Mineralization study of Bukit Sambunggiri with the approach of geological and petrogenesys methods in Merawang Subdistrict, Bangka Regency

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Abstract. The research area is located in Merawang District of Bangka Regency of Bangka Belitung Province. This research is to find out more detail about Bukit Sambunggiri mineralization and its relation with the availability of mineral cassiterite as tin minerals. The method that will be used is qualitative and quantitative method to some rock samples that exist in the research location and geomagnetic to interpretation of distributionog minerals. Steps to be taken include literature study, field research, laboratory analysis including mineralogy analysis and microscope observation and geochemical rock sampling using XRD / XRF. The sampling procedure for analysis was done randomly, the rock samples to be tested were chosen based on the number of rocks / lithologies available to be observed and examined for their mineralized content. Regionally the research area consists of a hill which is interpreted as a source of tin minerals. It is hoped that this research can produce existing mineralization models by studying the lithology / rocks, the geological structure of the mineralized carrier and the types of minerals contained in addition to the tin minerals. From the results of petrographic analysis obtained some litologies such as sandstone metasediment and claystone metasediment as well as mineral veins filled by ore minerals. Geomagnetic analysis results from 5 existing line show the distribution of minerals follow the direction of geological structure and the existence of mineral ore. Result of xrf analysis known mineral content is cassiterite, monazite, zircon, ilmenite and iron oxides minerals.

1. Introduction
Physiographically, Bangka Island is part of the lift from Sunda Exposure. The island with an area of 11,534.142 Km² is surrounded by the island of Sumatra and Bangka Strait in the southwest, Belitung Island to the east, Borneo island in the northeast, Riau Islands to the northwest, Anambas Island and South China Sea to the north and Java Sea in the southeast. It has a granite rock intrusion phenomenon that is spread over most of its territory as a tin mineral carrier rock. Bangka Belitung Islands Province has many potentials, especially its natural resources in mining (metal and non-metallic minerals). Researchers who have done previous research found a variety of minerals such as ilmenite, zircon, magnetite, xenotime, tourmaline, and others as lead minerals. Currently the lead minerals are not yet utilized but the content of metal elements and radioactive elements can be used in the future.

Based on the above background researchers are interested to see scientifically through research on the type of rock carrier mineralization in Bukit Sambunggiri especially on rocks that penetrate and intruded (intrusion). Bukit Sambunggiri has been mined by people who are looking for tin minerals
and become the main attraction where mining is done traditionally using makeshift equipment and mining method is done by making the path of holes in the hill. This research uses a survey approach by mapping surface and subsurface geology that aims to collect geological information of the area in detail. Observation positions will be plotted using GPS, other geological phenomena will be in data such as geological structure of rocks, type of mineralization and rock sampling.

2. Regional Geology of Research Areas
Bangka Island is tectonically the result of a collision of two continental crusts that produce intrusion with granitic composition to produce acidic rocks and mineralization with the main elements of Sn. The spread of tin on Bangka Island is a continuation of the Tin Major South East Asian Tin Belt in the center, stretching from Burma, Thailand and Malaysia to ending in Indonesia. The tin belt is estimated to be Triassic and dominated by Granite S type. Indonesia tin line in the form of a series of islands scattered with the tendency of the northwest - southeast direction, starting from Karimun Island, Kundur Island, Singkep Island, Bangka Island, Belitung Island and Karimata Island. On the track about one-third of its part is a land (islands) which is estimated to be the remaining resistant part during the process of Sunda Shelf erosion, while the rest is covered by oceans.

Stratigraphy
According to Osberger (1965) from the old to the young, the Regional Stratigraphy of Bangka Island was composed by Pemali (CpP) consisting of skiss, phillit, mudstone, chert, tuff, gneiss, quartzite and lens insertion limestones. The massive sedimentary rock structure, with the content of the form Fusulinidae and Radiolaria fossils. Tanjung Genting (Trt) in the form of metamorism sandstorms and sandstones with limestone lenses. The Triassic age rocks of sedimentary structures cross maze and contains fossils Montlivaltia moluccana, Perodinella sp., Entrochus sp. and Encrine sp. The formation is stronger folded, fractured and faulted and was not in harmony over Pemali Group and Formation Tanjung Genting on it. Sometimes encountered outcrops of granite which has been weathered. There is also a fresh granite outcrops are exposed as blocks (boulder) granite scattered on the beach., Ranggam (TQr) Consists of sandstone, sandstone clay, with a thin layer of rock and organic matter. These rocks have sedimentary layering structure and cross maze and contains fossils Mollusk be Turitellaterbra sp., Olivia triciment mzt., Cypraea sonderavamart and fossil Foraminifera form Celathus creticulatus Bentos, Ammonia sp., Celcarina sp. and Triculina sp. and molar teeth Pleistocene elephants, Late Miocene Formations this is not aligned on top of Granite Klabat and Alluvium (Qa) In the form of sediments swamp and
river sediments consisting of loose material and spread along the river along the valley and beach. The Quarter-old unit is not in harmony over Rangggam Formation.

