Characteristics Of Silica in Mountain Area Tapa and Surrounding Areas of Tulang Bawang Regency Lampung Province

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Abstract

Silica sand is an industrial mineral that consists of silica crystals (SiO_2). Quartz sand has a combined composition of SiO_2, Fe_2O_3, Al_2O_3, CaO, MgO and K_2O, clear white or other colors depending on the impurity compound. Meanwhile, the results of a survey by the Center for Mineral Technology Research and Development in 2013, quartz sand production continues to increase every year, namely around 28.30% per year. The Silica Sand research in the Mount Tapa area and its surroundings aims to find out the characteristics of the Silica Sand that is distributed in the area. This is done because there has been a lot of illegal silica sand mining by local communities. Illegal mining carried out by local residents uses traditional tools and mining carried out by local residents tends to not pay attention to the impacts that will be had in the future. The method used in this research uses XRF and Petrograph Analysis. This research aims to obtain information about the characteristics of silica sand found in the Mount Tapa area and its surroundings.

Keywords: *Silica Sand, Characteristics, Mount Tapa*

I. INTRODUCTION

Silica sand, which is an industrial mining material, usually consists of... from silica crystals/minerals (SiO_2). Silica sand also has a combined composition from other elements such as SiO_2, Fe_2O_3, Al_2O_3, CaO, MgO dan K_2O, the color that the results produced usually depend on the impurity compound. Based on the results survey of the Mineral Technology Research and Development Center in 2013, results Silica sand production continues to increase every year, ranging from at 28.30%/year [7].

White sand or usually also known as silica sand, silica sand is one of the... the most abundant non-metallic minerals in Indonesia. Some areas Indonesia which consists of acidic igneous rocks which are the main source silica minerals, that is one of the reasons why this type of non-metallic mineral often quite abundant in Indonesia. This silica sand is included in the group non-metallic mineral mining. Based on Law No. 3 of 2020 regarding "Mining of Minerals and Rocks" silica sand is a type of non-metallic mineral mining due to the industrial mining materials taken and only the silica content is utilized. As one of the potential mining materials industrial minerals, Silica sand is also regulated in (PP No. 1 of 2017 concerning Fourth Amendment to Government Regulation Number 23 of 2010 Concerning Implementation of Mineral and Coal Mining Business Activities).

Silica sand has several properties and characteristics that make it ideal for use in water purification. First, silica sand has grains that are porous, which allows water to flow through it. During the process purification, silica sand can hold solid particles such as mud, soil, and organic substances dissolved in water. This occurs because of the pore structure of the sand silica which can filter these particles, thus improving water quality [2].

The study of silica sand has many uses, both in everyday life everyday life and as a market commodity, so it is important to study. For example, the importance of silica sand includes its role in water purification. Silica is used as a filter medium to remove particles. pollutants from water. Metal casting with chemical purity of silica sand helps prevent unwanted interactions between the mold and the molten metal. Construction industry Silica sand is a major structural component in a number of construction products, such

as flooring, mortar, cement, roofing shingles, and asphalt. Other industries Silica sand is also used in the glass, ceramics, textiles, paper, cosmetics, electronics, paint, film, and toothpaste [2].

The aim of this Silica Sand research in the Mount Tapa area and its surroundings is to find out the characteristics of Silica Sand that is spread in the area This is done because there is already a lot of Silica Sand Mining illegally by the local community. Illegal mining is carried out by local residents using traditional tools and mining which has been done by local residents, this tends not to pay attention to the impacts the impact that will be obtained in the future if this activity continues.

Geological Engineering Study Program, Faculty of Science and Technology, University of Jambi requires students to complete a final assignment as a requirement in completion of academic studies with the aim of applying the theory obtained in college and provides experience and adds field insight in understanding the field of resource geology and environment. For that reason, the title taken in this Final Assignment is "Geology and the Characteristics of Silica Sand in the Mount Tapa area and its Surroundings, Tulang Bawang Regency, Lampung Province".

II. MATERIALS AND METHODS

A. Research Location and Time

The activities in this research were carried out at PT. Masurai Geo Solutions (MGS), the research implementation began in February-May 2024 which was located in Mount Tapa Area, Tulang Bawang Regency, Lampung Province.

B. Research Methods

The research methods used in this Final Assignment consist of five stages, namely literature study, data collection, data processing and data analysis, Data Interpretation and Discussion, and Discussion and Report Preparation.

C. Research Stages

With the aim of obtaining the data needed in preparing the report This means that several methods are used:

1. Level Of Preparation
   At this stage, a literature review was conducted from various references to support research. In addition, it also prepares a tentative map that is made using the ArcGis application by combining information from maps topography, regional geological maps and drainage pattern maps obtained from maps Indonesian Landforms and Geological Survey Center.
2. Data Collection Stages
   Field data collection and retrieval is carried out during the research, the data collected is data related to the research The data required consists of Geological, Geomorphological, Test Wells data resulting from the drilling procces, stratigraphy.
3. Surface Data Studio Analysis Stage
   This stage is carried out by using surface mapping data in the form of geomorphological data that will become a geomorphological map, rock unit data, data the structure that will become a geological map and documentation results, coordinates and description will be tabulated data. This stage is the stage where the data can be obtained directly from The field is presented in the form of maps including geomorphological analysis, analysis carried out to determine the original form and shape of the land, geological structure analysis and stratigraphic analysis. This determination is made based on observations field morphology and interpretation of *National Digital Elevation Model data.*

   Structural geological analysis is carried out to determine the type of fracture and the type of fault. based on measurement data of plane structure and line structure. Stratigraphic Analysis used to determine the sequence or arrangement of rocks from the oldest to the youngest youngest and know how the stratigraphy of rocks relates, which will carried out during the collection and processing of field data.
4. Petrographic Analysis Stage
   At this stage, thin section analysis is carried out on rock samples. Analysis will be carried out at the Geoaccess Laboratory. The estimated sample to be analyzed about two rock samples with different types of rock samples. The method used is the parallel nicol observation method (PPL) and crossed nicol observation (XPL). Parallel nicol observations are made with polarized light in one direction so that the direction of vibration is parallel to one of the cross threads. Optical properties of minerals observed in the form of light penetration, inclusions, shape, cleavage and fractures. Meanwhile, observations of crossed nicols are carried out with polarized light.in two times so that the vibration direction is perpendicular to the cross thread. S composition, texture and mineral structure and rock name of the sample [3].
5. Level of XRF Analysis
   Ray fluorescence (XRF) is a fast, non-destructive, analytical method. and environmentally friendly with excellent accuracy and reproducibility. high. All elements in the periodic table from beryllium to uranium can measured qualitatively, semiquantitatively and quantitatively in powders, solids and liquids.

Almost any solid or liquid material can be analyzed, if the standards are adequately available. For rocks and minerals, typical commercial instruments requires a sample to be at least a few grams of material, although The samples collected may be much larger. For chemical analysis of rocks XRF, samples are collected that are larger than the largest grain size or particles in the rock. Sample testing was conducted at the PSDMBP Laboratory.

