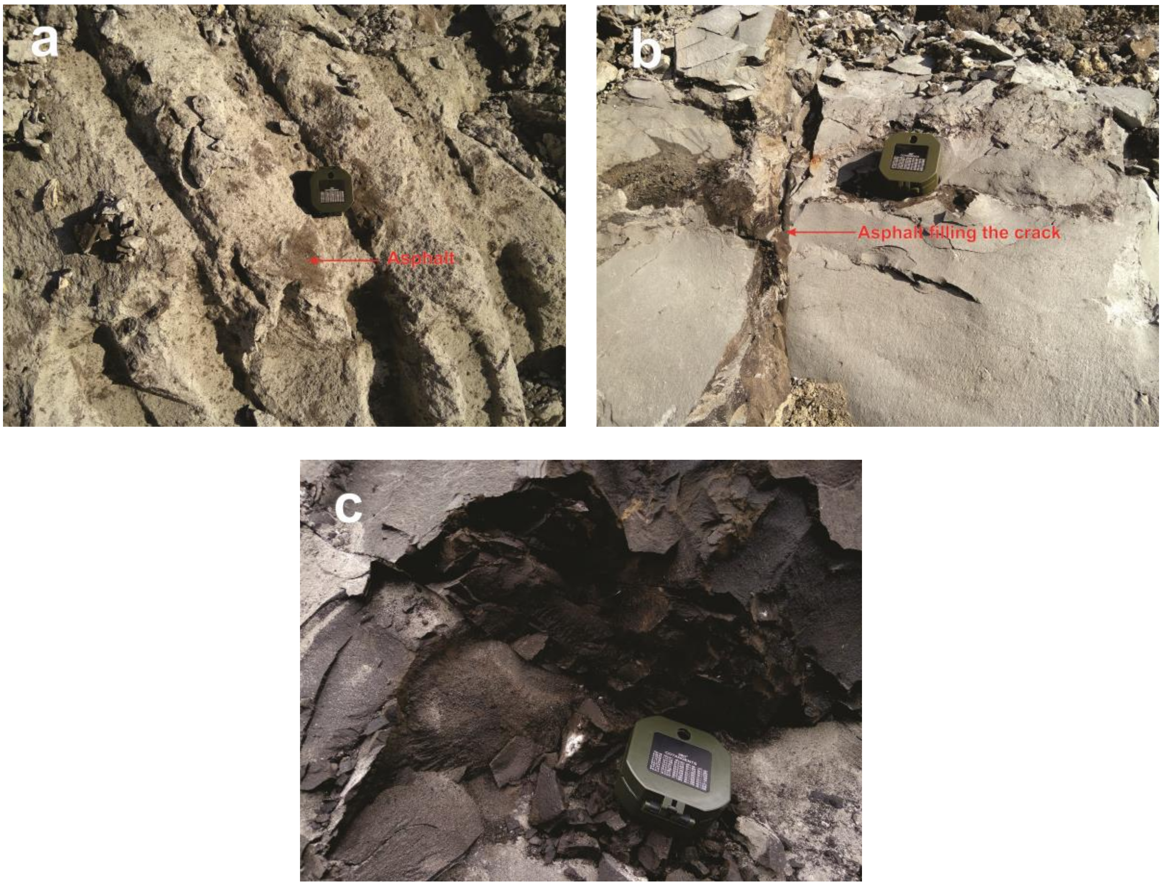
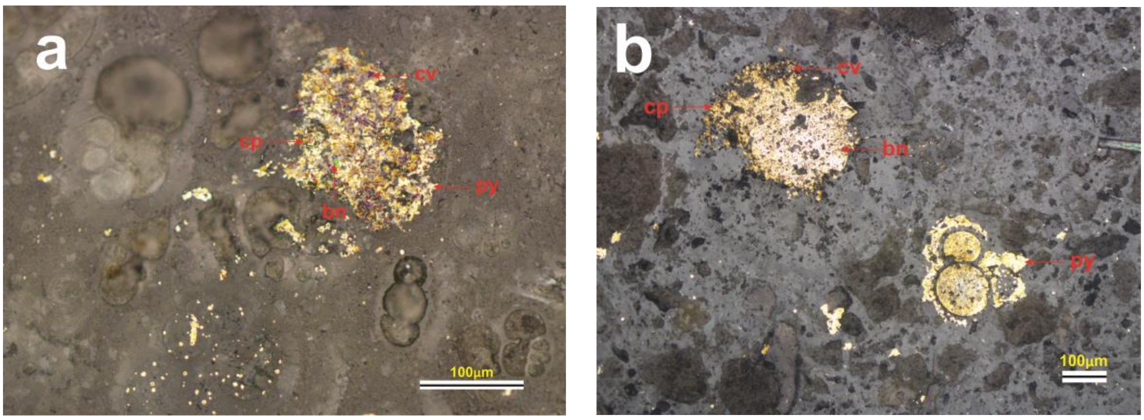


