PROSPECTING OF IRON ORE IN SUBULUSSALAM PENANGGALAN AREA, SUBULUSSALAM CITY, PROVINCE OF ACEH

Andi Ilham Samanlangi [1]*, Adi Tonggiroh [2], Moh.Khaidir Noor [3]
[1,3]University of Combatants of the Republic of Indonesia (UPRI)
[2]Hasanuddin University Geology Studies Program

ABSTRACT

Geologically, the rocks found in the study area consists of metamorphic rocks, intrusive and sediment with geological age differences relatively as indicator the presence of iron metals. This study is an iron ore prospecting conducted to confirm indications of the presence of iron metals and associated minerals and mineral type of metal bonded to iron.By applying methods of field survey and geochemical laboratory, it is known that iron ore in study area consists of two types, namely low grade correlated with the type of metamorphism and high grade correlated with magmatic processes. Study areas include the considerable exploration prospects locations for iron ore mining industry, but still needed to determine the stage of detailed exploration to know model or shape of iron ore deposits. Suggested conducted detailed mapping which aims to determine the distribution of the intrusion igneous rock as hostrock of iron ore.

Keywords : Iron ore, Aceh

INTRODUCTION

Iron ore is metal mineral deposit containing iron mineral (Fe) in varied grades, which is a mineral as results of mineralization from the influence of hydrothermal or due to lateritization. Both of these geological processes produce an iron ore deposit types in nature, and must be used as reference in the survey in the city of Sabulussalam.

Nanggroe Aceh Darussalam, is one of areas that geologically allow for the formation of iron-ore deposits. This paper is a study of some of the outcrops data of intrusive rocks, metamorphic and sedimentary rocks which aim to determine the characteristics of the iron ore deposits. Data and information that already exist show that the iron ore found in the Southeast of Nanggroe Aceh Darussalam, particularly in the city Subulussalam (Figure 1).

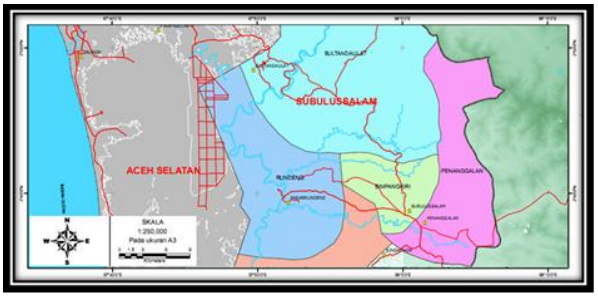

Figure 1. Lokasi penelitian di Wilayah Administrasi Provinsi Aceh

REGIONAL GEOLOGY

Based on Geological map of Indonesia, Sheets Sidikalang and Sinabang (Anthony, 1993 and Geological map of Indonesia, Lembang Sinabang area (Endharto, 1994), regional geology of study area is relatively complex deposited by sediment of gunungpai Pre-Tertiary separated by three Cenozoic deformations, namely faulting and shifting. The oldest rocks are occupied by slate, metashale, metaquarsite arenit. Formation Kluet (Puk) in Late Paleozoic age deposited on the ensialic basin environment, then on it was deposited limestone alternating with mafic volcanic rocks Peusanagan Group late Permian – late Triassic in shallow marine environments are truncated by anik

Takengon fault occured to tertiary. At the late Jurassic - early Trasik, two depositional sequence separated by Geumpang reverse fault and Anu-Batee fault was formed (Woyla Group) in the western and eastern part of the fault. In the western part generally consists of low degree metavolcanic and crystallized limestone, while in the eastern part of Woyla Group the rocks associated with oceanic crust sedimentary, ophiolite.

In the early Tertiary (Eocene - early Oligocene) or tertiary I, formed Meurudu Group consists of Simoneu Formation (Tlsm, slate, metawacke and polymictite conglomerates), Semelit Formation (Tls), Meucampli Formation (Tlm) and Kieme Formation (TLK). On this group was deposited unaligned Gadis Group or tertiary II in Early Miocene – Miocene age.

Central consists of Loser Formation (TLL) and Meurah Buya Formation (TMM). On this group deposited aligned tertiary III or Lhoksukan Group and Hulu Masen group in late Miocen - Plio Pleistocene age. Lhoksukan Group consists of Keutapang Formation (Tuk), Seureula Formation (Tps), Julu Rayeu Formation (Qtjr), Idi Formation (QPL) and Blangkejeren Formation (Qpbl). Hulu Masen Group consists of Tangla Formation (TLT), Kueh Formation (TMK), Tutut Formation (QTT) and Meulaboh Formation (QPM). On top of this group deposited unaligned sediment in Quaternary - Holocene age namely alluvium.