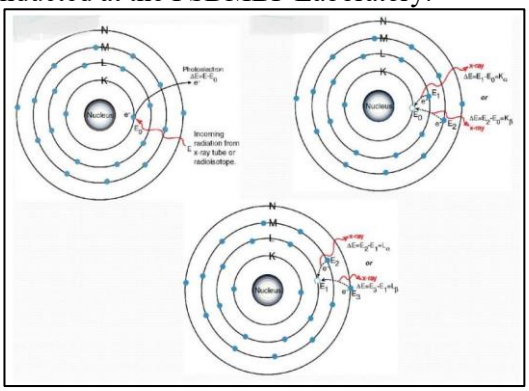


Figure 1. Principle of X-Ray Analysis

Fluorescence X-ray methods are commonly used for both qualitative analysis both quantitative and quantitative. Commercially available equipment, in general, based on two types of geometry. The first type uses flat crystal planes to refract and reflect *fluorescent X-rays.* The sample is irradiated with primary X-rays from an X-ray tube and X-rays excited fluorescence reflected on a flat crystal surface to disperse or diffract into its component wavelengths which is reflected back by a good collimator and detected and measured with appropriate electronic components.

6. Data Presentation and Report Preparation Stage
   This stage is the final stage in research, where the data is has been analyzed and processed will be combined to create a summary and conclusion which is compiled in the final assignment report. The results presented are in the form of a unit map rocks and cross-sections, geomorphological maps and cross-sections, profiles measured stratigraphic cross-sections, track maps, drainage pattern maps and profiles.
7. Research Flowchart
   Based on which is a flow chart in this study, the chart This flow explains the research series from the beginning to the case study. raised in the research area, the following is the research flow chart:

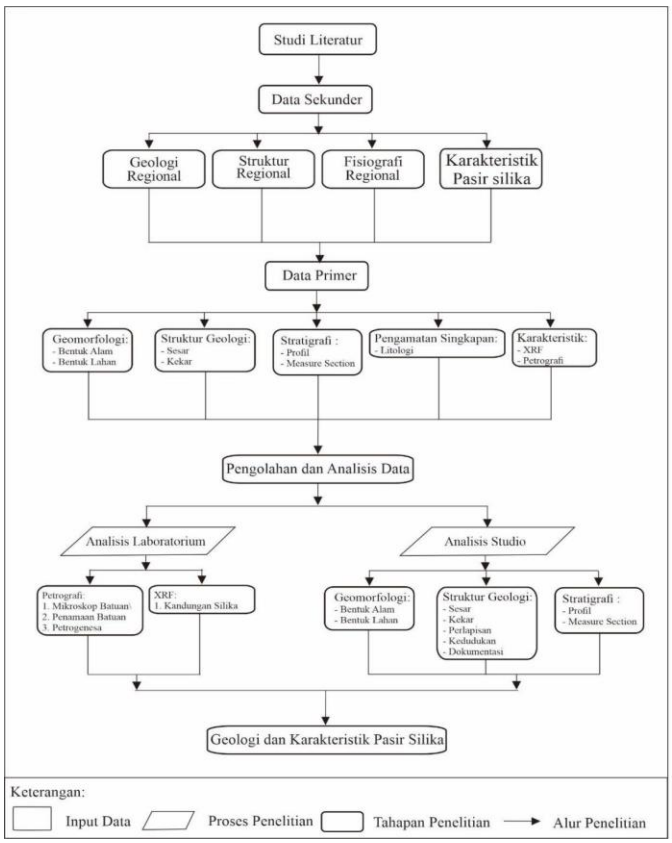


Figure 2. Flow Chart

III. Results and Discussions

A. Geology of The Mount Tapa Area

1. Geomorphology of the Research Area

The drainage pattern is a collection of the smallest parts of a river flow. on rocks that have weathering or not and are occupied by rivers permanent. To assist in the interpretation of flow patterns in the research area. then the author classifies it based on the type of flow pattern created by [6].The flow pattern in the research are is included in Dendritic flow pattern category.

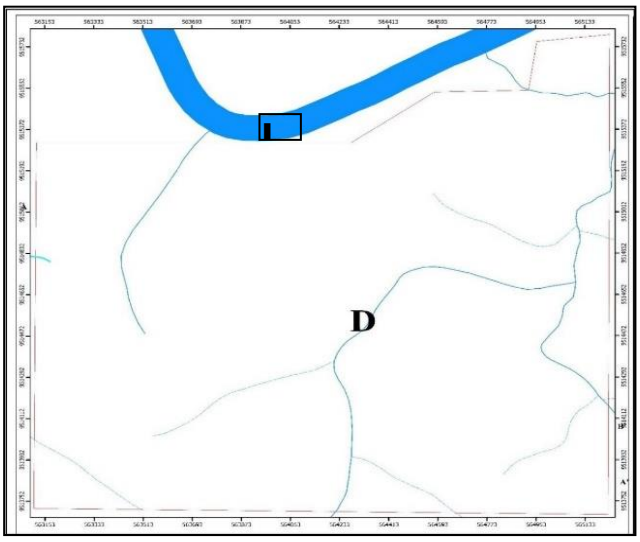


Figure 3. Drainage Pattern of the Research Area (Modification based on Howards, 1967).

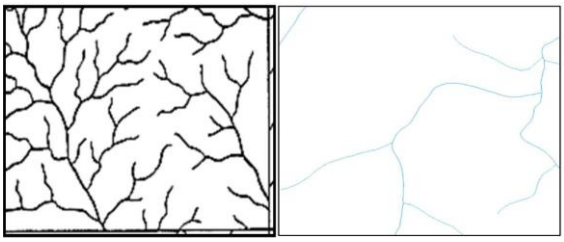
One of the factors that could be the absence of a drainage pattern in the research area is caused by conditions of relatively low topography and water sourcesused in the research area originates from the main river.

River Flow Pattern

Based on spatial data analysis sourced from the Geospatial Agency Indonesia (BIG) with modified DEM data to form a watershed. Supported field observations in the form of river flow forms and patterns, structural control and The lithology of the rocks that make up the research area shows a flow pattern that can be found found in the research area in the form of Dendritic and *Local Meandering.*

I. Dendritic

Dendritic flow patterns are found in almost all areas of the research area, stages of river development in the research area are included in the stages adult. The adult stage is characterized by the beginning of the flood plains, then forming a meander. At this stage, the flow of the river has already shown balance of vertical erosion rate with lateral erosion rate. The current stage also characterized by bends or river bodies that meander regularly with the direction of the turn reaching more than half a circle. The turn separated from the river because the flow returns straight through when it meets (Howard, 1967). The research area is a lowland area with height 0-20 meters above sea level is composed of sedimentary rock lithology such as sandstone.



Picture 4. A)Dendritic drainage pattern (Howards, 1967) b) Drainage pattern of the research area

II. Local Meandering

At this stage the river current has shown a balance in rate. *vertical* erosion and lateral erosion rate. Erosion balance at river flow stages creating the formation of this flow pattern. This flow pattern is located south of the area The research is dominated by the lithology of sand and clay swamp deposits.