Figure 2. (a) Limestone outcrop with low grade asphalt (sample TR1-003), (b) Asphalt filling the crack of limestone (sample TR2-001), (c) Buton rock asphalt (sample ATC-002)

4. Result and Discussion

The result of field observations, found no veins or hydrothermal alteration in the rock as a characteristics of contamination from hydrothermal sulphide solution. However, the result of observations of the polish section sample showed the presence of sulphide minerals, that is Pyrite (FeS_2), Chalcopyrite ($CuFeS_2$), Bornite (Cu_3FeS_4), and Covellite (CuS). The result of analysis using microscope polarized shown in Figure 3.



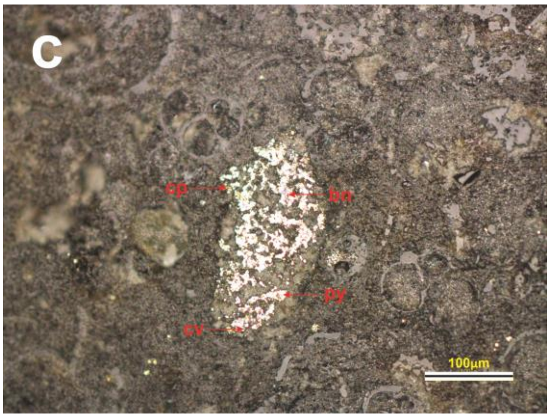


Figure 3. (a) TR1-003 polish section, (b) TR2-001 polish section, (c) ATC-002 polish section

Mineral sulphides composition and description shown in Table 1.

Table 1. Sulphide mineral compositions of analysis result

No.	Sulphide mineral composition	Symbol	Color
1.	Pyrite (FeS_2)	py	Yellowish white
2.	Chalcopyrite ($CuFeS_2$)	cp	Copper yellow
3.	Bornit (Cu_3FeS_4)	bn	Pink, green
4.	Covelit (CuS)	cv	Blue

The sulphide mineral composition obtained is similar to the sulphide mineral composition in porphyry type andesite rocks from Central Lombok, Nusa Tenggara Barat (Figure 4). This indicates that the limestone has a contamination of sulphide solution.

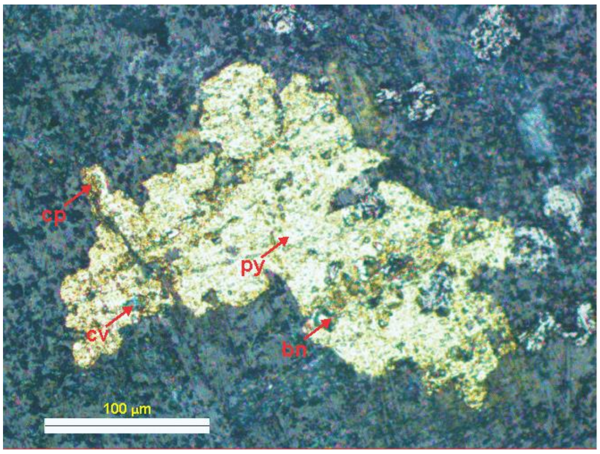


Figure 4. Polish section sample of porphyry type andesite rock Central Lombok, NTB

The abundance of sulphide mineral on rocks potentially polluting the environment. In particular, the release of sulphur through the weathering of sulphides in natural rocks or in mine wastes generates sulphuric acid, resulting in acid rock drainage or acid mine drainage (AMD). In addition, the heating process of asbuton has the potential to produce toxic gas because it produce gas that mix with sulfur and on a large scale it can cause acid rain. Therefore, right treatment is needed to reduce the potential for contamination by the mineral sulphide content in asbuton.

5. Conclusion

Base on the result of the analysis, it can be concluded that:

1. Asbuton trap rocks contain sulphide mineral, that is Pyrite (FeS_2), Chalcopyrite ($CuFeS_2$), Bornite (Cu_3FeS_4), and Covellite (CuS).
2. Field observation found no trace of hydrothermal alteration or quartz vein as an indication of hydrothermal solution contamination. However, the sulphide mineral content in the asbuton trap rock has the same composition as the sulphide minerals found in the andesite rocks porphyry type in Central Lombok, it indicates that there is a contamination of sulphide solution in the asbuton trap rock.
3. The need for right treatment to reduce the impact of environmental pollution due to the minerals of sulphide on the asbuton trap rock.

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