

A Comparative Mineralogical Characterization of Structural and Skeletal Bauxites from the Kagnaka Deposit, Boké Prefecture, Republic of Guinea

Mamadou Oury DIALLO^{1,2}, Gbélé OUATTARA², Aly SOUMAH^{1,2}, Abdoulaye Kadiatou DIALLO^{1,2}, et Kandas KEITA^{1,2}

¹-Laboratoire de Recherche Appliquée en Géosciences et Environnement (LRA) de l'Institut Supérieur des Mines et Géologie de Boké, BP 84, Republic of Guinea

²-Laboratoire des Sciences Géographiques, du Génie Civil et des Géosciences de l'Institut National Polytechnique Félix Houphouët-Boigny (INP-HB), Republic of Guinea

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ABSTRACT

Our research explored the minerals contained within six bauxite samples taken from the Kagnaka deposit, found in Guinea's northwestern Boké region. These samples were analyzed using X-ray diffraction (XRD). The findings showed that the samples could be divided into two main types: structural bauxites (three samples) and skeletal bauxites (three samples). Overall, the XRD tests revealed that all the samples were mainly made up of four key minerals. Gibbsite was the most common mineral, making up between 65% and 95.3% of the total material. Next came hematite, with amounts ranging from 1% to 17%, and orthoclase, found in proportions between 0.9% and 6.8%. When we compared the two types of bauxite, we found clear differences in their makeup. Structural bauxites contained much more gibbsite, averaging 87.10%, while skeletal bauxites had less, averaging 71.82%. On the other hand, skeletal bauxites showed higher average amounts of hematite (10.04%) and orthoclase (5.43%) than structural bauxites. The Lateritic Maturity Index (LMI) also highlighted these distinctions even more. Structural bauxites appeared very mature, with an average LMI of 19.67, while skeletal bauxites were less mature, with an average LMI of 5.33. Ultimately, what this tells us is that the two types of bauxite represent different stages in how laterite forms over time. Structural bauxites are from a more developed stage, while skeletal bauxites are not as developed.

Keywords: Structural bauxite, skeletal bauxite, XRD, mineralogy and Kagnaka.

INTRODUCTION

Guinea is extraordinarily rich in bauxite, possessing the world's largest reserves. These reserves are estimated at over 40 billion tons, with a colossal 23 billion tons located specifically in the Boké region [1]. These immense deposits are concentrated in what is known as the Fouta Djallon-Mandingo bauxite province, which is quite simply the largest of its kind on our planet [2]. The exploitation of this resource, which began in 1973 with the Compagnie des Bauxites de Guinée (CBG), has become the cornerstone of the country's economy. As a result, Guinea is now one of the world's largest producers and the leading exporter of bauxite [1].

Most bauxite—about 88% of global reserves—is classified as lateritic. It forms through a long process of chemical transformation of rocks rich in aluminum and silicon, which occurs in hot, humid tropical climates. This natural phenomenon, known as lateritization, results in a concentration of aluminum in the form of various minerals (such as gibbsite or boehmite). This occurs because other elements, such as silica, alkali metals, and alkaline earth metals, are gradually washed away by water [3]. In these areas of weathered rock (lateritic profiles), the most common type of bauxite is so-called “residual” bauxite, which forms directly in situ from the original rock. These residual bauxites are not all identical; they exhibit various textures and structures. These differences tell us a great deal about the progress of the transformation process and the local conditions of their formation. In West Africa, two main categories of residual bauxites are generally distinguished: structural bauxites and skeletal bauxites [4].

Understanding these two types of bauxite is essential, as it has significant implications for how we understand bauxite formation, the quality of the ore found, and the best methods for extracting it [4].

The Kagnaka deposit, located about fifteen kilometers from Sangarédi within the CBG mining area, is one of the sites identified for increasing bauxite production in the future [5]. However, no detailed scientific study has yet been published on the mineral composition of its residual bauxites, particularly regarding the comparison of their different structures and textures. This is why this study aims to conduct an in-depth analysis of the mineralogical composition of the residual bauxites from Kagnaka, using an

analytical technique called X-ray diffraction. In this study, we will also conduct a mineralogical comparison between the structural and skeletal bauxites in this deposit in order to:

- Precisely identify which major minerals are present in each type of bauxite and in what quantities;
- Assess the stage of transformation of each type of bauxite based on the minerals it contains and their quantities;
- Understand the relationships between the various major minerals and thereby better decipher the mechanisms of bauxite formation;
- Assess the suitability of Kagnaka bauxite for industrial uses, particularly for the aluminum manufacturing process.

The objective of this study is to identify the main differences between these two types of bauxite in order to better understand their mineralogical composition and their formation processes.

Geographical Context

The Kagnaka bauxite deposit is located in the Boké Prefecture, in the northwestern part of the Republic of Guinea. Its precise geographic coordinates place it between 11°1'10"N and 11°2'25"N for latitude, and between 13°52'15"W and 13°53'30"W for longitude [6]. The location of the Kagnaka deposit area is illustrated in Figure 1.

This deposit is part of the HALCO Mining concession, and its exploitation will be carried out by the Compagnie des Bauxites de Guinée (CBG). It is an integral part of the vast Fouta Djallon-Mandingo bauxite region. It covers an area of approximately 2.8 square kilometers, with a perimeter of about 7 kilometers, and is located just 15 km south of the famous Sangarédi bauxite plateau. It is naturally bounded to the north by the Parawi and N'Dangara plateaus, to the south by Bouroré, to the east by Bidikoun, and to the west by Koobi [7].

The climate in this region is typically tropical and humid, characterized by the alternation of two distinct and well-defined seasons. The rainy season, from May to October, brings heavy rainfall, often between 2,500 and 3,000 mm per year. In addition, there is a dry season, which lasts from November to April. Throughout the year, temperatures remain pleasant and warm, generally ranging between 25 and 35 °C [6].