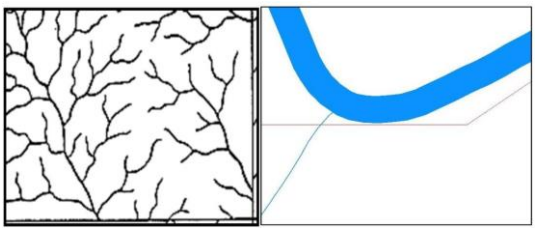


Figure 5. a) Local meandering drainage pattern (Howards, 1967) b) Drainage pattern of the research area

2. Morphology

Discussion of the geomorphological conditions of the research area cannot be separated from conditions of landforms, genesis, and geomorphological processes that occur in it. In determining the geomorphology of the research area, this was done through approach regarding the identification of various morphological elements found in field and adjusted to what is on the topographic map. Basic separation and naming of geomorphological units in the research area refers to [10] classification of the main aspects of determination in analysis Geomorphological mapping and landform classification can be seen in (Table 1).

Table 1. Geomorphological Classification of the Research Area

Aspek Geomorfologi / Satuan Geomorfologi		Rawa	Dataran Nyaris	Tubuh Sungai
		F4	D5	F1
Morfologi		Rawa	Dataran Nyaris	Tubuh Sungai
Morfologi	Morfografi	Lahan dengan genangan air	Permukaan lahan yang menurun ketinggiannya	Lembah bergelombang dan landai
Morfologi	Morfografi – Relief	Rendah	Rendah	Rendah
Morfologi	Morfografi – Elevasi	0-4 mdpl	4-19 mdpl	0-2 mdpl
Morfologi	Morfografi – Pola Pengaliran	-	Dendritik	Local Meandering
Morfologi	Morfografi – Bentuk Lembah	U	U	U
Morfologi	Morfoganesa – Morfostruktur Aktif	Lahan genangan air secara ilmiah secara terus menerus atau musiman	Permukaan hampir datar akibat proses denudasional	Diperngaruhi oleh erosi
Morfologi	Morfoganesa – Morfostruktur Pasif	Tersusun dari batuan resistensi lemah	Tersusun dengan batuan resistensi lemah dan memiliki lapisan(layer)	Resistensi batuan lemah
Morfologi	Morfodinamik	Erosi	Erosi	Sungai

In this research area, many geomorphological processes have occurred, both exogenously and endogenously. Exogenous geological processes include weathering and erosion. This exogenous process is influenced by humidity and sufficient rainfall. height and lithology of the rock composition found in this research area dominated by sedimentary rocks in the form of claystone and sandstone, which The rocks have undergone a lot of weathering. While in the endogenous process in the form of geological structures in the form of folds that influence the shape of the land in the area research. With the existence of exogenous and endogenous processes, the span nature that exists in the research area can be formed. In this research The results of the morphological formations are made in the form of geomorphological maps and tables. based on the applicable classification.

Based on the topography of the low research area, with Thus, the morphology of the research area falls into the category of land forms which are dominated by lowlands, river bodies and swamps. Based on the conditions classification, the morphology of the research area can be concluded into 3 parts. The geomorphology of the research area can be seen in.

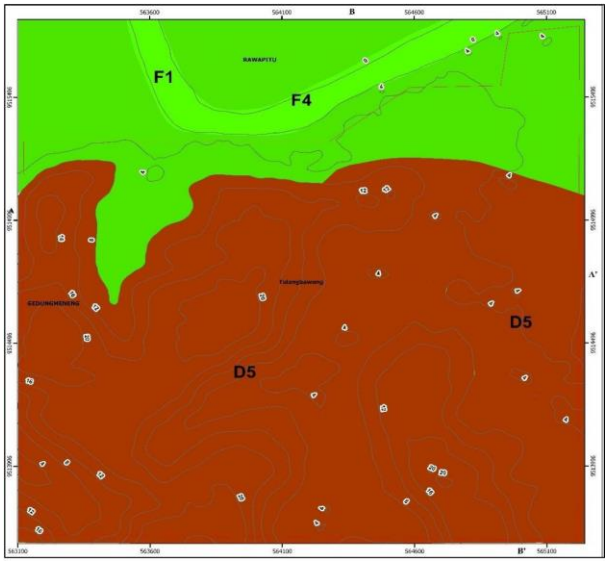


Figure 6. Geomorphology of the Research Area (Rahmadi, 2024)

Based on the division of geomorphological unit classification according to [10] supported by the results of interpretation, direct observations in the field and remote sensing method using DEM data can conclude the form The geomorphological units in this research area are divided into three units geomorphology is almost plain (D5), river body (F1) and swamp (F4). Based on the shape of the land, it has certain aspects different geomorphologies that characterize each form land. These landform units are then presented in a geomorphological map. where each geomorphology shown on the map is the result of how conditions of the research area and analysis has been carried out based on existing classifications for geomorphology.

A. Near Plain (D5)

Plains are almost plains that decrease in height because denudacial influence. The Nyari Plain is one of the geomorphologies that exist in the research area.

Figure 7. Morphological Unit of the Near Plain of the research area with an azimuth direction of N 314°E of the photo to the Northwest (Coordinates x: 563879 and y: 9514600)

In the form of land in this research area consists of the Nyari Plain. Naming in this unit it is based on outcrops in the field which are the result of the influence of denudation in the form of erosion and weathering. In general, the exposure of the research area is controlled by the process weathering and erosion of rocks. This unit occupies 60% of the research area. with an altitude of 8-20 meters above sea level and is characterized by the morphology of the Nyari plains with plains with gentle hills. The exogenous processes that influence are weathering and erosion. Based on the influence of existing exogenous processes in the research area, this natural form can be formed in the research area which almost dominates the research area. This almost plain land form dominated by land forms in the form of community plantations which become agricultural land mainly growing vegetables and sick and there are still some parts of This natural form is filled by the surrounding forest.

B. River Body (F1)

The landform of this research area is usually called the river body, The naming of this landform is based on the conditions in the area. research which is the result of denudational processes. In general, outcrops which is controlled by the process of rock sedimentation, both claystone and sandstone. This unit of river body morphology occupies 10% of the area research with an altitude of 0-2 meters above sea level and can be characterized by the conditions of The river body has a gentle slope and is located in a small part research area, this region has a local meandering flow pattern.

Figure 8. Morphological Unit of River Body in the research area with photo azimuth direction to the west (Coordinates x: 2121212 and y: 1391893891)

C. Dance (F4)

Swamps are part of natural forms by paying attention to morphology. that exist in the research area, starting from the forming factors and conditions in research area Figure 16.

Figure 9. Swamp Morphology Unit of the research area with azimuth direction N112°E of the photo to the Southwest (Coordinates x: 563739 and y: 9514313)

In the form of land in this research area consists of swamps. The naming of This unit is based on outcrops in the field which are the result of the influence of fluviation in the form of weathering. In general, the exposure of the area The research was controlled by the weathering process on the mudstone. This unit occupies 40% of the research area with an altitude of 2-8 meters above sea level and characterized by alluvial plain morphology Exogenous processes that affect is weathering. Landforms are dominated by plantations and forests.

