

REVIEWER'S REPORT

Manuscript No.: IJAR-59519

Title: Petrography of the magmatic and metamorphic rocks of the western Korhogo area (northern Côte d'Ivoire).

Recommendation:

Accept after minor revision

Rating	Excel.	Good	Fair	Poor
Originality		√		
Techn. Quality			√	
Clarity		√		
Significance			√	

Reviewer's ID: JPR-006

Detailed Reviewer's Report

1. Objective and Scientific Novelty

The manuscript aims to improve geological knowledge of the western Korhogo area by identifying and characterizing its magmatic and metamorphic rocks. However, the specific scientific novelty over earlier geological investigations, particularly the study by Fofana, should be clearly established. The authors should explicitly state the unresolved research questions and explain how the present petrographic investigation advances existing knowledge.

2. Background and Significance of the Study

The introduction provides a general overview of the geological setting and gold mineralization potential of the Korhogo region. However, the scientific rationale would be stronger if the authors explained the relationship between lithological diversity, regional geological evolution, hydrothermal alteration, and mineralization. The research gap should be supported by a more critical discussion of previous studies rather than primarily describing the limited number of investigations.

3. Geological Setting and Regional Context

The geological setting describes the Korhogo greenstone belt and associated granitoids within the Paleoproterozoic domain of the West African Craton. Nevertheless, the spatial relationships among the different lithological units, major structures, and boundaries of the investigated area require clearer explanation. The authors should provide a more detailed geological map with a scale, legend, coordinate reference system, sampling locations, and relevant structural features to improve reproducibility and geological interpretation.

4. Sampling Strategy and Field Investigation

The methodology mentions field observations, macroscopic petrography, and the collection of rock samples for thin-section analysis. However, the manuscript does not adequately specify the total number of samples, sampling locations, selection criteria, or the spatial distribution of specimens across the study area. The authors should include a sample inventory with sample identification codes, coordinates, lithological classifications, and sampling context to establish the representativeness of the observations.

5. Adequacy of the Petrographic Methodology

The study combines macroscopic examination, optical microscopy, and scanning electron microscopy (SEM) to characterize the identified rock types. However, the operating conditions, analytical procedures, magnification ranges, and criteria used for mineral identification are insufficiently detailed. The authors

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should provide the relevant laboratory protocols and explain how observations from different analytical techniques were integrated to support reliable petrographic classification.

6. Mineral Identification and Classification of Rock Types

The manuscript identifies basalts, gabbros, quartz diorites, granodiorites, two-mica granites, biotite granites, alkaline granites, microdiorites, pegmatites, and migmatitic gneisses. Although the descriptions include mineral composition and texture, some classifications would benefit from more objective supporting evidence. The authors should clarify the diagnostic criteria used to distinguish closely related rock types and, where possible, support the classifications with quantitative modal mineralogical data.

7. Interpretation of Primary and Secondary Minerals

The manuscript reports the alteration of primary minerals into carbonates, sericite, epidote, chlorite, and amphibole. However, the mechanisms, sequence, and relative intensity of these transformations are not sufficiently established. The authors should distinguish primary magmatic minerals from secondary alteration products and explain the petrographic evidence used to infer mineral replacement and alteration relationships.

8. Significance of Silicification and Hydrothermal Alteration

Silicification, oxidation, sulphidation, and the occurrence of quartz and carbonate veins are important observations in the investigated rocks. Nevertheless, the manuscript does not sufficiently characterize the spatial distribution, intensity, or cross-cutting relationships of these alteration features. The authors should document representative field and microscopic evidence and discuss whether the alteration is consistent with hydrothermal activity or whether alternative geological processes may explain some observations.

9. SEM Analysis and Mineralogical Confirmation

The SEM investigation identifies pyrite, chalcopyrite, pyrrhotite, sphene, apatite, ilmenite, and iron oxides. However, the analytical configuration and mineral identification criteria are not adequately described in the methodology. The authors should specify whether energy-dispersive X-ray spectroscopy (EDS/EDX), elemental mapping, or other confirmatory techniques were used and provide representative analytical results to substantiate the reported mineral identifications.