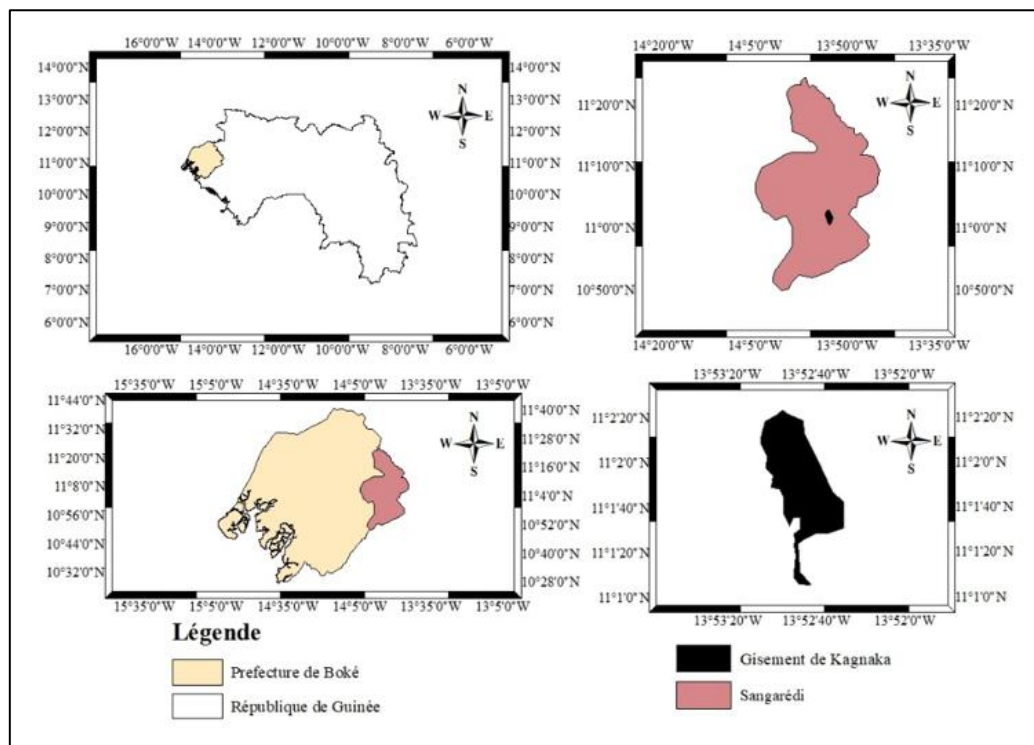


Figure 1: Map showing the location of the study area [2]

Geological Background

The subsurface of this deposit, like that of the Sangarédi subprefecture as shown in Figure 2, consists of several types of rock:

- Very ancient formations (from the Paleozoic era): these include clay and silt layers from the Silurian period, originating from Téliimélé (which are between 150 and 160 meters thick), as well as siltstone, claystone, and quartz-rich sandstone dating from the Devonian period, near Faro [8].
- More recent intrusive rocks (from the Mesozoic era): these are flat veins of dolerite dating from the Jurassic period (approximately 147 to 167 million years ago), which have intruded between the layers of clay and sandstone [9].

The fact that these original rocks were subjected to prolonged erosion under the region’s hot and very humid climate facilitated the formation of bauxite deposits on the plateaus, areas also known as “bowals” [10].

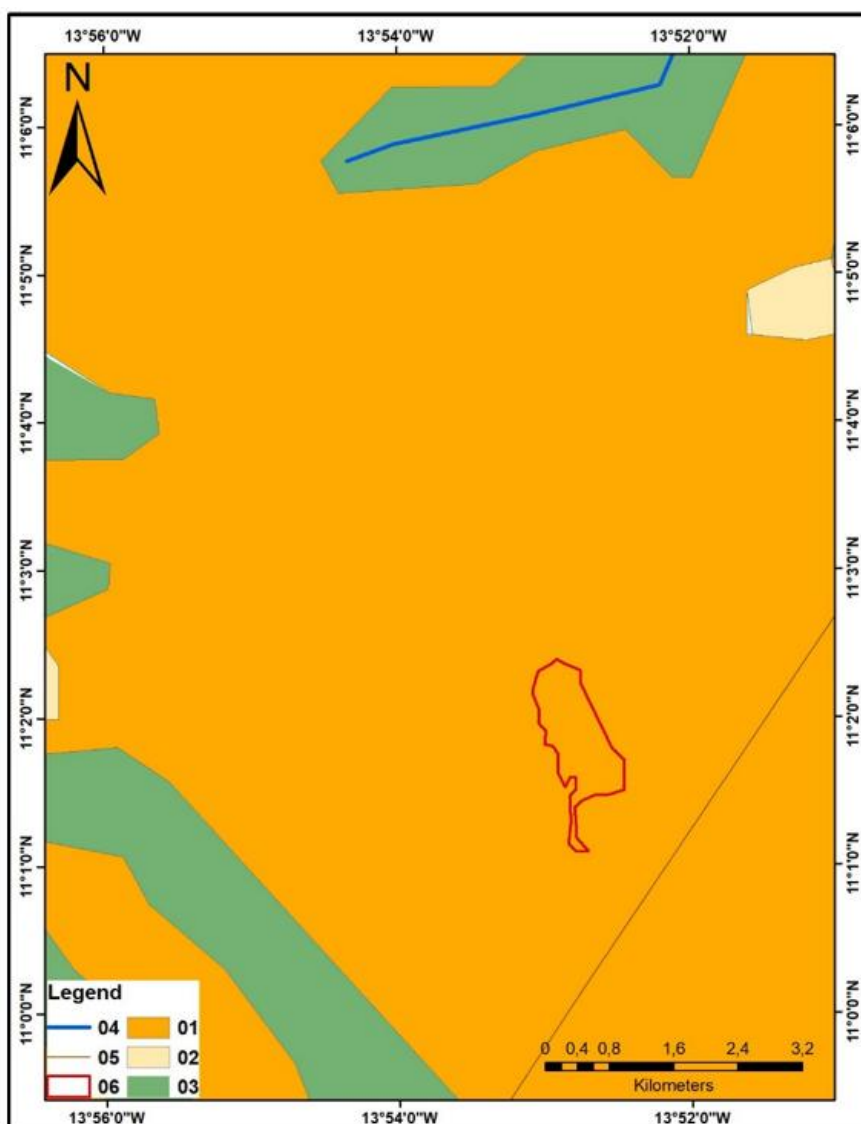


Figure 2: Geological map of the Kagnaka deposit [2, modified from]