3. Stratigraphy

Based on observations and data collection in the field, the results obtained in the form of rock lithology, measured stratigraphic cross-sections, and comparing each lithological characteristics of rocks that have similarities.

Table 2. Stratigraphic column of the Mount Tapa area

UMUR				SIMBOL	FORMASI	KARAKTERISTIK FORMASI
Masa	Zaman	Kala				
KENOZOIKUM		Holosen		Qs	Qs	Lumpur, Lanau dan Pasir Lempung, Lanau dan Pasir Pasir Kuarsa
		Plistosen		QTk	Qs	
	Neogen	Pliosen	Akhir			Tuf batuapung, batupasir tufan, batupasir sisipan batulanau dan batulempung
			Tengah			
			Awal		QNk	
		Miosen	Akhir			
			Tengah			
			Awal			

Based on the combination of all data by following the division and layout unofficial name according to the Indonesian stratigraphic code (SSI) 2023. Based on this The research area can be grouped into 4 rock units based on age. old to young, namely Swamp Deposit Sandstone and Kasai Sandstone.

Figure 10. Geological Map of the Research Area (Rahmadi, 2024)

Petrographic analysis in determining rock types, the author also uses thin section analysis method in the form of petrographic analysis which aims to identify the mineral composition of the rock so that the name can be determined definitely rocks. The researcher's petrographic analysis consists of 2 rock samples, namely Kasai sandstone unit and Rawa Sand Deposit.

The Kasai sandstone unit in the research area has the following types: different content at each sampling location. The samples tested is a representative sample of the Kasai formation in the research area.

Sampel 1

This sandstone unit is spread across the northwest of the research area, including 32.34% of the research area and with an elevation of 4-25 meters above sea level. This rock partly exposed on the banks of the main river which forms a U and some of which are exposed in the plains area of the research location. Macroscopically, The samples in the research area have a fresh light brown color and weathered color whitish brown, structure in some places layered with inserts in the form of sandstone with fine to coarse sand grains having a degree of circular rounding.

Meanwhile, to determine the age of the Kasai sandstone unit (QNk), the author referring to regional geology according to Suwarna et al. (1992) namely the age of Late Miocene.

Figure 18. A) Kasai Sandstone Outcrop, B) Enlarged Kasai Sandstone Outcrop (Coordinates x: 293404 and y: 9712474)

Thin section observations were carried out on siliciclastic sedimentary rock samples. with 4x ocular magnification and 10x objective magnification. It has a texture with size of clay sand (0.001-0.004 mm) to medium sand (0.1250-0.250 mm), degree of roundness pointed – slightly rounded, closed packing, inter-grain relationship floating. The composition of the rock is composed of quartz, lithic, matrix. Based on The explanation is based on macroscopic observations in the field with the formation of samples in the research area.

After macroscopic observations have been made, it is necessary to carry out microscopic observation to maximize the results of rock naming, which requires cutting of rock samples Figure 19.

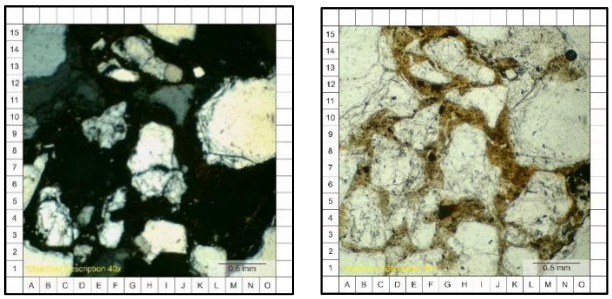


Figure 11. Petrographic Section of Kasai Sandstone (a) PPL (Plane Polarized Light) Parallel Nikol and (b) XPL (Cross Polarized Light)/Parallel Nikol

With microscopic description the grains consist of Quartz (H8) – 60%. In PPL colorless absorption color, low relief, no pleochroism, crystal form anhedral, no cleavage. In XPL the interference color is gray-white order 1, wavy dark corners, no twinning. Lithic (L13) – 4%. In PPL brown absorption color. In XPL the interference color is brown. Consists of a mixture micron-sized silicate and iron oxide materials. Matrix (G4) – 36%. In PPL black absorption color, low relief, no pleochroism, euhedral crystal form– anhedral. In XPL the first order black interference color, twinning is absent.

Based on the results of the microscopic description, the value of mineral content in sample 1 research area. Microscopic results can assist in naming rock types using classification. The classification commonly used in sedimentary rocks, usually uses classification based on Pettijohn's Classification (1975) using the Diagram QFL. The QFL diagram is part of the Pettijohn classification which is used to determine the naming of rock lithology based on its aspects, which are The naming of this rock lithology is based on the material that makes it up, such as Quartz (Qz), Matrix (M), and Lithic Fragments (L). The results of the lithology plotting Airbenakat sandstone using the QFL diagram can be seen in Figure.

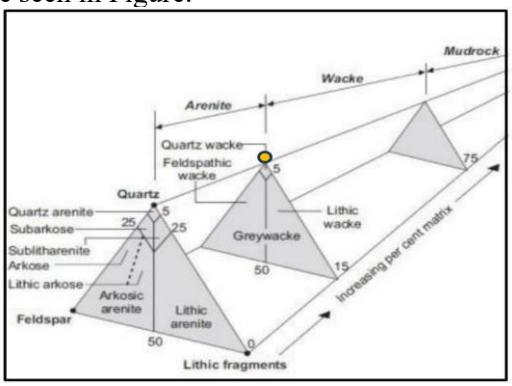


Figure 12. Results of Airbenakat Sandstone Lithology Plotting Using the QFL Diagram (Pettijohn, 1975)

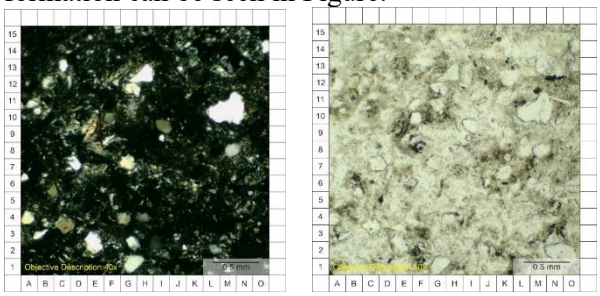
Figure explains that to determine the name of the sandstone lithology Kasai used the QFL diagram Pettijohn, 1975. Mineral composition of sandstone This is Quartz (H8) – 60`%, Lithic (L13) – 4%, and Matrix (G4) – 14%. So for the last name of this sandstone lithology is Wacke. While fragments of this sandstone lithology, namely quartz of 60%. So for The first name of this sandstone lithology is Quartz. So, the lithology name of This sandstone is Quartz Wacke according to Pettijoh (1975).

Sample 2

This second sample was taken from the Kasai formation which is located in the southwest. research area. This second sample is at a relatively high altitude compared to the first sampling in the lowland area. This second sample was taken for laboratory testing as comparative material of the types of sand characteristics found in the same formation with the mineral content found in rock samples from the formation the same. This comparison is also used as company archive data material for supporting data in the research location area.

