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Geochemical Characteristics of Iron Sand Deposits in Karsut Beach Area, Jeneponto Regency, South Sulawesi Province

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ABSTRACTS

Indonesia is currently still limited to being used as a raw material in cement factories in making concrete. In the chemical element in the priodic table, iron is symbolized (Fe). The purpose of this study is to determine the minerals that carry iron sand and the chemical characteristics of iron sand. The research location is in the Jeneponto Regency area, Jeneponto is a verada district right in South Sulawesi Province, Indonesia. The stages of the sampling method are carried out by measuring the distance of each sample hole. between one point to another point at a distance of 10-15 meters with a depth of 30cm from the surface each, after which the samples that have been taken are then dried This research method uses XRD and XRF analysis methods. From the results of XRD analysis, it was found that 2 minerals carrying iron sand, including Magnetite and Hematite minerals with the percentage of content of these minerals are. Magnetite minerals (Fe_3O_4) 40.0% and hematite minerals (Fe_2O_3) 37.77%. The results of XRF analysis show that the chemical composition contained in the mineral Fe_2O_3, contains oxides and hydroxides Fe and O are chemical compounds that contain at least one oxygenated atom and at least one other element.

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INTRODUCTION

Indonesia has great potential in concocting orei ore to become iron if viewed comprehensively as a natural resource which is quite abundant (Bakri, Anas, Wakila, et al., 2023). But until now, Indonesia still needs iron ore from neighboring countries. In Indonesia, iron ore which is orei from Fe is almost found in various parts of Indonesia in considerable quantities, iron sand is a natural material that is available in abundance in Indonesia. The spread of iron in Indonesia is very wide, starting from the edge of the Indian Ocean, to Sabang to iMarauke (Wakila et al., 2023a). In the Sulawesi Island area in the Pasiri besi area on the coast of Talaudi Beach, North Sulawesi, it spreads towards the sea to form a reservoir. In the study conducted on the distribution of iron sand caused by the process of active movement of the earth's crust, it resulted in a change in pattern in sedimentation (Anshariah et al., 2022). In general, iron sand deposits found in iPunagaya village, precisely in iBulo-Bulo, Kampala and Pabiringa come from the results of volcanic rock demolition in the form of lava deposits (Aswadi et al., 2022; Wakila et al., 2023b). The process of iron sand deposition in the Bulo-Buloi area and its surroundings occurs due to the decay of rocks which generally occur due to a process of natural phenomena as a result of which makes mineral grains separate from the rocks of origin, iron sand deposits generally consist of magnetite minerals and other minerals generally consist of volcanic rocks that are transformed into various beaches in Indonesia. The mediation of the transportation of coastal iron ore minerals is river water and seawater waves heading to the coast (Bakri, Anas, Hardin Wakila, et al., 2023; Jafar et al., 2022).

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Iron sand is sand containing Fe elements that are transported along the coast coast, formed due to a long process by the weather, bottomed by water containing iron minerals and deposited on the beach. Basically, iron sand is dark gray and blackish [4]. Iron sand has a lot of potential to be used in any field by the Indonesian people, but in its processing it still has ipro and icontra. Ibesi sand has a dominant content, namely Fei, Ti and O (S. Chaerun, 2015; Duan, 2014; Xia, 2019). In Indonesia, the use of iron sand itself is still limited to being used as a raw material in cement factories in the manufacture of concrete. Before being processed, iron sand is taken in raw or raw form, iron sand can be further processed so that its usefulness is more useful and more effective and efficient and the market price is higher than that of the one that is processed (S. K. Chaerun, 2017; Xiangli, 2022).

Basically, the magnetism content (Fe2O3) in beach sand can be processed into magnetite inanopheryls (Fe2O3) or permanent magnet base materials. In addition, the smaller the diameter of the nanoparticle grain, the more the coercivity of the nanoparticle will form (Thamsi & Jafar, 2024b). The levels contained in an imineral are caused by the influence of geology and mineralization processions in each region. These minerals have almost 88% magnetite levels and 12% do not have enough magnetite levels (Thamsi & Jafar, 2024a). The layers formed along the coastline form holes from iron sand deposits [10]. Therefore, I, as the author, need to conduct special research related to the composition and magnetic properties of iron sand using XRF and XRD tests. The goal to be achieved from this research is to find out the minerals of iron sand. And iKnowing the chemical composition of iron sand.