- | | |
|---|------------------------|
| 01: Devonian Faro (Claystones and siltstones) | 04: Watercourses |
| 02: Miocene-N1 (lateritic rocks) | 05: Faults |
| 03: Mesozoic (Dolerites) | 06: Outline of Kagnaka |

MATERIAL AND METHODS

Sampling

Six bauxite samples were collected from drilling cores obtained from the Kagnaka deposit, as detailed in Table 1.

Table 1: Bauxite Samples Collected at Kagnaka

Structural bauxites	Skeletal bauxites
KG 09	KG 14
KG 23	KG 20
KG 35	KG 24

These samples were selected because they effectively represented the diversity of both bauxite types, following a thorough visual inspection of the drill cores. After preparation at the mechanical processing workshop, each sample was placed in an identified plastic bag and dispatched to the laboratory [11].

Sample Preparation

- To prepare these samples, a multi-step process was followed:
- Firstly, oven drying was performed (at 105 °C for 24 hours) ;
- Subsequently, samples underwent coarse crushing using a jaw crusher to achieve fragments smaller than 2 mm [12] ;
- Following this, finer grinding was carried out with a tungsten carbide ring mill, reducing particle size to less than 75 micrometers [13] ;
- Finally, each sample was thoroughly mixed and quartered to yield small portions of approximately 5 grams, ready for X-ray Diffraction (XRD) analysis [14].

X-ray Diffraction (XRD) Analysis

Operational Methodology

X-ray Diffraction (XRD) is a non-destructive analytical method. It is based on Bragg's Law (expressed by the formula $n\lambda = 2d \sin\theta$) . This technique enables the identification and quantification of various crystalline components within a material. This is achieved by observing how a single (monochromatic) X-ray beam is deflected (diffracted) by the regular atomic arrangements (the lattice planes) of minerals [15] [16], [17] [18].

Instrument Settings

An X-ray diffractometer equipped with a copper anode source (Cu K α , with a wavelength λ of 1.5406 Å) was utilized [19];

The applied voltage was 40 kilovolts, and the current intensity was 30 milliamperes ;

The measurement angle [20] ranged from 5° to 70° [21];

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"Measurements were taken at intervals of 0.02° (2 θ), with data acquisition proceeding at a rate of 2° per minute [22].

Interpretation of Raw Data

To identify the various mineral components, the acquired data was cross-referenced with standard patterns from the International Centre for Diffraction Data (ICDD) [23] [24] [25]. The relative proportion of each identified mineral was then determined using the Rietveld method. The primary minerals whose reference patterns were consulted are in the table 2 below:

Table 2: Minerals identified through X-ray Diffraction Analysis

Minerals	Chemical formula	Crystal structure	ICDD reference
Gibbsite	Al(OH) ₃	Monoclinique	00-033-0018
Orthoclase	KAlSi ₃ O ₈	Monoclinique	00-031-0966
Hématite	α-Fe ₂ O ₃	Rhomboédrique	00-033-0664

Analysis of Results

To thoroughly understand and interpret the gathered data, a comprehensive suite of analytical approaches was employed:

First, fundamental statistical parameters were computed for each identified mineral and for both bauxite varieties. These included the mean, extreme values (minimum and maximum), standard deviation, and coefficient of variation (CV) [26].

Furthermore, key mineral ratios were established, specifically the Gibbsite to Hematite (Gb/Hm) ratio and the Gibbsite to Orthose (Gb/Or) ratio [27].

The Lateritic Maturity Index (IML) was determined using the formula: $IML = \text{Gibbsite (\%)} / [\text{Orthoclase (\%)} + \text{Hematite (\%)}]$. This index provides valuable insight into the stage of lateritic soil alteration; a higher IML value signifies a more advanced bauxitization process in the rocks [28].

- Direct comparisons were conducted between the two distinct bauxite types, focusing on differences in mean values and their respective mineral ratios [29] [30].
- A Pearson correlation matrix was generated [31] to elucidate the relationships and interdependencies [32] among the various mineral phases.
- Finally, a ternary diagram was constructed to graphically represent the relative proportions of Gibbsite, Orthose, and Hematite [33].

RESULTS AND DISCUSSION

Description of the Studied Facies

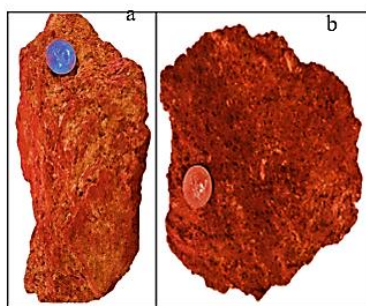
Two primary categories of in-situ bauxite, meaning they formed directly from the alteration of underlying parent rocks, were identified and thoroughly investigated, as depicted in Figure 3.

Structural Bauxite

Structural bauxite is distinguished by its faithful preservation of the original rock's appearance and structural characteristics. Even after the complete alteration of its initial mineral components, one can still discern primary features such as bedding planes, folds, or the distinctive texture typical of certain volcanic rocks. This bauxite type remains relatively robust, exhibits a consistent density, and is not overly porous. This remarkable retention of form suggests a "constant volume" transformation process, where individual minerals were progressively replaced without a significant change in the rock's overall volume, akin to a precise mineralogical mold.