Figure 21. A) Kasai Sandstone Outcrop, B) Enlarged Kasai Sandstone Outcrop (Coordinates x: 293404 and y: 9712474)

Thin section observations were carried out on siliciclastic sedimentary rock samples. with 4x ocular magnification and 10x objective magnification. It has a texture with size of clay sand (0.001-0.004 mm) to medium sand (0.1250-0.250 mm), degree of roundness pointed – slightly rounded, closed packing, inter-grain relationship floating, well sorted. The composition of the rock is composed of *quartz, lithic, matrix.* The petrographic section of the sand of the Swamp Deposit formation can be seen in Figure.

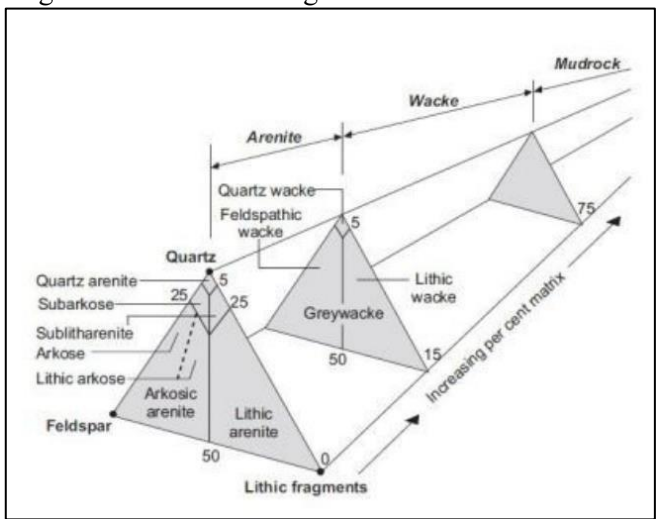


Gambar 1. Sayatan Petrografi Batupasir Kasai (a) PPL (*Plane Polarized Light*)/Nikol Sejajar dan (b) XPL (*Cross Polarized Light*)/Nikol Sejajar

With microscopic description the grains consist of Quartz (A5) – 40%. In PPL colorless absorption color, low relief, no pleochroism, crystal form anhedral, no cleavage. In XPL the interference color is gray-white order 1, wavy dark corners, no twinning. Lithic (C4) – 7%. In PPL brownish yellow absorption color. In XPL

the interference color is brown. Consists of a mixture of micron-sized silicate and iron oxide materials. Matrix (D7) – 53%. In PPL the absorption color is black, the relief is low, there is no pleochroism, the crystal form is euhedral – anhedral. In XPL the interference color is black of order 1, with the presence of There are no twins in the sample results.

The naming of this rock lithology is based on the Pettijohn Classification (1975) by using the QFL Diagram, which names the lithology of these rocks based on the constituent materials, such as Quartz (Qz), Matrix (M), and Lithic Fragment (L). The results of the lithology plotting of Kasai sandstone using the QFL diagram can be seen in Figure 23.



Gambar 2. Hasil Pengeplotan Litologi Batupasir Endapan Rawa menggunakan Diagram QFL (Pettijohn, 1975)

Figure 23 explains that to determine the name of the sandstone lithology Kasai used the QFL diagram Pettijohn, 1975. Mineral composition of sandstone This, namely Quartz (A5) – 40`%, Matrix and Lithic (D7) – 7%. In the calculation results The matrix of this sandstone lithology, namely the Oxide Matrix is 53% which which includes 15% - 75% according to Pettijohn (1975). So for naming The back of this sandstone lithology is Wacke. While the fragments of this lithology This sandstone, which is quartz, is 40%. So for the naming of the front of The lithology of this sandstone is *Quartz.* So, the lithology name of this sandstone is Lithic Wacke according to [8].

Swamp Sand Deposits

This sandstone unit is spread in the northeastern part of the research area including 32.34% of the research area and with an elevation of 0-4 meters above sea level. This rock partly exposed on the banks of the main river which forms a U and Some of it is exposed in the plains area of the research location. It has a fresh color whitish brown and grayish brown weathered color, structure in some places layers with inserts in the form of fine to coarse sandstone grains has a degree of rounding. In addition, impurity materials such as Mud is also found in the swamp sand deposit samples in the research area.

Meanwhile, to determine the age of the swamp deposits (Qs), the author refers to Regional geology according to [9] is Quarter age. At the age of Quarters formed during a period of tectonic calm make this formation still in the part of the South Sumatra basin which is dominated by formations young rocks. The Kasai sandstone outcrops can be seen in Figure.

Gambar 3. A) Singkapan Endapan Pasir Rawa, B) Perbesar Singkapan Endapan Pasir Rawa (Koordinat x: 293404 dan y: 9712474)

Observations of samples of swamp sand deposits were carried out macroscopically or in terms of field description using the naked eye. This is done because in These swamp sand deposit samples cannot be tested in the laboratory. The samples in this swamp sand deposit have a form of material that is has not been rocked like sedimentary material in general. Sedimentary material in

This formation is caused by the fact that the rock formation process has not yet occurred, which causes Sedimentary material that has not been properly lithified is still piled up like layers or layers of sedimentary material alone. Field appearance at the location This swamp sediment is still mixed with other materials such as wet mud. This is influenced by the morphological conditions of the area in which the formation is located. in swampy areas that have peat land and locations close to the big river which big river is way river Tulang Baong. Weather conditions are also one of the factors that cause the area become wetlands or become swamps that are flooded by water, making the process sampling is still relatively difficult due to the presence of water. However, with conditions like this can still be seen in the appearance of sand in swamp deposits. mixed with mud accompanied by the appearance of quartz.

In terms of field description, this swamp sand deposit sample is considered difficult to obtain. described. The appearance of the sample mixed with mud material makes description is quite difficult. However, the clear appearance of quartz in the sample can be a supporter that the wealth of silica sand in the research area It is indeed fairly evenly spread throughout the areas in the location. research precisely in the Mount Tapa area and its surroundings.

Swamp Clay Deposits

This clay unit is spread across the northern part of the research area, covering 15%. from the research area and with an elevation of 0-4 meters above sea level. These rocks are partly exposed on the banks of the main river which forms a U and part of it exposed in the plains area of the research location. Has a fresh brown color whitish and grayish brown weathered color, structure in some places layering with quartz inserts in the form of fine to coarse sand grain sizes having a degree of circular rounding. In addition, dirty materials such as mud are also present on samples of swamp clay deposits in the research area.

Meanwhile, to determine the age of the swamp deposits (Qs), the author refers to Regional geology according to Suwarna et al. (1992) is Quarter age. At the age of Quarters formed during a period of tectonic calm make this formation still in the part of the South Sumatra basin which is dominated by formations young rocks. The outcrops of swamp clay deposits can be seen in Figure 21.