Table 1. Regional Stratigraphy of Bangka Island

| Umur          | Stratigrafi (Osberger, 1965)               |
|---------------|-------------------------------------------|
| Holosen       | Sediments swamp and river                 |
| Pleistosen    | Rangggam Formation                        |
| Pliosen       |                                           |
| Miosen        |                                           |
| Oligosen      |                                           |
| Eosen         |                                           |
| Paleosen      |                                           |
| Kapur         | Unconformity                              |
| Yura          |                                           |
| Trias         | Sandstones with limestone lenses          |
| Perm          | Skiss, phillit, mudstone, chert, tuff, gneiss, quartzite and lens insertion limestones |
| Karbon        | Unconformity                              |
| PraKarbon     | Dynamic metamorphic                       |

Structural Geology

According to Katili (1966) from the foregoing discussions the following conclusions can be drawn concerning the structure and age of the Indonesian tin belt:(1) The folding in Upper Jurassic time, corresponding with the Young-Kimmerian phase of diastrophism has produced a number of more or less parallel trending folds in the Indonesian tin belt. The axis of these fold-splunges and rises irregularly. The anticline with the highest amplitude is probably the one which stretches from the Malayan Peninsula over Ipoh and Malacca to Karimun, Sanglang, eastern Singkep and northeast Bangka.(2) The Mesozoic structural trend of Bangka as exposed in the diagrams reflects an S-shaped pattern. The strange shape of Bangka, its coastal line in general reflects the trend of the geological structure, especially the fold axis.(3) The presence of a notable deviation from the general fold-axis direction can be observed in central Bangka. This could be interpreted as another perhaps older pattern of deformation than the Mesozoic one.(4) Faults, fractures and joints in Bangka show many directions. Maxima were found in the same direction as in the Riauw-Lingga Archipelagoviz. North-south, northeast-southwest, east-west and southeast-northwest. All the fault directions in the Riauw-Lingga group, Bangka and Billiton, coincide more or less with the main directions of joints, which show the close relationship between these two structural features. The fracture and joints of the Indonesian tin girdle is closely related to the folding, and can be interpreted as shear, extension and tension fractures and/or joints.(5) Most of the plutons in the Riauw-Lingga group, Bangka and Billiton follow the trend of the fold-axis and are apparently situated in the cores of the anticlines. There are some exceptions like the large Tandjung Pandangranitic body in Billiton and some smaller ones in west and central Bangka, which could be explained by the presence of deep-seated faults or by the action of erosion.(6) Due to the fact that the granitic bodies in the Indonesian tin belt are asa rule follow the structural trend, the general fold-axis directions of the isleland of Bangka as determined from the diagrams, are of importance to trace the continuation of the granites into the sea. This might be valuable for the offshore exploration of new tin deposits.(7) Beside Jurassic granites, a possible occurrence of an older granitiegeneration of pre-Triassic age is suggested in Bangka. Whether this older granite could be related to the postulated older pattern.
Mineral Resources
Based on the results of previous research that many have done that Bangka Island contains many cassiterite minerals (lead minerals) and other minerals as a follow-up mineral. The minerals contained in them are associated minerals of tin: ilmenite, monazite, xenotime, zircon, quartz, galena, pyrite, hematite, and magnetite.

3. Basic Magnetic Principles
This method is based on measuring the intensity of the magnetic field owned by rocks. The nature of this magnet exists because of the influence of the earth’s magnetic field at the time of formation of the rock. The ability to magnetize depends on the magnetic susceptibility of each rock. These objects can be either symptom of subsurface structures or magnetic rocks. Susceptibility is the degree of the magnetization of an object due to the influence of the magnetic field [5]. Based on the value of susceptibilitas divided into groups of material types and rock litology compiler of the earth, namely:
- Diamagnetic, ie minerals that have negative magnetic susceptibility which means the electron orbit in this object is always opposite to the external magnetic field, for example: rock graphite, marble and quartz.
- Paramagnetic, ie minerals that have a positive magnetic susceptibility value and a small value, for example acid frost rocks.
- Ferromagnetic, ie minerals that have large magnetic susceptibility values, such as various igneous alkaline or ultara bases [6].