Skeletal Bauxite

In contrast, skeletal bauxite presents a partially degraded structure. While some remnants of its original texture, resembling a skeleton or a surviving framework, can still be observed, they are embedded within a highly altered and porous matrix. This bauxite is notably more fragile, less dense, and possesses significantly greater porosity than its structural counterpart. This partial disintegration is attributed to a more extensive dissolution of the initial minerals, leading to a noticeable collapse and partial reorganization of the material. It can be conceptualized as an intermediate stage of transformation, bridging the gap between a still somewhat recognizable parent rock and a fully metamorphosed bauxite.



a) Structural bauxite b) Skeletal bauxite

Figure 3: Samples of naturally occurring bauxite from Kagnaka.

Identified mineral phases

X-ray diffraction (XRD) analysis of the six residual bauxite samples unveiled a total of four distinct mineral phases, as depicted in Figure 4. Of these, the three primary crystalline components investigated in this study are:

- Gibbsite [Al(OH)₃]: Identified as the overwhelmingly dominant aluminum-bearing phase.
- Hematite [α -Fe₂O₃]: A secondary iron-rich constituent.
- Orthoclase [KAlSi₃O₈]: A remnant phase originating from the parent rock.

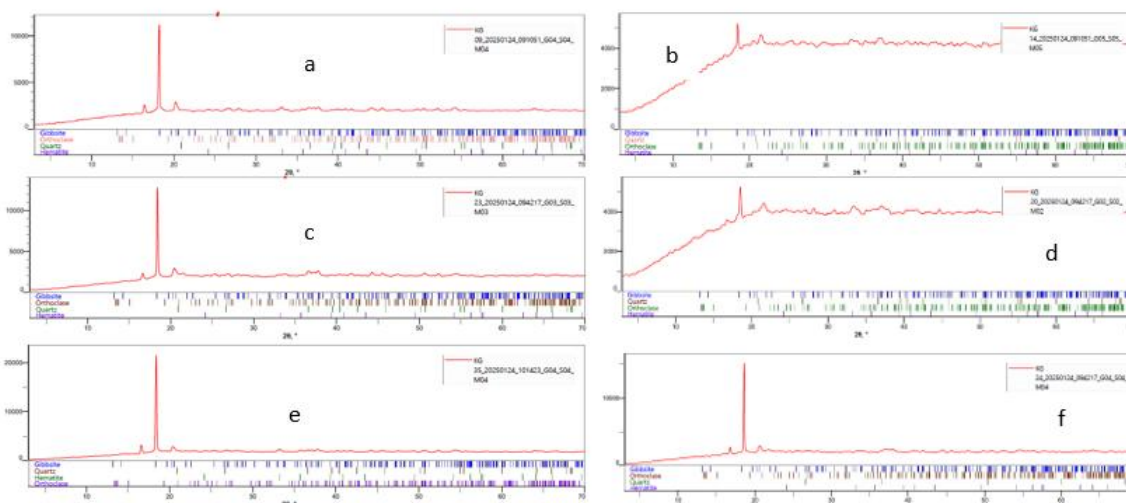


Figure 4 : The diffractograms of the six bauxite samples from Kagnaka

Overall Quantitative Composition

The complete quantitative makeup, derived from the DRX analyses, is presented in Table 3.

Table 3: Measured Mineral Content of Residual Bauxite Samples from Kagnaka

Samples	Facies	Gibbsite (%)	Orthoclase (%)	Hématite (%)	Total (%)
KG 09	Structural	87,00	2,51	5,99	95,50
KG 23	Structural	95,30	0,90	2,20	98,40
KG 35	Structural	79,00	1,45	17,00	97,45
KG 14	Structural	65,00	6,80	16,00	87,80
KG 20	Structural	71,47	5,50	13,13	90,10
KG 24	Structural	79,00	4,00	1,00	84,00

Descriptive Statistics per Facies

The descriptive statistics for each facies are detailed in Table 4.

Table 4: Descriptive Statistics of Mineralogical Composition by Facies Type.

Parameters	Structural Bauxites			Skeletal Bauxites		
	Gibbsite	Orthoclase	Hématite	Gibbsite	Orthoclase	Hématite
Mean	87,10	1,62	8,40	71,82	5,43	10,04
Minimum	79,00	0,90	2,20	65,00	4,00	1,00
Maximum	95,30	2,51	17,00	79,00	6,80	16,00
Standard Déviation-	8,15	0,83	7,79	7,02	1,40	7,87
CV (%)	9,36	51,23	92,74	9,77	25,78	78,39

Statistical analysis confirms that we are not observing a single, continuous mineral unit. Instead, it points to the existence of two distinct geological populations, clearly differentiated by their rock characteristics.

The structural bauxites represent an advanced stage of alteration, marking a final phase of laterization. They are notably rich in alumina, exhibit low variability, and show a near absence of residual silicates.

Conversely, the skeletal bauxites indicate a transitional or less developed stage of alteration. These are characterized by a diluted gibbsite content and the persistent presence of orthoclase, resulting in a generally more intricate chemical composition for this particular type of rock.

Lastly, hematite displays considerable variability, following its own distinct zoning pattern that does not appear to be systematically linked to the classification of the main rock facies.

General Comparison of Aspects

This comparison of the different facies is shown in the table 5.

Table 5 : offers a comparative analysis, contrasting the structural and skeletal bauxite types found at Kagnaka."

Parameters	Structural (n=3)	Skeletal (n=3)	Difference	Str/Squ Ratio
Average Gibbsite (%)	87,10	71,82	+15,28	1,21
Average Orthoclase (%)	1,62	5,43	-3,81	0,30
Average Hématite (%)	8,40	10,04	-1,64	0,84
Average Gb/Hm	24,61	25,51	-0,90	0,96
Average Gb/Or	64,10	14,10	+50,00	4,55
Average IML	19,67	5,33	+14,34	3,69

To better illustrate the mineralogical differences between these two types of bauxite, we have prepared Figure 5.