Gambar 4. A) Singkapan Endapan lempung Rawa, B) Perbesar Singkapan Endapan Lempung Rawa (Koordinat x: 293404 dan y: 9712474)

Observations of the swamp clay sediment samples were carried out macroscopically. or in a field description using the naked eye. This is done because In this swamp sand deposit sample, direct testing cannot be carried out. laboratory. The samples of this swamp clay deposit have the form of undecomposed material such as sedimentary material in general. MaterialThe sediment in this formation is caused by the fact that the rock formation process has not yet occurred. causing sedimentary material that has not been properly lithified to still accumulate such as layers or layers of sedimentary material only. The appearance in the field on The location of the swamp deposits is still mixed with other materials such as mud wet. This is influenced by the condition of the morphology of the area in the formation which is located in a swampy area that has peat land and a location that close to a big river which is the way river Tulang Bawang. Weather conditions are also a factor. causing the area to become a wetland or a flooded swamp by water, making the sampling process still relatively difficult due to the presence of water. Such conditions can still be seen in the appearance of clay deposits swamp mixed with mud accompanied by the appearance of quartz.

Based on field description, this swamp clay deposit sample is considered difficult to obtain. described. The appearance of the sample mixed with mud material makes description is quite difficult. However, the clear appearance of quartz in the sample can be a supporter that the wealth of silica sand in the research area It is indeed fairly evenly spread throughout the areas in the location. research precisely in the Mount Tapa area and its surroundings.

4. Structure Geology

In this research area, namely the Mount Tapa area, there is a geological structure such as folds. In this research area it is included in the Geological Map Sheet Manggala, there are quite interesting tectonic activities such as folding.

Where the relationship between folds and straightness is directly proportional to the foldsb and straightness because straightness and folds always intersect the stress direction, if straightness is west-east then the direction of stress is north-south and if direction southeast-northwest straightness then the fold is oriented southeast-northwest.

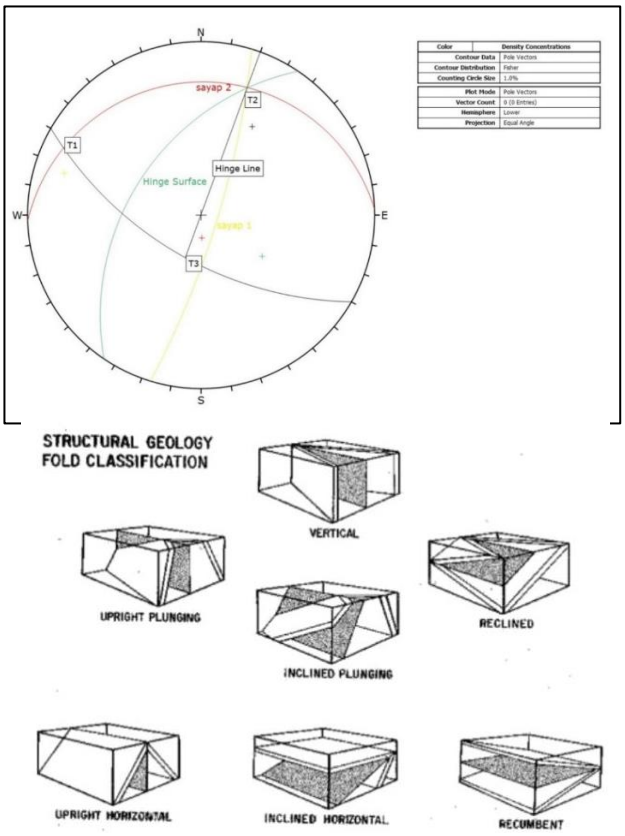
Mount Tapa Anticline Folds

The Mount Tapa anticline fold is located in the western part of the research area, which is located at Lp 8 and Lp 15. The location of the folds that occur at two locations The observation is not visible to the naked eye in the field. The appearance of this fold based on the results of the stratigraphic cross-sectional drawing relationship, which is the draw has two different dip positions between Lp 8 and Lp 15 which which is one of the supporting factors in the area. This is can be seen from the appearance in the field.

Gambar 5. Kenampakan Struktural Pada Lp 8 (Koordinat x: 563577 dan y: 9514748)

This fold is known based on the interpretation of *the strike / dip* direction with the N direction. N259°E/17° and N N268°E/15°. Based on the *strike/ dip* analysis , obtained in the research area, stereographic analysis was carried out and it was found that σ1 14°, N300°E, σ2 22°, N20°E, and σ3 88°, N120°E, from this analysis the types of The *Upright Horizontal Fold* is adjusted based on Fleuty. (1964) with North-South Subduction

Direction. The following are the stereographic results of the anticline folds The research area is shown in Figure 25.



Gambar 6. Stereografi Lipatan Antiklin Pada Lp 8 (Berdasarkan Klasifikasi Richard, 1971).

B. Characteristics of Silica Sand in The Mount Tapa Area

Silica is a chemical compound with the molecular formula SiO_2 (silicon dioxide) which can be obtained from mineral silica, vegetable and crystal synthesis. Mineral silica is a compound that is often found in mining/excavation materials in the form of minerals such as quartz sand, granite, and feldspar which contain crystals silica (SiO_2). In addition to being formed Naturally, silica with a tridymite crystal structure can be obtained by means of heating quartz sand at a temperature of 870°C and when the heating is done at temperature of 1,470°C can obtain silica with a cristobalite structure. Silica contains impurities that are carried during sedimentation process. Quartz sand is also known as white sand. The results of rock weathering contain primary minerals such as quartz and feldspar.

Quartz sand has a combined composition of SiO_2, Al_2O_3, CaO, Fe_2O_3, TiO_2, CaO, MgO,dan K_2O, are clear white or other colors depending on the its impurity compounds. Silica is usually obtained through a mining process that starting from mining quartz sand as a raw material. The quartz sand is then the washing process is done to remove mud and dirt organic which is then separated and dried again until obtained sand with a greater proportion of silica depending on the state of quartz from mining site. This sand is what is known as silica sand or silica at a certain level [1].

Silica sand is widely used in industrial activities. its use is used according to its characteristics, including its use as glass manufacturing production, ceramic manufacturing, filter production clean water, concrete casting, sandblasting to clean iron rust crust such as machines, pipes, plates and so on. In fine aggregate concrete casting or silica sand is used as the main element in the manufacture of fresh concrete in batching plant, in addition to coarse aggregate, cement and water and additional materials in the form of additive. Before use, the silica sand material is checked in the laboratory to knowing the quality and composition of the mixture to be used.

To determine the characteristics of silica sand from sandstone lithology samples. Kasai formation and Swamp Deposit Formation, direct observation can be carried out from the texture of the rock by sight or from laboratory observations based on petrographic analysis and analysis to determine the mineral composition owned by each sample research area.

Characteristics of silica sand in samples obtained at the location research can be seen based on rock texture, mineral composition, and physical properties of rocks, such as the availability of silica minerals on a rock for determine whether a rock has good silica sand characteristics or not and can be useful for the community there or not in the future.

In this research discussion, the author discusses the characteristics Silica sand is a mineral composition that is found in each sample. research area. In addition, the author also discusses petrographic sections from rock samples analyzed in the laboratory in the form of petrographic analysis sandstone sample 1 and petrographic analysis of sandstone sample 2. In this study The author focuses on the Kasai formation because it has been proven that the Kasai formation... producing a lot of silica can also be seen in the surrounding area research that already exists on the remains of illegal mining. The samples that are Laboratory tests were carried out in the form of 2 petrographic analysis samples.