Quaternary sediment (Qh), most deposited in coastal areas (Meulaboh Formation (QPM) and Blangkejeren depression (Qpbl) and lowland areas or rivers such as gravel, sand and clay and alluvium and fluviatil.

Extrusive rock deposited in study area and around derived from Geurendong volcanic (Qtvtu, Qvee, Qvp, Qvns, QVL and Qvtg) Plio-Pleistocene in the middle and the Peut Sague volcanic (Qtvl, Qvs, QVM, Qvmk and Qvps) in the northwest. The rocks consist of andesitic pyroclastic, hornblende andesite, andesitic pumis, dacitic, lava, strongly silificated propylitic andesitic strong and slightly hipabisal. Intrusive rock formed since the Paleozoic to Pleistocene including Serbajadi batholiths (Mpisj) - Palozoik or Mesozoic, reuengeuet stock (Mir) – Earlier cretaceous, Beurleung intrusion (Tmib) - Late Cretaceous - Pleosen, Bateekeubeu intrusion (Tib) - Late Oligocene, diorite (not named) (tid) - Early Miocene - central, Tampeu intrusion (Tit) - Middle Miocene - Late, Bale granodiorite.

LITHOLOGY

Based on the results of geological mapping, stratigraphy in study area composed of sandstone and metamorphic lithology.

Sandstone

Sandstone outcrops distributed in the west, north and south. On the morphology of mountains, its distribution is also limited by the fault follows the flow direction of Batu-batu river. Outcrop conditions generally moderate to strong weathered and experienced metamorphism on fault zones.

Field appearance of sandstone unit is characterized by white, browny white. Another appearance in the field, the sandstone shows quartz mineral content and interspersed with claystone and conglomerate. Claystone colored light gray to gray-brown, elastic, thickness of layers up to 7 cm and generally shaled on the angled layers (Figure 2).

On microscopic observation showed samples of thin slices colored yellow absorption with the colors interference is blackish-gray, clastic texture with mineral shape subhedral-anhedral, good sorting, closed fabric, grain size of 0.02 mm - 0.2 mm. (See attachment of petrographic description). Microscopically, known that the mineral

composition of the mineral units of the sandstone ie: mineral quartz (35 m%, the size of 0.03 mm to 0.07 mm), orthoclase (25 mm, the size of 0.07 mm to 0.1 mm), muscovite (20%; the size of 0,04mm up to 0.1 mm), silica cement (10%) and opaque minerals (10%, the size of 0,03mm to 0,4mm).

Figure 2. Sandstone outcrop (a), contain quartz mineral show in turs with claystone (b), (c) sandstone outcrop in hill morphology

Metamorf

Metamorphic rocks in the study area is divided into two types namely metasandstone and metamorphic rocks. While the metamorphic rocks, there are non-mineralized and mineralized.

Metasandstone

Metasandstone unit distributed in the southern part, northern area of investigation. Distribution of rocks generally follow the patterns of geological structures indicated sandstone experienced metamorphism. Field appearance of sandstone unit is characterized by white, browny white, hard enough when scratched with a magnetite pen that illustrated the process of silicification on surface rock. Another appearance in the field, metasandstone shows a pattern of silicification toward the alteration process of silica in contact with andesite rocks. Lithology characteristic in this metastandstone outcrop predicted as members Kluet Formation (Figure 3).

Figure 3. Metasandstone outcrop

Non-Mineralized Metamorphic Rocks

Metamorphic unit is generally distributed on the east and the north, the south area of investigation. Distribution of rocks generally follow geological structures patterns indicated sandstone experienced metamorphism. Metamorphic lithologies consist of metashale, meta-quartzite characterized by white, whitish gray, browny gray, strongly silificated and protolith due to the influence of metamorphic phase. Generally found as fragments of gravel and boulder and experienced weak to moderate oxides intensity. Based on the appearance of the field, this metamorphic rocks, showed the same lithology characteristics as a member of Kluet formation (Puk) in Cretaceous – Perm age.

Mineralized Metamorphic Rocks

This mineralized metamorphic rock units generally have structure contact with sandstone and metamorphic units. Directions of geological structure contact found in the form of systematic joint structure that the trend relatively in southwest northeastern. Field appearance of mineralized metamorphic rocks are gray-green, dark gray to blackish gray. Experienced moderate to strong silicification and found mineralization of pyrite, chalcopyrite, manganesse and geotit. The presence of mineralization indicated that the mineralized metamorphic is part of propylitic alteration systems.

