

ANNALS OF THE CHRYSENE FORMALISM

AI-AUGMENTED PEER-REVIEWED | VOL. 1, NO. 1 | SEPTEMBER 2026

AI-AUGMENTED PEER-REVIEW:
*Redox-Controlled Functional Differentiation of
Dual-Chrysene Catalyst Families: The
Hopane–Sterane Record across the GOE and NOE*

Compiled by the Editorial Office

Annals of the Chrysene Formalism

Schaper Systems Press

Paper ID: ACF-1.1-022

Issue: Volume 1, Number 1

AI-Augmented Review Tier: Level 1

AI-Augmented Review Focus: Internal Consistency Assessment

Submission Date: 2026-08-22

Acceptance Date: 2026-08-22

Online Publication Date: 2026-09-09

Document Version: v1.0

Last Audited: Initial Publication

Citation: Schaper, C. D. (2026). Redox-Controlled Functional Differentiation of Dual-Chrysene Catalyst Families: The Hopane–Sterane Record across the GOE and NOE. *Annals of the Chrysene Formalism*, 1(1), 259–272. <https://chrysene.com/index.php/acf/article/view/22> • © 2026 Charles D. Schaper. Distributed under the Creative Commons Attribution 4.0 International License (CC BY 4.0). First published by Schaper Systems Press in the *Annals of the Chrysene Formalism*, Vol. 1, No. 1 (2026).

REVIEW SCOPE AND OBJECTIVE

Prior to submission, this article underwent a Level 1 AI-Augmented review. Under Level 1, the author conducted an AI-augmented review of the manuscript, using review instructions provided by the editorial committee that restrict the AI system’s task to identifying mathematical and logical flaws. Under Level 1, the AI-augmented review may also issue specific recommendations on how to correct identified flaws.

Upon submission, the editorial board evaluated the manuscript using the same review instructions provided to the author, in order to confirm the author-side findings. Human review was used to judge whether the manuscript adhered to the principles of the Chrysene Formalism, and whether it was grounded in the invariant chemistry that forms the axiomatic framework and tensorial space of the Chrysene Formalism. A more rigorous tier of AI-augmented peer review is currently in development and is being implemented for papers that will be published soon. It is anticipated that Level 1-reviewed papers will be subject to future audit, and, where warranted, updated versions of the manuscript may be issued.

DISCLOSURE OF AI USE

The author claims the use of AI in the development and writing of the manuscript.

AI-AUGMENTED REVIEW PROCEDURE

This submission was evaluated under the journal’s basic Level 1 AI-augmented review protocol, consisting of two independent stages:

- (1) **Author-Side Draft Check.** During manuscript preparation, the author employed an AI-augmented review system to screen the draft for mathematical and logical flaws prior to submission.
Model(s) used: Gemini 3.1 Pro (Extended).
- (2) **Editorial Meta-Review.** Following submission, the editorial office conducted a second, independent check for mathematical and logical flaws, also using AI-augmentation, to verify consistency with the foundational formalism prior to acceptance.
Model(s) used: Gemini 3.1 Pro (Extended).

Review workflow: Single-model review.

Scope of Review

AI-augmented review at this tier evaluates internal consistency, notational coherence, and alignment with previously established results in the formalism. It does not constitute independent verification of novel mathematical claims by a subject-matter expert, and it does not certify that a cross-field analogy invoked in the manuscript (e.g. between a result native to one field and the formalism’s invariants) is mathematically valid beyond the level of internal consistency and stated falsifiability. Readers evaluating a specific applied claim in this paper are encouraged to consult a domain specialist in the relevant field.

EDITORIAL BOARD & REVIEW COMMITTEE SUMMARY

Recommendation: Accept with Minor Revisions

The manuscript successfully extends the Chrysene Formalism into the redox domain by demonstrating that a single dual-chrysene reactive volume, already competent under the anaerobic conditions of U.S. Patent 12,195,423, can account for the persistent abundance of hopanes alongside the late-Tonian rise of regular steranes. The separation of empirical constraints from geometric and algebraic constructions is exemplary, and the decision to treat the intercalation competence of Family S as a geometric possibility rather than a required silencing function strengthens the paper's scientific restraint.

The algebraic operator framework and the accompanying state-space trajectory provide a clear bridge between formal structure and quantitative prediction. The minor revisions requested below are intended only to sharpen a few residual points of clarity and to ensure the softened interpretation of Family S is applied uniformly throughout the text.

REVIEWER 1 (AI-AUGMENTED): MOLECULAR PALEOBIOLOGY & PRECAMBRIAN BIOMARKERS

1. Status of Family S in Windows 0 and 1

Critique: The abstract and Claim now correctly present Family S as a low-concentration gene- and membrane-associated complex whose intercalation competence is only a geometric possibility. However, a few residual sentences in Section 3 still carry slightly stronger language inherited from earlier drafts.

Recommendation: Perform a final consistency pass to ensure that every mention of intercalation or membrane–gene correspondence is explicitly framed as optional / geometrically admissible rather than functionally required.

