Identification of Calcite Characteristic Using X-Ray Fluoressence (XRF) In Sukamulya Village, Cikembar District, Sukabumi Regency, West Java Province

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Abstract. Using the X-ray fluorescence analysis method, The characterization of calcium carbonate (Ca(CO3)) from calcite rock in Sukamulya Village, Cikembar District, Sukabumi Regency was doing. The identification of the characterization of calcite stone is carrying out to determine the mineral content that can utilize as a village potential. The research methodology starts from the preparation stage, the sampling stage in the field, the data processing stage and the reporting stage. The XRF test results from 6 sampling points on average contain 55.85% CaO, 0.145% SiO2, 0.162% Al2O3, 0.144% Fe2O3. Meanwhile, the Pearson correlation test carried the relationship of each mineral in calcite, which resulted in a close relationship between minerals from low to moderate levels. Based on XRF analysis and Pearson correlation, the CaO content in cough calcite cannot use as industrial raw material. It is necessary to increase the level of CaO to match industry specifications. Currently, the existing CaO content can only be used as raw material for animal feed and neutralizing soil acidity.

Keyword: *Calcite Deposits, XRF (XRay Fluorescent). Potential of Calcite Deposits, Value Add Mineral*

1. Introduction

Limestone potential is quite a lot found in Sukabumi district, based on data on the amount of limestone production in Sukabumi Regency during 2020 of 2,166,355 tons [1]. One of the potentials of this limestone is in the research location, namely Sukamulya Village, Cikembar District, Sukabumi Regency. The potential for limestone in Sukamulya village in 2017 received a business permit but has never is producing; this limestone excavation's location has been abandon. Several studies on the potential of limestone have been carrying out, both with gravimetric, the A.A.S., XRD and XRF methods [6], [15], [18]. The XRF method for mineral processing activities is carrying by utilizing X-rays as an effective method in the activity of mineral characteristics. Selection of methods Chemical analysis of minerals with XRF. Besides, the results are more accurate and faster. This study aims to identify the

excavation is mineral content using XRF, determine the utilization based on the identified calcite rock potential, and determine the availability and characteristics of calcite rock [8]. In addition to identifying minerals, the utilization is in line with the rapid increase in the demand for mineral resources [12], thus requiring innovation in mineral exploration and processing technology.

2. Geological Setting

The regional geology of the Sukabumi Regency consists of several rock formations, namely Qvo, Qvb, Tomc, Toml, Toba, and Tow. The Qvo and Qvb formations characterized by igneous rock resulting from a volcano explain ancient volcanoes formed in the quarter. The Rajamandala formation in this area indicates that the area was once a shallow sea which became an area of limestone deposition formed in the Tertiary - Oligocene era. Then the Batuasih Formation consists of sedimentary rock composition with deposition time in the late Oligocene era and the Walat Formation composed of sandstone formed during the tertiary era.

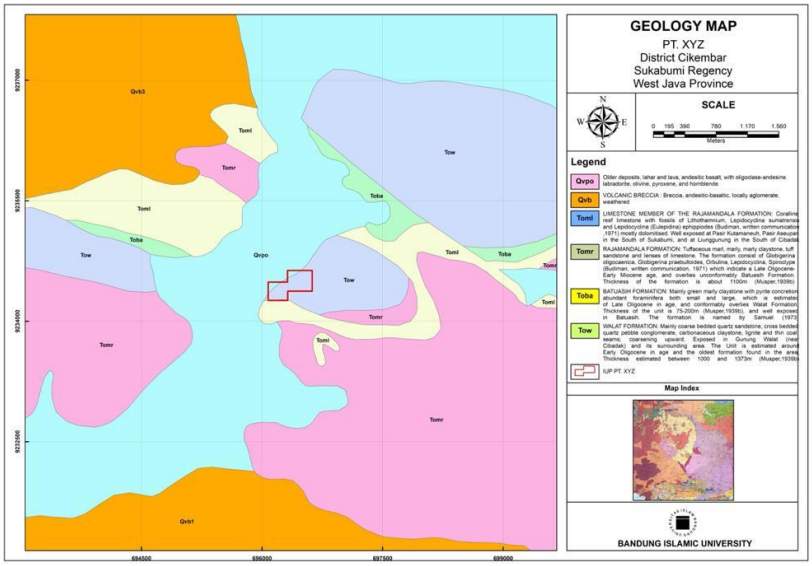

Figure 1
Geological Map

- The structures that develop in the area are anticlines, synclines, and faults, indicating high tectonic intensity. The discovery fault is one of the markers of the mineralization zone that is developing in the area. The regional geological map can be seen in Figure 1.
- Qvo : Older Deposits, lahars and lavas, andesite basalt with pyroxene olivine, and horenblenda
- Qvb : Volcano Bereksi, basalt andesite stratified excision, localized agglomerate, weathered
- Tomr : Rajamandala Formation: Tufan Nafal, marl clay, sandstone and limestone lenses containing Globigerina fossils
- Toml : Members Of The Rajamandala Formation Limestone: Coral reef limestone with some Lithothamnium fossils
- Toba: Batuasih Formation: Mainly green marl claystone with pyrite concretions, in some places a lot of large and small foraminifera, thought to be of late Oligocene age

- Tow: WALAt FORMATION: Mainly cross-layered quartz sandstones, conglomerates of quartz gravel, carbonaceous claystone, lignite and thin coal seams

3. Material and Methods

3.1 Material

The material to be tested for chemical analysis is cough calcite which is found together with limestone in the village of Sukamulya, Cikembar, Sukabumi. Calcite stone taken from 6 points.