METHODS

In this research, it is carried out with stages that are hard to regulate. At the beginning of this research was carried out to collect information in the field. At this stage, there is a literature study, then there is a background, problem formulation, purpose and purpose, limitations of the research process and conclusions of the research results. Before the research took place, a literature study was carried out to obtain information related to the topic discussed in our research. We can also take references from previous research reports and other data can be used as complementary data. In this second stage, sampling was carried out at the location. The sampling location was carried out in the Karsut Beach area. Sampling was carried out on mineral deposits found at the site. The third stage is XRD and XRF analysis from samples that have been obtained from the research site. The fourth stage is to determine the carrier minerals and types of minerals in the research area (Asmiani et al., 2024; Nawir, Thamsi, & MH, 2023).

At the data collection stage, the researcher collects the database that has been collected in the field, both primary and secondary data, the stages are carried out to obtain the data needed to conduct XRD and XRF analysis. Primary data collection is carried out to obtain survey results while in the field which are directly related to field observation, observation, collection, documentation and laboratory analysis. Meanwhile, secondary data such as knowing the condition of the location of the research area. All data obtained in the field, namely primary data and secondary data, are then processed using the analysis of the variables to be known. The final results of data processing are then analyzed to answer all parameters in accordance with the research objectives so that a conclusion that can be accounted for is obtained. The data processing techniques used in research use observation techniques or quantitative data processing. Then we draw conclusions through the data that we have obtained in the field.

Based on the results of the calculation from the results of the analysis. In this study, the data analysis method used during the research is a quantitative method. The author uses a descriptive method to obtain answers from the results of data processing. In the XRD analysis, 3 samples were used and the samples obtained in the field were crushed into a powder powder and subsequently fed into XRD and XRF instruments. XRD and XRF analysis was carried out at the Mineral Materials Processing Laboratory, Hasanuddin University. This stage is the final stage of the research results while in the field, namely the preparation of results or data processing in the form of reports and answers to the results of this research. At this stage, the author puts the data that has been processed and analyzed into the form of a report on the results of research in accordance with what happened in the field and the principles for writing a thesis that have been determined in the iStudy Program of Mining Engineering, Faculty of Industrial Technology, Muslim University of Indonesia. After the thesis report was completed, the researcher conducted a seminar to present the results in front of the supervisor and examiner of the Mining Engineering Study Program, Faculty of Industrial Technology, Muslim

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University of Indonesia. The seminar stage starts with a proposal seminar, then continues with a results seminar and ends with a closing seminar (Nawir, Thamsi, Sanjaya, et al., 2023; Thamsi et al., 2023).

RESULTS AND DISCUSSION

The number of samples in the study amounted to three samples, including Station 1, Station 2 and Station 3, then samples were taken based on distance and depth. The sampling technique is to first dig at a depth of 10-30 cm, the three samples are taken perpendicular to the coastline, the distance between Station 1, Station 2 is 5 meters as well as Station 3 with a distance of 5 meters and Station 1 is the sampling point closest to the coastline, each sample amounts to 1 kg. Next, samples are taken and dried. Then the next step is preparation by going through the grinding and sifting process until the grain size is 200 mesh and the last step is the analysis process using XRD and XRF analysis. From the analysis of the data on the sample obtained from XRD and XRF analysis at the Mineral Material Processing Analysis Laboratory, Hasanuddin University, the following are the results of the analysis that has been obtained.

XRD and XRF Analysis Results

Sample Station 1

Table 1. XRD data of station samples 1.

Minerals	Chemical Formula	Percentage(%)
Magnetite	Fe_3O_4	50.0
Feldspar	$KAlSi_3O_8$	32.6
Quartz	SiO_2	17.4

Based on table 1, it shows that in the XRD analysis of the sample characteristics test, the mineral content of the carrier was obtained, which includes. Magnetite (Fe) 50.0%; Feldspar ($KAlSi_3O_8$) 32.6 Quartz (O_2) 17.4%; where the dominant mineral is Magnetite 50% and the least mineral is dominated by Quartz 17.4%. The following is a graph of the diffraction pattern from the analysis results according to the number of elemental masses that have been analyzed.