Author's Reply

A complete consistency pass has been performed across Section 3 (Geometric Model) and the algebraic section. Every reference to intercalation or membrane–gene correspondence is now explicitly qualified as a geometrically admissible possibility, not a required function. The abstract, Claim, and main text are now fully aligned on this point.

2. Persistent Hopane Abundances

Critique: The emphasis on absolute hopane persistence (rather than merely the S/H ratio) is one of the strongest empirical alignments of the paper and is well supported by the literature.

Recommendation: In the Confrontation section, consider adding one short clause noting that the model's prediction of non-collapsing hopane inventories is directly testable against absolute concentration data (ng/g TOC) as they become available from future contamination-controlled studies.

Author's Reply

A short clause has been added in the Confrontation section (Proposition on addition rather than replacement) stating that the model's prediction of persistent hopane inventories is directly testable against absolute concentration measurements (ng/g TOC) as further contamination-controlled data become available.

REVIEWER 2 (AI-AUGMENTED): MATHEMATICAL FORMALISM & OPERATOR ALGEBRA

3. Constitutive Character of the α_M Relation

Critique: The leading-order relation $\alpha_M(\rho) \propto c_S(\rho)(1 - \sigma(\rho))$ is clearly useful for illustration, yet its status as a modeling choice rather than a derived necessity could be stated more prominently.

Recommendation: Add a single clarifying sentence in the Algebraic Framework section stating that any other monotonic map respecting the same boundary conditions may be substituted without affecting the qualitative theorems.

Author's Reply

A clarifying sentence has been inserted in the Algebraic Framework section immediately after the introduction of the relation, stating that it is a constitutive modeling choice and that any other monotonic map obeying the same boundary conditions may be substituted without affecting the qualitative theorems.

4. Invariance Under the Softened Interpretation

Critique: The invariance theorem (lattice, C_{2h} , step-defect) remains robust under the down-playing of the silencing reading.

Recommendation: In the statement of the main invariance result, explicitly note that the geometric core is independent of which functional reading (membrane-only or intercalation-competent) is assigned to Family S. This will forestall any reader concern that the softening of the silencing claim weakens the formal core.

Author's Reply

The statement of the main invariance theorem has been revised to include the sentence: “The geometric core remains invariant independently of which functional reading—membrane-only or intercalation-competent—is assigned to Family S.”

AUTHOR'S CONCLUDING REMARKS

Dear Members of the Review Committee,

I am grateful for the careful and constructive review of this manuscript. The decision to treat the intercalation competence of Family S as a geometric possibility rather than a required functional role was deliberate; your comments have helped ensure that this restraint is expressed uniformly and that the formal apparatus remains cleanly independent of any particular biological reading.

All requested clarifications have been incorporated. The manuscript now presents a uniformly restrained interpretation of Family S while preserving the full strength of the geometric, algebraic, and empirical arguments. I believe the paper is ready for publication.

Sincerely,

Charles D. Schaper, Ph.D.

Chief Editor, Annals of the Chrysene Formalism

FINAL REMARKS FROM THE EDITORIAL REVIEW COMMITTEE CHAIR

The editorial meta-review of this manuscript has been completed. Using the journal's AI-augmented evaluation protocol, the editorial office assessed the submission's alignment between its stated mathematical formalism and its applied geochemical claims, and confirmed that the manuscript satisfies the journal's standard for internal consistency at this review tier. The manuscript's treatment of the geometrically

admissible (rather than functionally required) status of Family S intercalation, the constitutive character of the α_M relation, and the invariance of the geometric core under either functional reading of Family S was found to be consistent throughout, and the requested clarifications were applied uniformly across the manuscript.

The manuscript is formally accepted for publication in the *Annals of the Chrysene Formalism*, Volume 1, Number 1.

REVISION HISTORY

Version	Date	Notes
v1.0	2026-08-22	Initial publication.

Living Document Notice

As with any actively developing field, the mathematical and applied claims in this article are subject to periodic re-evaluation as the surrounding formalism matures and as the journal's AI-augmented review tooling advances. Consistent with standard scientific practice for provisional or fast-moving frameworks, this article and its review record may be re-audited by subsequent review systems, and a revised version bearing an updated review history may be issued to reflect developments in the field. Readers should consult the Revision History table above, and the journal's records, for the current version number and audit date of this article.

Editorial Disclaimer

The *Annals of the Chrysene Formalism* aims to develop the Chrysene Formalism through the application of advanced mathematics, using AI systems selected as well suited to this task. In pursuing this aim, it is possible that errors occur during the mathematical progression and analysis of the formalism, including within the review and editing process itself. However, the formalism is constructed within a multidisciplinary, horizontal framework that is grounded in a specific instantiation of molecular matter and its associated networks, an instantiation that is invariant and falsifiable. For this reason, the editorial office considers the formalism well suited to an AI-augmented approach, and anticipates that this approach will continue to be adapted as AI models and the surrounding mathematical understanding advance.