Earth’s Magnetic Field
The influence of the north and south poles of the earth’s magnet is separated by the magnetic equator. Earth’s magnetic field is composed of three parts: (1) the main magnetic field (main field) is the field that comes from the earth. (2) the external magnetic field (external field) is the field that comes from outside influences earth is the result of ionization in the atmosphere caused by ultraviolet rays from the sun, and (3) the magnetic field anomalies is the magnetic field generated by rocks containing minerals magnetized such as magnetite, titanomagnetite and others that are in the earth’s crust. Earth’s magnetic field is characterized by physical parameters: Declination, Inclination, Horizontal Intensity, Total Magnetic Field [6]. The intensity of the magnetic pole and the maximum value at minimum (zero) at the equator. Because of the different locations there is a difference between the magnetic north and the geography called declination. Polarization direction magnetic objects will be determined by the value of inclination which the object is placed. The theory relating to the magnetism of the earth is known as the dynamo theory. Measurement of Earth’s magnetic field on the surface of a resultant of various variables.

4. Research result
4.1 Lithology of Bukit Sambunggiri
Seen from the lithology of rocks around Bukit Sambunggiri are lithologies, among them are: sandstone, converted stone, generally all lithology is filled with quartz veins and mineral polymetallic veins and granite intrusions. At the location of the existing sandstone study showed metasedimen process whereby multiple locations occupied by quartz veins and pilometalik also has undergone a process of weathering strong as in figure 2.
4.2 Geological Structure of Bukit Sambunggiri
Based from the solid measurement data consisting of 21 shear, has a general direction almost the same that ranges from 50 to 90° E, while the crust dip between 3 – 87°. Shear is divided into 2 which is filled with quartz veins and filled with iron oxide minerals.

4.3 Mineralization
Results from the XRF analysis of 27 samples testing the rock samples showed a link between rock types, physical properties and mineralized content. This was demonstrated by the following samples: sample 1 was a sandstone filled with mineral veins, the results showed that the high Sn element content of 4115.04 ppm indicated the vein contained mineral cassiterite, another sample showing high Sn element content was sample 10 and 11 lithologies in the form of sandstone filled with mineral veins, as shown in FIGS. 4a and 4b, in samples containing high Sn elements also contained significant other elements Ce (87.30 ppm and 142.21 ppm), Fe2O3 (89742.47 ppm and 95268.26 ppm). Of the 2 samples containing Sn (cassiterite) elements associated with minerals containing Ce (monazite) and Fe2O3 (polymetallic).
Mineral content of follow-up can also be seen from several samples including sample number 14 with the content of Mo element amounting to 41.32, TiO2 elements in samples 11, 12, 14, 18, 19 and 21, with lithology samples in laps sandstone filled with polymetallic veins such as figure 5.

4.4 Geomagnetic of Bukit Sambunggiri

The research location is located on Bukit Sambunggiri with line number of 5 line, the elevation value between the measurement points ranges from 26 meters to 103 meters, the number of measurement points of 89 points. The results of geomagnetic data processing obtained in the form of anomalous Total Magnetic Index (TMI) which then done reduction to the equator (RTE).

From 5 lines of geomagnetic survey, RTE value ranges from -44.7 - 13.1 nT. The RTE value is a resultant of a magnet intensity component that is suspected to be related to rocks that have high and low magnetic susceptibility properties at the measurement site. The distribution of anomalous magnetic reduction to the equator (RTE) is generally divided into 3 color groups, ie low anomalies ranging from -44.7 nT to -27 nT, moderate anomalies ranging from -27 nT to -15.5 nT, and high anomalies ranging from -15.7 nT to 13.1 nT. In general, relatively high RTE magnetic anomalies (red) are present in the West - North, whereas relatively low anomalies occur in the Eastern - Southern research area (blue color).

Negative RTE magnetic anomalies are almost dispersed throughout the study area depicting low susceptibility. This is thought to be a sedimentary part of sedimentary rocks or metamorphic rocks that have been decomposed. The distribution pattern of RTE magnetic anomaly tends to enlarge to the northwest (value above 3.1 nT) is a rock that has high magnetism properties, because it is close from the primary sediment source in Sambunggiri hill. While relatively low RTE magnetic anomaly values are spread out to the Southeast, which is thought to be the result of residual primary sediments transported.
Figure 6. Geomagnetic measurement results

Figure 7. Research Location
5. Conclusions
Lithology of rocks around Mount Sambunggiri are lithologies, among them are: sandstone, converted stone, generally all lithology is filled with quartz veins and mineral polymetallic veins and granite intrusions. At the location of the existing sandstone study showed metasedimen process whereby multiple locations occupied by quartz veins and polymetalik also has undergone a process of weathering strong. The location of the study consisted of Shear is divided into 2 which is filled with quartz veins and filled with iron oxide minerals. XRF analysis of 27 samples testing the rock samples showed a link between rock types, physical properties and mineralized content as it comes with mineral cassiterite and iron oxide minerals. From 5 lines of geomagnetic survey, RTE value ranges from -44.7 - 13.1 nT. The RTE value is a resultant of a magnet intensity component that is suspected to be related to rocks that have high and low magnetic susceptibility properties at the measurement site.

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