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Carbon Traceable Protocell Construction From Substituted Chrysene Stocks

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Declared conflict

This is an independent referee report prepared for the Editorial Board. There is no author-reply section.

Scope of Review

This manuscript provides a rigorous mathematical and material audit of the protocell construction program across Articles 62–76, grounded in U.S. Patent No. 12,195,423 B1. By treating the synthesis and selection of the incoming $6, 12$-, $3, 6, 12$-, and $3, 6, 9, 12$-substituted chrysene stocks as an explicit upstream boundary condition, the author isolates a well-posed finite-resource construction problem: whether all functional carbon inside an operating compartment can be traced without hidden organic feeds or duplicate atom ownership to admitted

chrysene cores and their declared organic arms. The paper establishes five substantive mathematical contributions, backed by a zero-dependency Python verification suite and formal proof companions.

Compiled disposition

Accept with minor revisions. The independent referee confirms five major advances and recommends acceptance after correction of displaced row entries and formula typos in Table 3, restoration of the error-bound display in Theorem 3.19, and resolution of a duplicate bibliography key. No further computation is required. The carbon-provenance, stock-reservation, and operating-witness results stand.

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1 Stage summary

Five substantive contributions confirmed

(i) Typed assembly interfaces, persistent carbon provenance, and exact stock reservations (Sections 2–3). (ii) Stock-resolved bridge to the constitutional amino-acid repertoire (Sections 3.7, 4). (iii) Explicit uncoded finite-stock operating witness, bootstrap from zero peptide, and matched ablation (Sections 5–7). (iv) Uniform four-period robustness box and pathwise perturbation bounds (Section 8). (v) Renewal cycles, resource-inheriting conditional division, return-map contraction bounds, and microscopic transfer (Sections 9–11). The methodological separation of graph certificates $\mathcal{G}$, assumed-law operating trajectories $\mathcal{O}$, and conditional physical realizations $\mathcal{X}_\theta$ brings clarity to the series.

Major items M1–M3

M1: Displaced row entries and formula typos in Table 3 (Twenty constitutional targets). Move the Pro connectivity string back to the Pro row; correct the Val formula from $C_5H_{11}NO_1$ to $C_5H_{11}NO_2$; restore locant labels in Phe, Trp, Arg, and Lys. M2: Restore the corrupted error-bound display (M11) and the upper bound in Theorem 3.19; restore $P_4^{\text{retained}} + P_4^{\text{lumen}}$ in (M9). M3: Resolve the duplicate bibliography key [Sch261] for Articles 62 and 66 (render as [Sch26i] and [Sch26l]); correct the citation footer URL from view/72 to view/77.

Minor and typographical corrections

Restore corrupted or dropped symbols in displayed equations (Section 1.3 hierarchy, Definition 2.1, Section 2.4, Eq. (2), Proposition 3.2, Table 2, Section 3.4, Section 3.7, Eq. (7), Eqs. (9)–(10), Theorem 8.1, Eq. (28), Proposition 11.3, Section 12.4, Table 4). Clear the remaining typographical items listed in the full report.

2 Full independent referee report (verbatim)

The following is the complete text of the independent referee report.

Manuscript ID: ACF-2026-077 (Vol. 1, No. 4, pp. 1567–1605)
Title: *Carbon Traceable Protocell Construction From Substituted Chrysene Stocks*
Author: Charles D. Schaper, Ph.D.
Recommendation: Accept with Minor Revisions

1. Summary and Overall Assessment

This manuscript provides a rigorous mathematical and material audit of the protocell construction program across Articles 62–76 of the *Annals of the Chrysene Formalism*, grounded in U.S. Patent No. 12,195,423 B1. By treating the synthesis and selection of the incoming $6,12$-, $3,6,12$-, and $3,6,9,12$-substituted chrysene stocks as an explicit

upstream boundary condition, the author isolates a well-posed finite-resource construction problem: whether all functional carbon inside an operating compartment can be traced without hidden organic feeds or duplicate atom ownership to admitted chrysene cores and their declared organic arms.

The paper establishes five substantive mathematical contributions, backed by a zero-dependency Python verification suite and formal proof companions (`Article77_Verification_Code` and `Article77_Formal_Proof`, Appendices A–B):