10. Evidence Supporting Potential Gold Mineralization

The manuscript suggests that the occurrence of pyrite, chalcopyrite, and pyrrhotite may indicate gold mineralization in the study area. However, these sulphide minerals alone do not establish the presence of economically significant gold concentrations. The authors should clearly distinguish mineralogical indicators of possible mineralization from direct evidence of gold occurrence and provide supporting geochemical assays, documented gold-bearing mineral observations, or other appropriate evidence if available.

11. Structural Geology and Deformation Analysis

The manuscript mentions deformed basalts, granodiorites, microdiorites, and granitoids, as well as the orientation of geological structures. However, structural observations are not developed sufficiently to establish their relationship with lithological emplacement, deformation, or mineralization. The authors should provide systematic structural measurements, including foliation, lineation, fractures, and shear-zone orientations where observed, and explain how these features contribute to the regional geological interpretation.

12. Interpretation of Magmatic Evolution

The diversity of mafic, intermediate, and felsic rocks suggests a complex magmatic history involving potentially multiple intrusive and volcanic episodes. The discussion proposes several formation processes, but the available petrographic evidence does not conclusively establish the genetic relationships among all the rock types. The authors should distinguish direct petrographic observations from interpretations of magmatic evolution and consider geochemical and geochronological evidence to strengthen any proposed petrogenetic model.

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13. Metamorphic Conditions and Evolution

The manuscript describes migmatitic gneisses with granoblastic textures and secondary minerals, including epidote, chlorite, and sericite. However, the metamorphic conditions, grade, and timing of metamorphism are not quantitatively constrained. The authors should explain which mineral assemblages and textural relationships support their metamorphic interpretations and acknowledge that reliable pressure–temperature estimates would require suitable mineralogical and analytical evidence.

14. Comparison with Previous Geological Studies

The discussion compares the observed lithologies and alteration features with previous investigations of Birimian formations and gold deposits in Côte d'Ivoire and neighbouring West African regions. However, much of the comparison is descriptive rather than critically analytical. The authors should identify specific similarities and differences in lithology, mineral assemblages, alteration patterns, and structural characteristics, explaining whether these comparisons support or challenge the existing geological models.

15. Limitations, Data Presentation, and Reproducibility

The manuscript contains geological maps and macroscopic and microscopic figures, but the evidence would be more useful if presented systematically alongside the sampling and analytical data. Important limitations include the absence of a clearly documented sampling inventory, quantitative mineralogical results, and detailed SEM analytical information. The authors should improve figure resolution, standardize mineral abbreviations and captions, provide appropriate scale bars, and explicitly acknowledge the limitations of drawing regional geological or mineralization-related conclusions from petrographic observations alone.

16. Conclusions and Future Research Directions

The conclusion summarizes the major lithologies and secondary minerals identified in the western Korhogo area and highlights the possible relevance of sulphide mineralization. However, it should more clearly distinguish the principal findings from interpretations that remain unverified, particularly regarding gold prospectivity and geological evolution. The authors should conclude with specific recommendations for future work, including systematic geochemical sampling, structural mapping, quantitative mineralogical characterization, geochronological investigation, and targeted gold assays where justified.

17. Suggested Corrections and Improvements

The authors should address the methodological gaps, strengthen the evidence supporting their interpretations, clarify the novelty of the work, and ensure that conclusions about gold mineralization remain proportional to the data presented.

18. Overall Recommendation for Publication

The manuscript presents a valuable contribution to regional geology by providing a systematic petrographic characterization of the magmatic and metamorphic rocks of the western Korhogo area. The integration of field observations, optical microscopy, and scanning electron microscopy strengthens the scientific quality and reliability of the findings. The study offers useful insights into regional geological evolution and potential mineral exploration opportunities. Overall, **I recommend acceptance for publication after minor revisions to improve clarity, presentation, and scientific communication.**