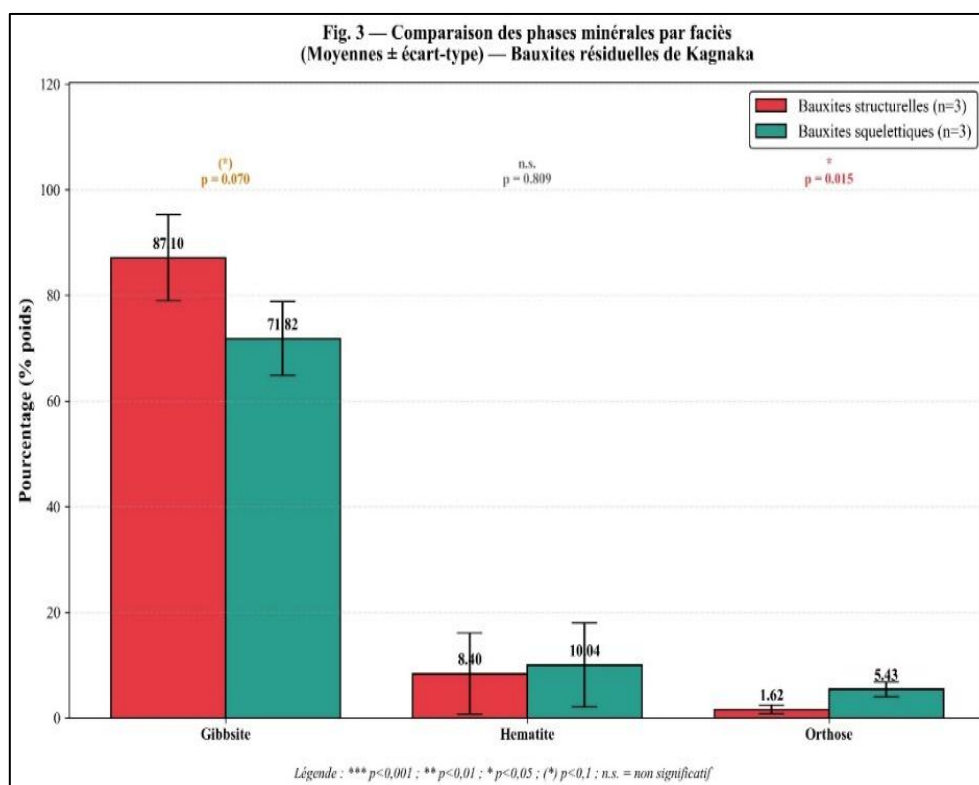


Figure 5 : Comparing the mineral components across different facies.

Gibbsite Content significant difference is seen in the average amount of gibbsite. Structural bauxites contain a notably higher proportion, averaging 87.10%, which is 21.3% more than the 71.82% found in skeletal bauxites.

Orthoclase Content: In contrast, orthoclase shows the opposite trend. Skeletal bauxites exhibit a considerably greater concentration, holding approximately 3.35 times more (5.43%) than structural bauxites (1.62%).

Lateritic Maturity Index (IML) The Lateritic Maturity Index (IML) also varies significantly. Structural bauxites register an IML of 19.67, which is about 3.69 times higher than the 5.33 recorded for skeletal bauxites.

Hematite Levels: While the overall amounts of hematite are quite similar between the two types, structural bauxites display a much wider range of variability (indicated by a Coefficient of Variation of 92.74%). This greater fluctuation is mainly attributed to one specific sample, KG 35, which contains an elevated 17% hematite.

These mineralogical insights and maturity indicators are further detailed in accompanying analyses, such as those presented in Table 6.

Table 6 : inter-mineral ratios and the Lateritic Maturity Index for each sample.

Samples	Appearance	Gb/Hm	Gb/Or	IML	Maturity level
KG 23	Structural	43,32	105,89	30,74	1st (most mature)
KG 09	Structural	14,52	34,66	10,24	2nd
KG 35	Structural	4,65	54,48	4,28	3rd
KG 24	Skeletal	79,00	19,75	15,80	4th
KG 20	Skeletal	5,44	12,99	3,84	5th
KG 14	Skeletal	4,06	9,56	2,85	6st (least mature)

Note: Sample KG 35 exhibits a relatively low IML value, despite being categorized as a structural bauxite. This is primarily due to its high hematite content, which makes up 17% of its composition.

Inter-Mineral Relationships

The correlation matrix illustrating the various mineral phases is presented in Figure 6 below.

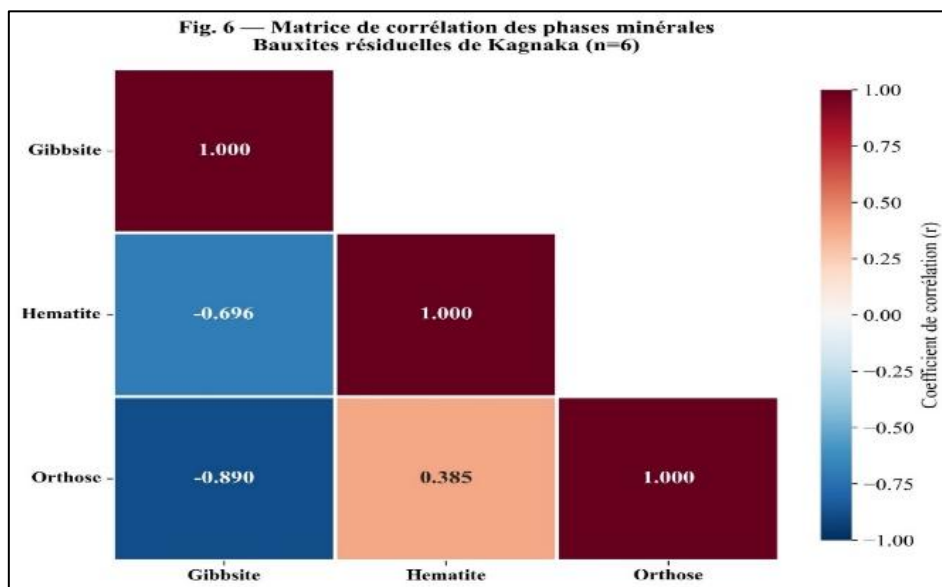


Figure 6 : Mineral Phase Correlation

Triangular diagram

The Gibbsite-Hematite-Orthose triangular diagram is shown in Figure 7.