METAL MINERAL

To determine the composition of the metals contained in the study area, conducted a laboratory analysis of rock. It is known that a metamorphic lithology experienced mineralization actually found mineral, as follows: pyrite; Cinnabar); chalcopirite; Sphalerit; galena; Copper and gold. Minerals are assembled within the void of rock fused with silica minerals (figure 4).

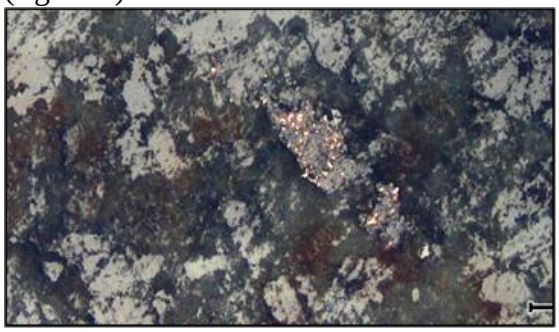

Figure 4. Microscopic photo of the metal composed rock

Silica influence is very dominant which the result of mass recrystalization by showing anhedral shape. This is because of the change of constituent mineral of metamorphic rocks and caused formation of a metal mineralization of pyrite; chalcopirit; cinnabar; Sphalerit; galena; Copper and gold.

Iron Ore

The presence of iron ore metal minerals on mineralized metamorphic rock, blob-shaped metal as mineral hematite, oxide iron and shaped. Blob of this metal is covered by silica mineral and fill in the cracks of rocks, so it's obviously megascopic appearance that except iron ore also contained mineral pyrite, and galena calcopyrite. (Figure 5).

Figure 5. Field appereance of mineralyzed metamhorpic rock and show quartz mineral and iron ore.

Geochemistry Laboratory tests, X-ray fluorescense (XRF) on two sample groups (01a, 01B, 01C, 01D and 02a, 02b, 02C, 02d) of metamorphic rock that are composed of minerals (mineralized). In the sample group (01) known to some of the data range of iron ore grade percentage, as follows: iron ore (2.73% to 4.53%), iron oxide (2.46% to 4.08%). Based on data from iron ore, that the iron ore contained in rocks is the outer layer of an iron mineral formation system. This is a description that grade fluctuation of iron ore was caused by the influence of genetic and chemical conditions. This influence caused the enrichment process of iron ore is not the maximum and do not correlate with rock metasediment. The indication that the iron ore contained in metamorphic rocks associated with copper metal.

The composition of the iron ore in groups of samples 02, mineralized metamorphic rock known have composition of iron ore (71.3% to 82.1%) and iron oxide is (46.2% to 57.39%). The iron ore grade data when compared to the commercial value of the standard made by Gross (1977), namely iron ore (± 40 to 60%), therefore the iron ore in research areas is eligible. The data sample of groups 02 illustrated that the iron ore grade is part of the iron ore mineralization directly related to a genetic of magma solution. Indicated there are type of intrusive rocks as a hostrock of iron ore.

CONCLUSION AND SUGGESTIONS

- The study area includes considerable exploration prospects location for the iron ore mining industry, but still needed the stage of detailed exploration to know model or shape of iron ore deposits.
- It is recommended to do the detailed mapping which aims to determine the distribution of intrusive rocks as hostrock of iron ore.

REFERENCE

Anthony, Aldiss,DT., 1993,***Peta Geologi Indonesia Lembar Sidikalang dan Sebagian Sinabang***, Puslitbang Geologi, Bandung.

Endharto.M,dkk.,1994, ***Peta Geologi Indonesia Lembar Sinabang, Puslitbang Geologi***, Bandung

Gross, G.A. (1965): ***General Geology and Evaluation of Iron Deposits***; Volume I, in Geology of Iron Deposits in Canada, Geological Survey of Canada, Economic Geology Report 22. Gross.G.A,Gower.C.F,Lefebure.D.V .,1977, ***Magmatic Ti – Fe ± V Oxide Deposits***, Geological Survey of Canada.

Guilbert, G.M. dan Park, C.F., JR, 1986. ***The Geology of Ore Deposits,*** W.H. Freeman and Company, New York.

Harben, P.W., 1995, ***The Industrial Mineral Handbook***, 2nd Edition, Warwick Printing Company Limited, Warwick , England.