1. **Typed Assembly Interfaces, Persistent Carbon Provenance, and Exact Stock Reservations (Sections 2–3).** Defining typed phase interfaces $\mathcal{I} = (\Gamma, \mathcal{L}, \mathcal{U}, \mathcal{C}, \mathcal{O}, \mathcal{E}, \sigma)$, the author proves safe phase composition (Proposition 2.2) and topological whole-strand enclosure on $\mathbb{R}^3 \setminus \Sigma$ (Proposition 2.3). From a five-type neutral precursor catalogue (D_2, I_2, T_2, T_0, D_m with general formula $\mathrm{C}_{18+2n_e}\mathrm{H}_{12+4n_e}\mathrm{O}_{n_h+2n_e}$, Proposition 3.2, Table 2), the paper proves persistent atom provenance and exact open-system carbon balance $C_{\mathrm{in}}(t) = C_{\mathrm{in}}(0) + I(t) + Q_{\mathrm{old,in}}(t) - Q_{\mathrm{out}}(t)$ (Theorem 3.5), no-double-use and local rewrite commutation (Theorem 3.6), and unit-slot Hall matching versus general multi-resource binary integer programming (Theorem 3.8, Proposition 3.9). Crucially, Proposition 3.10 resolves the four-carbon discrepancy between a D_2 dimer ($\mathrm{C_{44}H_{39}O_{10}P}$) and Article 62's 40-carbon route-A membrane precursor ($\mathrm{C_{40}H_{31}O_8P}$) via D_m, while Proposition 3.11 completes Article 66's short-link pore formula $\mathrm{C}_{18mq}\mathrm{H}_{12mq-b+p}\mathrm{O}_{4mq+2b+3p}\mathrm{P}_{b+p}$ ($\mathrm{C_{162}H_{96}O_{75}P_{18}}$ at $m = q = p = 3$, adding the three distal terminal phosphates to the 15 internal bridges). Proposition 3.12 (Figure 1) exhibits a concrete 810-carbon stock-reservation witness $(2D_m, 9T_0, 23D_2, 3T_2, 1I_2)$ with pairwise disjoint origin labels.
2. **Stock-Resolved Bridge to the Constitutional Amino-Acid Repertoire (Sections 3.7, 4).** Connecting the stock boundary to the revised Article 75 grammar, Assumption 3.13 and Theorem 3.14 specify the exact downstream stock-preparation interface required to supply the 18 core carbons and 2 arm-derived backbone carbons (c_α, c') without treating boundary ports (B_{12}, B_t) as hidden carbon sources. Using the finite guarded bond-word construction (Lemma 4.1), Theorem 4.2 proves that 18 disjoint unary prepared modules and 1 shared two-module sulfur packet (400 exposed carbons, 1,504 actual atoms, 40 ports) construct all 20 constitutional amino-acid graphs (Table 3) containing $107 = 67 + 40$ product carbons and 293 tracked nonproduct carbons, complemented by carbon-preserving linear amide joining (Propositions 3.15 and 4.3).
3. **Explicit Uncoded Finite-Stock Operating Witness, Bootstrap from Zero Peptide, and Matched Ablation (Sections 5–7).** Replacing Article 71's retired free-residue condensation law with Article 76's tethered-chain ledger in an uncoded setting, Sections 5–6 formulate a 10-state Carathéodory ODE system $(b, c, p, w, l, h, r, z, s, V)$ on $[0, 4]$ coupled to an exact Donnan mobile-ion excess $D(Q, V, c_s) = \sqrt{(Q/V)^2 + 4c_s^2} - 2c_s$ and a finite usable-work ledger $E(t)$. Theorem 7.1 establishes hybrid well-posedness and positive invariance; Theorem 7.2 proves that from zero initial peptide ($p(0) = 0$) and finite reserves ($b(0) = 130, c(0) = 30$), active retained chains reach the functional threshold $p_{\mathrm{fun}} = 3/2$ no later than $t_{\mathrm{fun}} \le 3131/1049 < 2.985$ (and reach $p = 8/5$ by $162812/43813 < 3.717$, Corollary 7.4) while preserving $100 \le V \le 600$, $500 \le A \le 660$, and $E(t) \ge 40$. Theorem 7.5 proves that the matched ablation deleting only the feedback term $20p/(1 + p)$ obeys

$p(t) \leq 1 - e^{-t} < 1$ for all $t > 0$ and never reaches $3/2$ (Figure 2). Theorem 3.19 and Corollary 3.20 bridge this continuous trajectory to a discrete path of integer stoichiometric blocks (M9) with uniform $O(1/M)$ error bounds.

4. **Uniform Four-Period Robustness Box and Pathwise Perturbation Bounds (Section 8).** Theorem 8.1 certifies a uniform multi-parameter uncertainty box around the nominal model, proving analytically that every system in the box crosses $p = 3/2$ by $t \leq 239898900/70245111 < 3.416$ and stays above $3/2$ through $t = 4$, while every matched ablation stays below 1.026, supplemented by Gronwall pathwise perturbation estimates (Proposition 8.2).