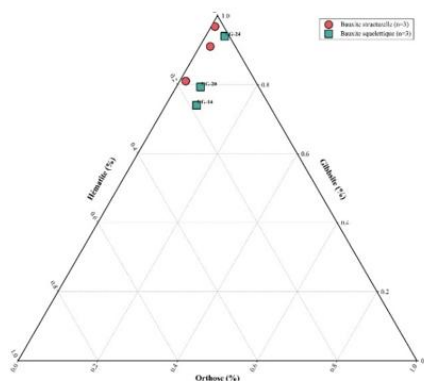


Figure 7: Gibbsite-Hematite-Orthose ternary

This triangular chart, using Gibbsite, Hematite, and Orthose as its axes, clearly illustrates how the key minerals are distributed within the bauxite samples originating from decomposed rocks at Kagnaka. It distinctly highlights differences between two categories of bauxite formations.

The samples of what are termed 'structural bauxites' (marked by red dots) are clustered tightly at the very top of the triangle. This signifies that they are almost entirely composed of gibbsite, often exceeding 90%. Such a high concentration indicates a very prolonged and intense natural weathering process, which has effectively purified the material by removing most impurities and unwanted elements.

In contrast, the 'skeletal bauxites' (represented by green squares), although still containing significant amounts of gibbsite (between 75% and 90%), are more dispersed and tend to shift towards the left side of the chart. This positioning suggests they contain more hematite (sometimes up to 15%) and also a quantity of orthose. This implies a less complete bauxitization process, with a greater presence of iron oxides (secondary minerals) and remaining silicates that have not fully broken down over time.

DISCUSSIONS

When we examine what the Kagnaka bauxites are made of, we find a clear difference between their 'structural' and 'skeletal' forms. This suggests they developed at different rates through the natural weathering process that creates bauxite. Such a pattern fits well with our geological understanding of bauxite deposits in West Africa, especially those in Guinea.

The 'structural' formations are primarily composed of gibbsite, with only tiny amounts of other minerals like quartz, orthoclase, and hematite. This composition indicates extremely thorough weathering, where much of the silica has been removed. Essentially, these formations represent a highly advanced stage of bauxite creation, where almost all the original rock minerals have transformed, leading to a significant buildup of alumina. This observation is similar to what researchers like Abdoulaye Kadiatou Diallo and their colleagues have noted in fully developed bauxites, which are also rich in gibbsite and contain very few remaining original minerals.

In contrast, the 'skeletal' formations contain less gibbsite but higher proportions of quartz, orthoclase, and hematite. This implies the weathering process was less complete, leaving behind more of the initial rock material. This mineral mix is typical of an earlier phase in bauxite development. This aligns with descriptions of the Sangarédi bauxites by Abdourahamane D. Barry, Mamady Cissé, and Mupenge M. Parfait, who linked these formations to a partial alteration of primary minerals and a more varied overall composition.

The evidence gathered here confirms a progressive transformation in the rock's composition within the Kagnaka deposit. This progression is shaped by factors like water flow, the surrounding landscape, and the nature of the underlying rock. The gradual shift from 'skeletal' to 'structural' rock formations clearly demonstrates an evolution over time. This is characterized by a reduction in silica and original mineral content, alongside a corresponding increase in gibbsite. This pattern aligns perfectly with the natural processes involved in the formation of laterite soils and bauxite.

Furthermore, these findings strongly support the research by V. I. Mamedov, A. A. Chausov, and E. A. Okonov. They developed a classification system for Guinean bauxites based on their various stages of transformation. These researchers demonstrated that a rise in gibbsite, combined with a reduction in remaining minerals such as orthoclase, reliably indicates the maturity of a bauxite deposit.

In essence, the examination of the Kagnaka deposit affirms that structural bauxites represent advanced stages of formation, making them suitable for commercial mining. Skeletal bauxites, conversely, point to intermediate stages, distinguished by a more varied mineral composition. This arrangement aligns with established genetic models in scientific literature and highlights the crucial role of surface geological processes in the development of bauxites within wet tropical environments.

CONCLUSION

An analysis of the Kagnaka bauxites indicates they mainly consist of gibbsite (ranging from 65% to 95.3%), along with fair amounts of hematite (1% to 17%) and small quantities of orthose (0.9% to 6.8%). This makeup confirms they are trihydrated gibbsitic bauxites, a type known for its high quality in metallurgical processing.

The lack of minerals such as boehmite, diaspore, goethite, and kaolinite suggests significant weathering, pointing to a well-developed lateritic soil profile that formed in humid tropical conditions. Researchers found two different types of bauxites: skeletal bauxites, which show an intermediate level of alteration, and structural bauxites, indicating a more advanced stage with a substantial buildup of gibbsite.

Structural bauxites are characterized by higher amounts of gibbsite and lower levels of orthose, signifying a more thorough transformation and a greater degree of maturity. In contrast, skeletal bauxites still contain more of the original minerals, suggesting only an incomplete change from the parent rock.

Overall, the structural bauxites at Kagnaka, being especially rich in gibbsite, are of superior quality and represent an ideal ore for industrial use, particularly for producing alumina through the Bayer process.