Physical Properties of Rocks

The characterization of silica sand in the research area has a different appearance in field conditions. Direct observation in the field can help to determine the characteristics of silica sand in the research area. Direct observation in the field is carried out by describing the samples in the research area with direct descriptions. The purpose of this field observation is to determine how the minerals are found visually and the carrier sources of the presence of samples in each research location.

Sample 1

Sample exposure 1 is located in the eastern part of the Meneng building, located at the area of the surrounding community's plantation plains. Based on the results of the studio analysis and thin section analysis (petrography) of the Kasai Formation Sandstone has Fresh color is grayish white and weathered color is brownish white, samples in several The age-stratification location of the Kasai sandstone unit refers to regional geology. According to [9]., it is late Miocene in age. Figure.

Gambar 7. Singkapan Sampel 1 (Koordinat x: 290947 dan y: 97110254)

The image above is a field appearance of sample 1 in the Kasai formation. The appearance of sand material with quartz inserts in each layer in the outcrop. The outcrop has a material that has a fresh color that dominates in the form of grayish white as a marker for the presence of quartz in the existing layer. The presence of quartz or silica in this outcrop is the result of deformations of acidic igneous rocks that undergo deformation and then erode and accumulate on a sloping plane that forms a sedimentary outcrop. The source of quartz or silica in this Kasai formation comes from 2 main sources, namely from the results of deformation of acidic igneous rocks that characterize the appearance of fairly large grains and the second is the result of deposition of volcanic materials where the visible appearance of quartz or silica is not very clear but its existence is certain to exist and is abundant in the Kasai formation outcrop.

The Kasai Formation has rock units such as sandstone , tuffaceous sandstone , and mudstone . In the image above , there are also rocks that characterize the Kasai formation. This outcrop has a fairly dominant material in the form of lithics that are blackish yellow, brownish red , and reddish gray. The lithic material is the result of a volcanic series or the result of sediment deposition with volcanic inserts. In terms of depicting the research area, this depiction affects the process of rock formation in the outcrop. In accordance with the formation of the Kasai Formation which is the result of deformations of old rocks around it . Unlike the lithics found in the outcrops of the Kasai formation, which are the result of a volcanic series or volcanic rocks.

Sampel 2

This sandstone unit is spread in the northwest and southwest parts of the area. The research area covers 32.34% of the research area and with an elevation of 0-4 masl. These rocks are partially exposed on the banks of the main river which forming a U and some of it is exposed in the plain area of the research location.It has a fresh light brown color and a weathered whitish brown color, structure in some places the layers are interbedded with sandstone of sand grain size fine to coarse has a degree of rounding Figure 9.

Gambar 8. Singkapan Sampel 1 (Koordinat x: 290947 dan y: 97110254)

The image above is the appearance in the field of sample 2. The appearance of the material in sample 2 was taken from the Swamp Deposit outcrop. In swamp deposits dominated by materials such as sand and clay with quartz inserts at the research area location. In terms of macroscopic appearance or field observations, this outcrop has a layer with a fresh grayish white color indicating sandy material and a brownish yellow color for clay material. The color change in the outcrop is due to the presence of impurities in the form of mud . Based on the sedimentation process in the swamp deposit area, it is the result of sedimentation from the deformation of old rocks that settle to form a layer and this swamp deposit is formed which has a material content such as sand and clay and with quartz inserts. This is influenced by the rocks that make up the swamp deposits originating from the transitional sedimentation current and the erosion of the nearest old rocks.

Swamp deposits on the above outcrops have materials such as Sand and Clay with quartz inserts. On the outcrop, the swamp deposits have a very clear silica appearance with the size of this outcrop like coarse salt or coarse-grained. For the distribution of this quartz, it is evenly distributed along the formation of this swamp deposit. While for the constituent materials such as sand and clay into sediment layers are generally found in swamp environments.

Chemical Properties of Rocks

The chemical properties of rocks are seen based on the mineral content of the rocks and based on the chemical element content of the rocks. In this study, two laboratory analyses were carried out to obtain the percentage of mineral content data in rocks and the

chemical element content of rocks using Petrographic analysis and XRF analysis. Petrographic analysis later will read how many percent of mineral content in samples with analysis on samples with intact conditions . While XRF analysis uses samples that are crushed first to get overall results on how the element content is in the rocks in the research area, especially in the Kasai Formation and Swamp Deposit rock samples that will be used as a comparison and to find out how much silica content is in each sample analyzed in this laboratory test.

The presence of mineral content and chemical element content is obtained from the results of laboratory analysis and the results are read based on the test results. The results of this laboratory will be the material to determine the characteristics of the silica content in the research area, these characteristics are based on the location of different sampling, from different rock formations or sources of existing material carriers. This will later be a benchmark for research that discusses the characteristics of silica or silica sand in the research area.

Sample 1

Sample 1 is a rock sample taken from the high part of the research area, precisely in the area that is included in the Kasai Formation. The Kasai Formation in terms of field appearance has a grain size or silica appearance that is not very visible to the naked eye. However, this analysis is used to re-confirm the chemical content of silica and mineral content in the samples that have been tested based on rock petrography tests and XRF tests.

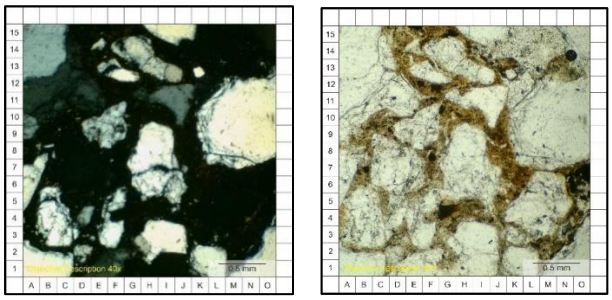


Figure 11. Petrographic Section of Kasai Sandstone (a) PPL (Plane Polarized Light) Parallel Nikol and (b) XPL (Cross Polarized Light)/Parallel Nikol

The results of this analysis have been adjusted to the results that come directly from the laboratory. The results of the petrographic analysis shows the many mineral levels found in the samples tested in the research area (Table 5).

Table 1 Results of Petrographic Analysis **of** Sample 1

No	Sample	Quartz	Lithic	Matrix
1.	Sample 1	60%	4%	36%

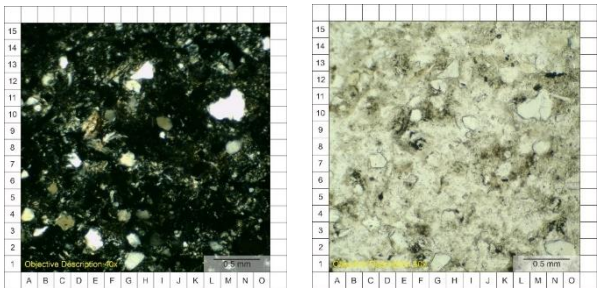
The result above shows how the percentage of mineral availability in sample 1. The result shows the availability Quartz , Lithic and Matrix. This content shows the high availability of quartz in this first sample with the matrix on this rock which is quite abundant also in this sample but the availability little lithic . This shows that the silica content in the rocks of sample 1 has a high silica content seen from the quartz mineral content which is more than half of the mineral content in the rocks.