5. **Renewal Cycles, Resource-Inheriting Conditional Division, Return-Map Contraction Bounds, and Microscopic Transfer (Sections 9–11).** Section 9 separates recurrent operational projections from nonperiodic consuming resource histories (Definition 9.1, Theorem 9.2, Proposition 9.3). Section 10 states the normalized area-conserving two-daughter partition (Proposition 10.1), formulates the five-part conditional division certificate $R_{i,h}(z) = \pi U_{i,h} P_{i,h} \Psi_h \Phi_{T(z,h)} \iota_h(z)$ (Theorem 10.2), derives the saltation/implicit-function return-map derivative bound $\|DR\| \leq e^{L\bar{T}}[B_x + (B_t + B_x M)G/\gamma]$ while repairing Article 73's linear stability condition on $R(\Lambda) = (\Lambda + G(\Lambda))/2$ from $G'(\Lambda_*) < 1$ to $-3 < G'(\Lambda_*) < 1$ (Theorem 10.3), and states the exact Poisson hold/fire barrier inequality (32) without reliance on Article 74's disputed H3 prolate minimizer claim (Section 10.4). Finally, Section 11 proves the finite molecular transfer theorem with Lipschitz observation tubes and integral/differential residual bounds (Definition 11.1, Theorem 11.2, Proposition 11.3).

The manuscript's methodological rigor—explicitly separating graph certificates $\mathcal{G}$, assumed-law operating trajectories $\mathcal{O}$, and conditional physical realizations $\mathcal{X}_\theta$ (Section 1.3, Table 1)—brings exemplary clarity to the entire protocell series. I recommend acceptance after the author addresses the table-formatting and typographical corrections detailed below.

2. Major Technical and Editorial Comments

- **M1. Displaced Row Entries and Formula Typos in Table 3 (Twenty constitutional targets, p. 1584).** In Table 3 on p. 1584, several entries in the second and third columns were shifted or corrupted during typesetting: (a) Displaced Pro connectivity in the Phe cell: the first row of Table 3 is Pro ($C_5H_9NO_2$, carbon origin $3+2$), but its second column is blank, while its connectivity string 5-4*b*-10*b*-n_α closes to backbone nitrogen is printed fourteen rows lower as a third line inside the Phe cell. Please move it back to the Pro row (and place Pro in alphabetical order between Phe and Ser). (b) Formula typo in the Val row: the neutral formula is printed as $C_5H_{11}NO_1$ instead of $C_5H_{11}NO_2$. (c) Corrupted locant labels in Phe, Trp, Arg, and Lys: in Phe the cycle locants 10b and 4b are misprinted as 106 and 46; in Trp the fused-cycle locants 12a, 4a, 4b are misprinted as 120, 44, 46 and 40, 120; in Arg and Lys the leading locant 5 is dropped before the first hyphen.

- **M2. Corrupted Error-Bound Display (M11) and Upper Bound in Theorem 3.19 (p. 1581).** In Theorem 3.19 the hypothesis $S(t) \leq S_{\max} \leq 130$ is misprinted as $S(t) \leq S_{\max} \leq 13c$, and the three displayed uniform error bounds in equation (M11) are severely garbled. Please restore the exact bounds: $|p_M - p|, |w_M - w|, |l_M - l| <$

$1/M$; $|c_M - c|, |h_M - h|, |z_M - z| < 2/M$; $|b_M - b|, |r_M - r| < 10/M$. Also restore $P_4^{\mathrm{retained}} + P_4^{\mathrm{lumen}}$ in (M9).

- **M3. Duplicate Bibliography Key [Sch261] for Articles 62 and 66, and Citation Footer URL (pp. 1567, 1571, 1577, 1604).** Both Article 62 and Article 66 are printed with the identical citation key [Sch261] (because the lowercase letters i and l were rendered as the numeral 1). Please ensure the bibliography labels render distinctly as [Sch26i] (Article 62) and [Sch26l] (Article 66). In the citation footer the article URL reads view/72 instead of view/77.

3. Minor and Typographical Corrections

Corrupted or dropped symbols in displayed equations appear in Section 1.3 (hierarchy of existence statements), Definition 2.1 (typed interface tuple), Section 2.4 (precursor pair transformation), Section 2.6 Eq. (2) (state tuple and ready subscript), Section 3.1 / Proposition 3.2 / Table 2 (locants, oxygen subscripts, missing e's, duplicated fragment), Section 3.4 (route-A target formula), Section 3.7 / Theorem 3.14 / Section 4.1–4.2 (missing c', $107 = 67 + 40$, Figure 1 row, missing verb), Section 5.2 Eq. (7) (Donnan upper bound), Section 6 Eqs. (9)–(10) (flux equation number and overdots), Proof of Theorem 8.1 (A instead of 4), Section 10.2 Eq. (28) (missing Φ and Ψ_h), Proposition 11.3 (supremum and parenthesis), Section 12.4 (duplicated fragment), and Table 4 (punctuation).

Recommendation

Accept with minor revisions. Correct the displaced entries and formula typos in Table 3, restore the error-bound display in Theorem 3.19, resolve the duplicate bibliography key, and clear the listed typographical items. No further computation is required. The carbon-provenance, stock-reservation, and operating-witness results stand.

References

[Art76] C. D. Schaper. The division of the vessel. *Annals of the Chrysene Formalism* 1(4):1545–1566, 2026. Article 76.

Revision history

Version	Date	Notes
v1.0	2026-10-25	Review record published with Article 77.

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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.