To get the most from the Kagnaka deposit, it is essential to conduct thorough and organized mapping of the various bauxite types, focusing on the structural and skeletal formations. This method would provide clearer insight into where these types are located and how their quality differs, thereby improving mining plans. Precisely identifying these formations on-site would also allow for more focused mining, concentrating on areas high in gibbsite and low in undesirable materials. This strategy would guarantee the most efficient use of the deposit by reducing waste and increasing the effectiveness of metallurgical processes.

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RÉFÉRENCES

- [1] « Potentiel minéral – Ministère des Mines et de la Géologie ». Consulté le: 23 avril 2026. [En ligne]. Disponible sur: <https://mines.gov.gn/potentiel-mineral/>
- [2] V. I. Mamedov, Y. V. Bouffev, et Y. A. Nikitine, « Banque de données sur les gisements et indices des minéraux utiles », *Min Mines Géologie Rép Guinée GEOPROSPECTS Ltd*, 2010.
- [3] I. Valetton, « Sur la genèse des gisements de bauxite du sud-est de la France », *Bull. Société Géologique Fr.*, vol. 7, n° 5, p. 685-701, 1966.
- [4] B. Boulangé et G. Millot, « La distribution des bauxites sur le craton ouest-africain ».
- [5] « ACCUEIL → CBG », CBG → Nous faisons plus que de la Bauxite. Consulté le: 23 avril 2026. [En ligne]. Disponible sur: <https://cbg-guinee.com/>
- [6] A. D. Barry, M. Cissé, M. M. Parfait, et M. M. Hallarou, « Mineralogical and Geochemical Characteristics of the Sangarédi Bauxite Deposit, Boké Region, Republic of Guinea », *Environ. Earth Sci. Res. J.*, vol. 8, n° 1, p. 11-22, mars 2021, doi: 10.18280/eesrj.080102.
- [7] M.-E. Damoulianou, S. Kalaitzidis, et N. Pasadakis, « Turonian-Senonian organic-rich sedimentary strata and coal facies in Parnassos-Ghiona Unit, Central Greece: An assessment of palaeoenvironmental setting and hydrocarbon generation potential », *Int. J. Coal Geol.*, vol. 258, p. 104029, 2022.
- [8] A. Abedini, M. Khosravi, et A. A. Calagari, « Geochemical characteristics of the Arbanos karst-type bauxite deposit, NW Iran: Implications for parental affinity and factors controlling the distribution of elements », *J. Geochem. Explor.*, vol. 200, p. 249-265, mai 2019, doi: 10.1016/j.gexplo.2018.09.004.
- [9] A. K. Diallo, M. S. M. Conte, O. B. Kaba, A. Soumah, et M. Camara, « Petrological and Statistical Studies of the Limbiko Bauxite Deposit, Republic of Guinea », *Int. J. Geosci.*, vol. 14, n° 04, p. 351-376, 2023, doi: 10.4236/ijg.2023.144020.
- [10] Ibrahima Kalil Kourouma, Oumou Hawa Bah, Alain Gbilimou, et Soryba Bangoura, « Study of certain technical aspects of the rehabilitation of bauxite mining sites operated at the Sangarédi mine (Parawi deposit, Compagnie des Bauxites de Guinée mining concession; CBG) », *World J. Adv. Res. Rev.*, vol. 21, n° 2, p. 607-617, févr. 2023, doi: 10.30574/wjarr.2024.21.2.2667.
- [11] B. d. v. du nord, « minéralogie, géochimie et génétique des », *Acta Geol.*, vol. 20, p. 199, 1976.
- [12] P.-J. Combes, « Typologie, cadre géodynamique et genèse des bauxites françaises », *Geodin. Acta*, vol. 4, n° 2, p. 91-109, 1990.
- [13] F. Berraki *et al.*, « Cartographie et étude pétrographique et minéralogique des dykes de dolérites de l'in ouzzal (hoggar occidental, algérie) », *Photo-Interpret. Eur J Appl Remote Sens*, n° 2012/1, p. 2, 2012.
- [14] C. Ansart, « Formation des latérites du bouclier amazonien: apports du couplage minéralogie-géochimie-géochronologie », PhD Thesis, Université Paris-Saclay, 2022.
- [15] P. Kelemen, I. Dunkl, G. Csillag, A. Mindszenty, H. von Eynatten, et S. Józsa, « Tracing multiple re-sedimentation on an isolated karstified plateau: the bauxite-bearing Miocene red clay of the Southern Bakony Mountains, Hungary », *Sediment. Geol.*, vol. 358, p. 84-96, 2017.
- [16] T. Boski et A. Herbosch, « Trace elements and their relation to the mineral phases in the lateritic bauxites from southeast Guinea Bissau », *Chem. Geol.*, vol. 82, p. 279-297, 1990, doi: 10.1016/0009-2541(90)90086-M.
- [17] M. Laskou, M. Economou-Eliopoulos, et I. Mitsis, « Bauxite ore as an energy source for bacteria driving iron-leaching and bio-mineralization », *Hell. J. Geosci.*, vol. 45, p. 163-174, 2010.
- [18] W. E. Petrascheck, « The genesis of allochthonous karst-type bauxite deposits of southern Europe », *Miner. Deposita*, vol. 24, p. 77-81, 1989.
- [19] E. Chanvry, E. Marchand, M. Lopez, M. Séranne, G. Le Saout, et M. Vinches, « Tectonic and climate control on allochthonous bauxite deposition. Example from the mid-Cretaceous Villeveyrac basin, southern France », *Sediment. Geol.*, vol. 407, p. 105727, 2020.
- [20] A. N. Al-Mutairi, M. A. Galmed, et K. S. Aldamegh, « Petrogenesis of the Az Zabirah south zone bauxite ore deposits, central northern Saudi Arabia », *Arab. J. Geosci.*, vol. 8, n° 4, p. 2327-2339, avr. 2015, doi: 10.1007/s12517-014-1347-5.
- [21] D. Esmaily, H. Rahimpour-Bonab, A. Esna-Ashari, et A. Kananian, « Petrography and Geochemistry of the Jajarm Bauxite ore Deposit, Northeast Iran: Implications for Source Rock Material and Ore Genesis », *Turk. J. Earth Sci.*, janv. 2010, doi: 10.3906/yer-0806-15.
- [22] N. Mondillo, M. Di Nuzzo, S. Kalaitzidis, M. Boni, L. Santoro, et G. Balassone, « Petrographic and geochemical features of the B3 bauxite horizon (Cenomanian-Turonian) in the Parnassos-Ghiona area: A contribution towards the genesis of the Greek karst bauxites », *Ore Geol. Rev.*, vol. 143, p. 104759, 2022.