In addition to the results of petrographic analysis, the XRF test on sample 1 was also used to determine the chemical element content of the Kasai formation rock samples. The results of this analysis show the chemical element content of the rock based on the samples sent to the laboratory.

The table above shows the results of the XRF test analysis on sample 1, where the chemical content in sample 1 is based on the percentage. Based on the results of the XRF test on sample 1, it shows that the silica content in sample 1 has a high percentage compared to the content of other elements. The silica content in sample 1 has a percentage of 94%, which from this result indicates that the silica content according to the results of the XRF test analysis on sample 1 has very good results. This is based on the formation process in the Kasai Formation area which is the result of the formation of acidic rock deformation which has a high silica content plus the process of deposition of volcanic material which makes the silica element content in sample 1 in the Kasai Formation very high. However, with this combined process, silica in appearance The field is only slightly visible which is the result of deformation of the surrounding old rocks and for other silica content to enter into lithic or lithic material in samples exposed in the Kasai Formation area.

Sample 2

Sample 2 is a sample taken from the lowland which is located in the Swamp Deposit. In the research area, the Swamp Deposit is located in the northern part of the plot which is directly adjacent to the main river and the topography of the Swamp Deposit is very low with an altitude of 1-4 meters above sea level . In terms of field appearance or direct observation , the presence of silica in this Swamp Deposit can be seen clearly with the naked eye but is still covered by contaminating material in the form of mud. After direct observation in the field, laboratory testing is needed as test result data to determine the mineral content and chemical element content in sample 2.



Gambar 9. Sayatan Petrografi Batupasir Kasai (a) PPL (*Plane Polarized Light*)/Nikol Sejajar dan (b) XPL (*Cross Polarized Light*)/Nikol Sejajar

The results of this analysis have been adjusted to the results that come directly from the laboratory. The results of the petrographic analysis shows the many mineral levels found in the samples tested in the research area (Table 7).

Table 2 Results of Petrographic Analysis of Sample 2

No	Sample	Quartz	Lithic	Matrix
1.	Sample 2	40%	7%	53%

The results above shows the percentage of minerals found in sample 1. These results show the findability Quartz , Lithic and Matrix. Based on the results in the table above shows that the presence of silica in sample 2 is quite high but has a smaller percentage compared to sample 1. This can be seen in the results in the table, where availability The matrix which is more than the quartz content in the second sample is influenced by the formation of sedimentation in the Swamp Deposits. Swamp deposits are formed from the results of sedimentation due to the erosional process of old formations around them and are included in the transitional deposition environment. This can be seen from the location of the Swamp Deposits which are not far from the main river and are on a gentle topography.

In addition to the results of petrographic analysis, the XRF test on sample 2 was also used to determine the chemical content of the Swamp Sediment sample. The results of this analysis show the chemical content of the rock based on the samples sent to the laboratory.

The table above shows the results of the XRF test analysis on sample 1, where the chemical content in sample 1 is based on the percentage. Based on the results of the XRF test on sample 1, it shows that the silica content in sample 1 has a high percentage compared to the content of other elements. The silica content in sample 2 has a percentage of 84%, which from this result indicates that the silica content according to the results of the XRF test analysis on sample 1 is very good. This is based on the formation process in the Swamp Deposit area which is the result of the formation of a transition area entering the levee sedimentation sub-environment and is the result of erosion and deformation of acidic rocks that then experience sedimentation in the Swamp Deposit. In terms of field appearance , the presence of silica in the Swamp Deposit is classified as coarse-grained, but in terms of laboratory analysis results, the mineral and chemical content of the rock is lower compared to sample 1. The clear appearance in the field has not determined the silica content in the rock has a high content. This is because the clear appearance in the field does not necessarily mean that the content is also high in each rock. Based on this, it is necessary to conduct laboratory tests to confirm the test results data.

IV. CONCLUSIONS

Based on research objectives and field observations and Based on the results of laboratory analysis, it can be concluded:

1. Geology in the research area refers to the geomorphological conditions with based on the aspects of morphology, morphoconservation and morphogenesis. Area The research has geomorphology with 3 types of landform units, namely River body (F1), Swamp (F4) and Plain (D5). In the research area has 2 types of developing flow patterns, namely local flow patterns meandering and dendritic. Meanwhile, in the research area there are 2 rock units that develop with age from old to young, namely units swamp sediment sand, and Kasai sandstone. From the above aspects, it is not missed the existence of the geological structure of the research area in the form of folds syncline with northeast-southwest trending stresses and anticline folds with west-east direction stress.
2. Silica sand in the research area has characteristics that can be seen from the aspects physical properties and chemical properties of rocks and laboratory results. Based on physical rocks have a fairly clear appearance in the field with minerals The most dominant is definitely quartz, which is clearly visible as grains. The chemical composition of rocks in the research area contains minerals which are diverse, ranging from Quartz, matrix and lithic with each have different content values. Based on laboratory results as in petrographic tests, rock samples that have silica content values the economical or high value is sample 1 compared to sample 2.

REFERENCES

[1] Anonim, 2013. Kajian Dampak implementasi Undang-Undang Nomor 4 Tahun 2009 terkait kewajiban pengolahan dan pemurnian mineral di dalam negeri, Direktorat Jenderal Mineral dan Batubara, Laporan, Jakarta, 2013.

[2] Feihu D., Jingsheng L., Xiaoxia L., & Zhang Z. 2010. "Improvement of Iron Removal Silica Sand Using Ultrasound Assisted Oxalic Acid". Ultrasonics Sonochemistry. 18, 389-393.

[3] Fiqih, D.W., 2020. Kajian Metode Preparasi Sampel dan deteksi Karbamzepin dan Karbamzepin-10, 11-

Epoksida dalam cairan Hayati menggunakan KCKT. UII: Yogyakarta.

[4] Galloway, W. E., 1983. Depositional System and Sequence in The Explorastion for Sandstone and Stratigraphic Traps, Springer-Verlag, New Rork. USA.

[5] Hamilton, W.R., 1979.*Tectonics of the Indonesian Region*. USA: USGeological Survey Professional Paper.

[6] Howard. 1967. Drainage Analysis in Geological Interpretation A Summation. The American Association of Petroleum Geologists Bulletin. California.

[7] Koesoemadinata, R. P., 2000, Tectono-stratigraphic Framework Of Tertiary Coal Deposits Of Indonesia, in Herudyanto, Sukarjo, Djaelani, E., and 60 Komaruddin (eds). *Proceedings Of Southheast Asia Coal Geology*. Directorate of Mineral Resources, pp. 8-16.

[8] Pettijohn, F.J., Potter, P.E., Siever, R., 1987. *Sand and Sandstone, Second Edition*. New York Inc., USA: Springer-Verlag

[9] Suwarna, dkk. 2006. Pengajaran Mikro Pendekatan Praktis dalam Menyiapkan Pendidik Profesional. Yogyakarta: Tiara Wacana.

[10] Verstappen, Th., H. 1977. The Use of Aerial Photographs in Geomorphological Mapping. ITC Teksbook of Photo-interpretation. ITC. Enschede