Diskripsi Batukalsit

Categori	Carbonat Mineral
Chemical Formula	$CaCO_3$
Strunz Classification	05.AB.05
Cristal Simetri	Trigonal 32/m
Unit Sel	a = 4.9896(2) Å, c = 17.061(11) Å; Z=6
Colour	Clear or white, grey, yellow, green
Stature	Crystalline, granular, stalactite, concretionary, massive,
System Kristal	trigonal hexagonal scalenohedral Crystal System (32/m), Space Group (R3 2/c)
Twin Form	with four law twins
Cleavage	Perfect in three directions [1011] with an angle of 74° 55'
Fraction	Konkoidal
Nature in	Fragile
Hardness (Mohs Scale)	3 (determine mineral)
Lustre	Glass to pearly lustre on a clean surface
Scracth	White
Diaphaneity	Transparent to translucent
Specific Gravity	2.71
Optical Properties	Uniaksial (-)
Refractive Indeks	nω = 1.640 – 1.660 nε = 1.486
Double Bias	δ = 0.154 – 0.174
Solubility	Soluble in liquid acids
Other Properties	Able to glow red, blue, yellow, and other colours under S.W. and L.W. U.V. light; phosphorescence

3.2 Methods

The chemical analysis is carrying using the XRF method, carried out in the *tek*MIRA laboratory. Before testing, the sample preparing first. Sampling requirements for XRF testing

Powder: Powder size < 4 00 mesh

Solids: Coated surface minimizes scattering effect
The sample must be flat for optimal quantitative analysis

Liquid: the sample must be fresh when analyzed, and the analysis is quick if the sample is
Easy. Evaporate. Sample must not contain sediment

4. Result sand Discussion

4.1 Result

Table 4.1 Laboratory Test Results with XRF

No. Lab.	**0735/2021**	**0736/2021**	**0737/2021**	**0738/2021**	**0739/2021**	**0740/2021**	**Average (%)**
Code	SKB 1A	SKB 1B	SKB 1C	SKB 1D	SKB 1E	SKB 1F	
Unit	(%)	(%)	(%)	(%)	(%)	(%)	
CaO	55,19	55,90	56,03	56,20	55,93	55,85	55,85
SiO_2	0,86	0,28	0,50	0,43	0,18	0,18	0,405
Al_2O_3	0,40	0,085	0,11	0,25	0,050	0,082	0,162
Fe_2O_3	0,45	0,021	0,059	0,056	0,21	0,069	0,144
MnO	0,021	0,017	0,010	0,010	0,018	0,022	0,016
MgO	0,25	0,18	<0,001	<0,001	0,18	0,12	0,122
Na_2O	<0,001	<0,001	<0,001	<0,001	<0,001	<0,001	<0,001
K_2O	0,020	0,001	0,012	0,002	0,001	<0,001	0,006
TiO_2	0,025	0,009	0,007	0,015	0,008	0,013	0,012
P_2O_5	0,018	0,014	0,005	0,002	0,009	0,004	0,008
SrO	0,076	0,087	0,017	0,015	0,065	0,22	0,08
SO_3	<0,001	<0,001	<0,001	<0,001	<0,001	<0,001	<0,001
LOI	42,73	43,41	43,26	43,02	43,35	43,44	43,20

Discussion

Low levels of Al_2O_3, K_2O, Na_2O, and SO_3 are associated with reducing the spread of clay. MgO content of 0.001- 0.25 wt%. A shallow content indicates a weak limestone dolomitization process. The Fe_2O_3 content ranges from 0.069 to 0.45% by weight (Table 5.2) and varies from place to place due to the distribution of tectonic discontinuities, bedding planes and clay soils. The slight increase in iron oxide can be attributed to surface sampling as the iron oxide fills the joints and bed planes. Loss on ignition value ranged from 42.73 – 43.41 wt% with an average of 43.20%, indicating a high carbonate content for limestone. The content of SiO_2, Al_2O_3 and Fe_2O_3 showed a strong negative correlation with CaO.

The negative correlation between CaO and SiO_2 is because CaO (from calcite) and SiO_2 (from quartz) originate from two different mineral phases, and they are not related []. The L.O.I. shows a strong positive correlation with the CaO content, which may be because the L.O.I. is contributed mainly by the carbonate content of the calcite. It also shows a negative correlation with SiO_2. Field observations and geological maps show that tectonic discontinuities and voids are less than other limestones in different places, associated with a decrease in impurity minerals and increased purity. Comparing the characteristics of the limestones of the Cikembar area with the classification shows that the limestones are marking with very high purity to the category of medium purity.

Calcite has identified its mineral content, can be used for various industrial needs. In each use, calcite has different specifications, depending on the needs of the industry. In its use, calcite functions as a filler, pelican, flux, and others. The nature and specifications depend on the industry of the user.

Conclusions

Test results Analysis of mineral content with XRF states the average content of CaO is 55.85%. This CaO content is a content that is still associated with other oxide minerals, and this content can be increasing through processing or chemical processes. The analysis of cough calcite from Sukamulya village, Cikembar sub-district that can be using other than CaO is quartz (SiO_2) and Al_2O_3. The processing method determines the appropriate, and it is necessary to calculate the beneficiation process for the industry that will use it. The results of the interim analysis show that the CaO content does not meet the requirements as a cement raw material, while for other uses, further research must be to carrying out

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