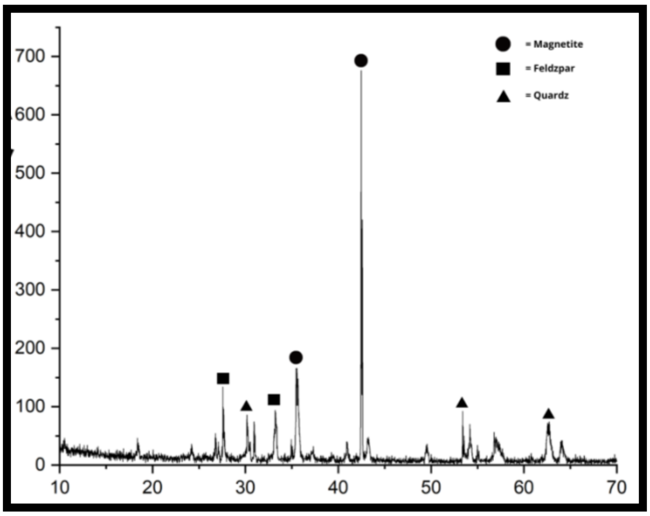

Figure-1. Difractogram chart of station sample 1.

Table 2. The results obtained from the XRF analysis of the station 1 sample.

Chemical Formula	Percentage(%)
Fe_2O_3	74.919
SiO_2	9.935
TiO_2	9.108
CaO	3.284
MnO	0.613
V_2O_5	0.545
P_2O_5	0.520

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Cr_2O_3	0.505
ZrO_2	0.317
K_2O	0.137
ZnO	0.116

Based on itabel 2, it shows that in the XRF analysis, the characteristic test of the sample was obtained chemical content, namely (Fe_2O_3) 74.919%; (SiO_2); 9.935 %; (TiO_2) 9.108%; (CaO) 3.284%; (MnO) 0.613 %; (V_2O_5) 0.545 %; (P_2O_5) 0.520%; (Cr_2O_3) 0.505 %; (ZrO_2) 0.317%; (K_2O) 0.137 %; (ZnO) 0.116 %;. The results of this XRF study are not much different from XRF data where the Fe_2O_3 phase is the dominant phase.

Sample Station 2

Table 3. XRD data of station samples 2.

Minerals	Chemical Formula	Percentage(%)
Hematite	Fe_3O_4	32.5
Quartz	SiO_2	31.4
Magnetit	Fe_2O_3	30.7
Rutile	TiO_2	5.4

Based on table 3, it shows that in the XRD analysis of the sample characteristics, the mineral content of the carrier was obtained, which includes. Hematite (Fe) 32.5%; Quartz (O_2) 31.4%; Magnetite (Fe_3) 30.7%; Rutile 5.4%; where the dominant mineral is Hematite 32.5% and the least mineral dominated by Rutile 5.4%. The following is a graph of the diffraction pattern from the analysis results according to the number of elemental masses that have been analyzed.

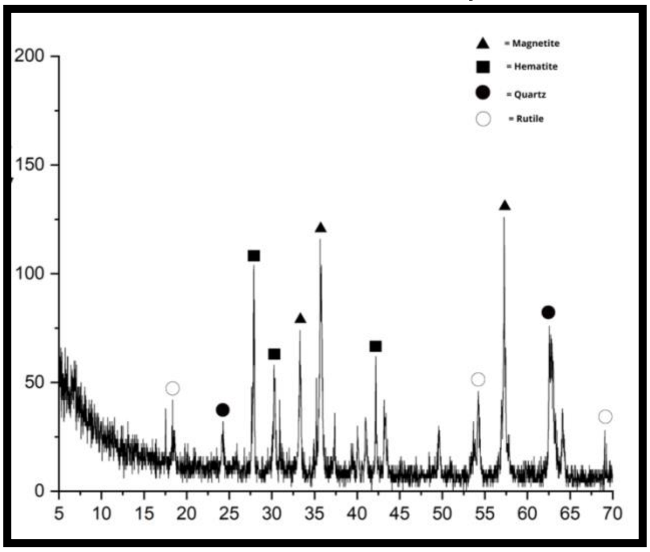

Figure-2. Difractogram chart of station sample 2.

Table 4. The results obtained from the XRF analysis of the station 2 sample.