- [23] M. Khosravi, C. Verard, et A. Abedini, « Palaeogeographic and geodynamic control on the Iranian karst-type bauxite deposits », *Ore Geol. Rev.*, vol. 139, p. 104589, 2021.
- [24] J.-L. Guendon, « Minéralogie, géochimie et génétique des bauxites du Vietnam du nord par Gy Komlossy. Acta Geologica Academiae Scientiarum Hungaricae, Tomus 20 (3-4), 1976 », *Karstologia*, vol. 5, n° 1, p. 62-62, 1985.
- [25] T. M. Sojien, E. L. T. Mamdem, A. S. L. Wouatong, et D. L. Bitom, « Mineralogical, Geochemical and Distribution Study of Bauxites in the Locality of Bangam and Environs (West Cameroon) », *Earth Sci. Res.*, vol. 7, n° 1, p. 117, janv. 2018, doi: 10.5539/esr.v7n1p117.
- [26] L. CHANGLING, « The Genetic types of bauxite deposits in China », *Sci. Sin. [B]*, vol. 31, n° 8, p. 1010-1024, 1988.
- [27] Y.-Y. Zhang, P. Hu, Z.-Y. Zhang, Y.-H. Qi, et Z.-S. Zou, « Mineralogical and geochemical characteristics of the Guigang Salento-type bauxite deposits, western Guangxi, China », *Acta Geodyn Geomater*, vol. 105, p. 1-7, 2014.
- [28] P. Merdy, Y. Lucas, R. Bertoldo, P. Prudent, I. Laffont-Schwob, et P. Hennebert, « Mécanismes et solutions réalistes de stabilisation de déchets industriels et de sols contaminés en milieu méditerranéen par l'utilisation de résidus de bauxite (boues rouges) », in *Journée de restitution des projets lauréats de l'AOI ECCOREV 2016*, 2018.
- [29] G. Bardossy et J. Dercourt, « Les gisements de bauxites téthysiens (Méditerranée, Proche et Moyen Orient); cadre paléogéographique et contrôles génétiques », *Bull. Société Géologique Fr.*, vol. 6, n° 6, p. 869-888, 1990.
- [30] D. Njoya, A. Njoya, A. K. Ngueteu, Y. D. Tchuindjang, et C. Nkoumbou, « Caractérisation chimique et minéralogique de quelques indices de bauxite de Fouban (Ouest-Cameroun) », *Int. J. Biol. Chem. Sci.*, vol. 11, n° 1, p. 444, mai 2017, doi: 10.4314/ijbcs.v11i1.35.
- [31] S. Lerat, « Bauxite et aluminium dans le monde », *Cah. O.-m.*, vol. 11, n° 44, p. 389-425, 1958, doi: 10.3406/caoum.1958.2095.
- [32] N. Haniççi, « Geological and geochemical evolution of the Bolkardaği bauxite deposits, Karaman, Turkey: Transformation from shale to bauxite », *J. Geochem. Explor.*, vol. 133, p. 118-137, oct. 2013, doi: 10.1016/j.gexplo.2013.04.004.
- [33] V. A. Tenyakov, V. I. Mamedov, M. Pastukhova, et M. G. Edlin, « Geochemistry of bauxites of the principal genetic types », in *Mezhdunarodnyj geologicheskij kongress. 27*, 1984, p. 323-325.

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Mamadou Oury DIALLO^{1,2} - Corresponding author




¹-Laboratoire de Recherche Appliquée en Géosciences et Environnement (LRA), Boké, BP 84, Republic of Guinea.

² Laboratoire des Sciences Géographiques, du Génie Civil et des Géosciences (LASCIG3), Yamoussoukro, Republic of Côte d'Ivoire.



Prof. Gbélé OUATTARA²

² Laboratoire des Sciences Géographiques, du Génie Civil et des Géosciences (LASCIG3), Yamoussoukro, Republic of Côte d'Ivoire.

	<p>Aly SOUMAH^{1,2}</p> <p>¹ Laboratoire de Recherche Appliquée en Géosciences et Environnement (LRA), Boké, Republic of Guinea.</p> <p>² Laboratoire des Sciences Géographiques, du Génie Civil et des Géosciences (LASCIG3), Yamoussoukro, Republic of Côte d'Ivoire.</p>
	<p>Abdoulaye Kadiatou DIALLO^{1, 2}</p> <p>¹ Laboratoire de Recherche Appliquée en Géosciences et Environnement (LRA), Boké, Republic of Guinea.</p> <p>² Laboratoire des Sciences Géographiques, du Génie Civil et des Géosciences (LASCIG3), Yamoussoukro, Republic of Côte d'Ivoire.</p>
	<p>Kandass KEITA^{1,2}</p> <p>¹ Laboratoire de Recherche Appliquée en Géosciences et Environnement (LRA), Boké, Republic of Guinea.</p> <p>² Laboratoire des Sciences Géographiques, du Génie Civil et des Géosciences (LASCIG3), Yamoussoukro, Republic of Côte d'Ivoire.</p>