Chemical Formula	Percentage(%)
Fe_2O_3	72.996
SiO_2	11.566
TiO_2	9.044
CaO	3.785
MnO	0.629
V_2O_5	0.511
P_2O_5	0.497
Cr_2O_3	0.444
ZrO_2	0.274
K_2O	0.115
ZnO	0.111

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Based on table 4, it shows that in the XRF analysis, the characteristic test of the sample was obtained chemical content, namely (Fe_2O_3) 72.996%; (SiO_2) 11.566%; (TiO_2) 9.044%; (CaO) 3.785%; (MnO) 0.629%; (Cr_2O_3) 0.511%; (V_2O_5) 0.497%; (P_2O_5) 0.444%; (RuO_2) 0.274%; (K_2O) 0.115% (ZnO) 0.111%; (SrO) 0.029% . The results of this XRF study are not much different from XRF data where the Fe_2O_3 phase is the dominant phase.

Sample Station 3

Table 5. XRD data of station samples 3.

Minerals	Chemical Formula	Percentage(%)
Magnetit	Fe_3O_4	43.7
Hematite	Fe_2O_3	40.0
Quartz	SiO_2	8.0
Rutile	TiO_2	7.8

Based on the table, it shows that in the XRD analysis, the characteristic test of the sample was obtained the content of the carrier minerals, which include. Magnetite (Fe3) 43.7%; Hematite (Fe) 40.0; Quartz (O2) 8.0%; Rutile 7.8%; where the dominating mineral is Magnetite (Fe3) 43.7% and the least dominated mineral is Rutile 7.8%. The following is a graph of the diffraction pattern from the analysis results according to the number of elemental masses that have been analyzed.

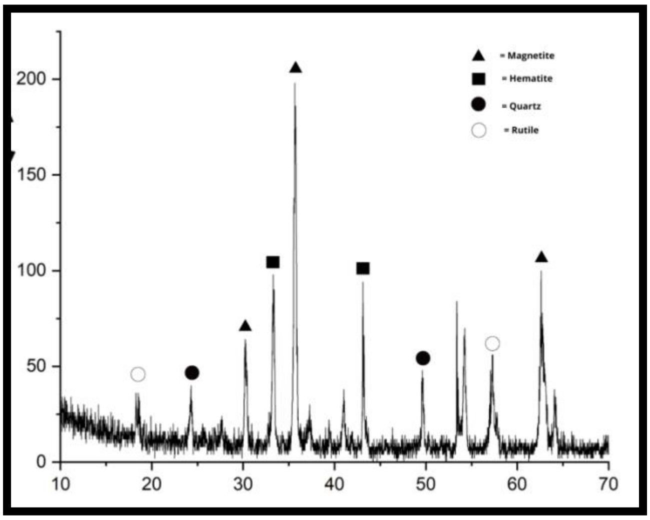

Figure-3. Difractogram graph of station sample 3.

Based on table 6, it shows that in the XRF analysis, the characteristic test of the sample obtained chemical content, namely (Fe_2O_3) 82,849; (TiO_2) 9.536%; (SiO_2) 4.768%; (CaO) 0.837; (MnO) 0.631%; (V_2O_5) 0.576%; (Cr_2O_3) 0.391%; (RuO2) 0.248%; (ZnO) 0.122%; (K2O) 0.035%; (ThO_2) 0.007%;. The results of this XRF study are not much different from XRF data where the Fe_2O_3 phase is the dominant phase.

Table 6. The results obtained from the XRF analysis of the station 3 sample.

Chemical Formula	Percentage(%)
Fe_2O_3	82.849
SiO_2	9.536
TiO_2	4.768
CaO	0.837
MnO	0.631
V_2O_5	0.576
P_2O_5	0.391
Cr_2O_3	0.248

ZrO_2	0.122
K_2O	0.035
ZnO	0.007

CONCLUSION

Based on the results of research that has been carried out at the Analysis Laboratory of Mineral Material Processing at Hasanuddin University, it is concluded that; From the results of the study using XRD analysis, it was found that 2 minerals carrying iron sand include Magnetite and Hematite minerals. The results of XRF analysis show that the chemical composition contained in the mineral Fe2O3, contains Fe and O elements with the percentage of content of Fe is. Sample 1 (29.36%), sample 2 (28.61%) and Sample 3 (32.4%).

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