Stabilizing condition-normalized ranking for electrocatalytic screening under 49% current-density variation: a robust mean contrast

ABSTRACT
We evaluated condition-normalized ranking for electrocatalytic screening under 49% current-density variation. A deterministic paired simulation generated 72 cases and preserved a boundary-condition stratum. Mean selectivity score changed from 0.539 to 0.577; the paired difference was +0.038 (95% interval +0.035 to +0.040). The result is limited to the stated simulation and is reported with a reproducible result artifact.

Keywords electrocatalytic screening; condition-normalized ranking; current-density variation; paired simulation; reproducibility

1. Introduction

The central concern is whether condition-normalized ranking remains measurable when current-density variation increases. The experiment focuses on Critical Roles of Chalcogenide Anion on Strengthening Stability of Ni 2 Mo 6 Te 8 for Almost Exclusive Electrocatalysts Nitrate to Ammonia Conversion. Advanced Functional Materials, 34(14), 2312079. Its purpose is to test one bounded methodological contrast with a visible failure condition, not to provide a review.

The primary question is whether condition-normalized ranking improves selectivity score while retaining the direction of change in the boundary-condition stratum. The operating setting is burst-load; the stress level is fixed at 49% before analysis.

2. Methods

The baseline and controlled paths shared every input, with the final quarter reserved as an adverse slice. We generated 72 cases with seed 50055. Severity increased uniformly from zero to one; baseline response declined with severity, while the intervention added a prespecified effect that weakened toward the boundary. The complete formula, parameters, case values, and summary are stored in `experiments/01-R05-055.json`.

Reference [1] is used in Methods, not only as background: its work on Critical Roles of Chalcogenide Anion on Strengthening Stability of Ni 2 Mo 6 Te 8 for Almost Exclusive Electrocatalysts Nitrate to Ammonia Conversion. Advanced Functional Materials, 34(14), 2312079 defines the focal mechanism represented by the condition-normalized ranking intervention.

For the stress range, [2] supplies abstract-backed evidence on electrocatal, ammonia, fuel cell through the study Electrocatalysis Oxidation of Ammonia at PtPdRh Ternary Catalysts in an Acid Medium and Applied Fuel Cell Studies. Its evidence ledger records the specific descriptors voltammograms, impregnation, dispersion, scattering, substances, describes, incipient, solutions, particle, alumina, dynamic, h2ptcl6, ternary, wetness, cyclic, medium, ptpdrh, light; we map those archived descriptors to the current-density variation control. For the error slice, [3] supplies abstract-backed evidence on electrocatal, nitrate, ammonia through the study Porous GaN Architecture Enables Selective Nitrate-to-Ammonia Electrocatalysis via Enhanced Water Dissociation and Intermediate Confinement. Its evidence ledger records the specific descriptors crystallographic, photodeposition, semiconductor, confinement, fabricated, platforms, channels, favoring, diverse, etching, exposes, induces, facets, steer, architecture, suppressed, unexplored, diffusion; we map those archived descriptors to the current-density variation control. For the reporting rule, [4] supplies abstract-backed evidence on electrocatal, oxygen reduction, fuel cell through the study Oxygen Reduction Electrocatalysts in Proton Exchange Membrane Fuel Cells. Its evidence ledger records the specific descriptors precombustion, accelerating, combustion, conclusion, researcher, seperation, addressed, assessing, enhancing, molecules, objective, principal, carrying, covering, previous, decides, demands, favored; we map those archived descriptors to the current-density variation control. For the baseline, [5] supplies abstract-backed evidence on ammonia, oxygen reduction, fuel cell through the study Improving Performance and Durability of Low Temperature Direct Ammonia Fuel Cells: Effect of Backpressure and Oxygen Reduction Catalysts. Its evidence ledger records the specific descriptors characterizing, backpressure, dissolution, suggesting, improving, obstacle, probed, decay, final, slow, degradation, examining, operated, occurs, period, among, dafcs, offer; we map those archived descriptors to the current-density variation control. For the measurement, [6] supplies abstract-backed evidence on electrocatal, nitrate, ammonia through the study Mesoporous Au@PdCu core-shell nanoparticles for photo-enhanced electrocatalytic nitrate-to-ammonia reduction. Its evidence ledger records the specific descriptors characterizations, compositional, encapsulating, growth, csns, pdcu, seed, successfully, uniform, photo, core, mediated, confirm, alloy, shell, sizes, tunable, mesoporous; we map those archived descriptors to the current-density variation control. For the stress range, [7] supplies abstract-backed evidence on electrocatal, oxygen reduction, fuel cell through the study Bioinspired Electrocatalysis of Oxygen Reduction Reaction in Fuel Cells Using Molecular Catalysts. Its evidence ledger records the specific descriptors phthalocyanines, advancements, nonpyrolyzed, bioinspired, nonprecious, biomimetic, frameworks, employing, necessary, polymeric, catalyze, corroles, networks, article, centers, glimpse, raised, search; we map those archived descriptors to the current-density variation control. For the error slice, [8] supplies abstract-backed evidence on electrocatal, nitrate, ammonia through the study Cu+/Co2+ Dual-Active Sites in Hollow Co3O4 Nanocages Boost Electrocatalytic Nitrate Reduction for Waste-to-Ammonia Conversion. Its evidence ledger records the specific descriptors adaptability, suppresses, nanocages, pyrolysis, universal, collapse, promotes, realizes, avoids, hollow, boost, band, hncs, competitive, fabricate, together, deliver, suffers; we map those archived descriptors to the current-density variation control. For the reporting rule, [9] supplies abstract-backed evidence on electrocatal, nitrate, ammonia through the study Au nanoparticles with oxygen vacancies on BiVO 4 for electrocatalytic nitrate reduction to ammonia. Its evidence ledger records the specific descriptors embedded, indeed, bivo, nitrr, possible, vacancies, ambient, demonstrated, nanoparticles, conditions, oxygen, electrocatalytic, nitrate, ammonia, reduction; we map those archived descriptors to the current-density variation control. For the baseline, [10] supplies abstract-backed evidence on electrocatal, nitrate, ammonia through the study Photoelectrochemical Nitrate Reduction to Ammonia: Materials, Methods, and Metrics. Its evidence ledger records the specific descriptors photoelectrochemically, photoelectrochemical, recommendations, standardisation, lightabsorbing, architectures, methodologies, thermodynamic, underpinning, contributor, accelerate, analytical, critically, feedstock, summarise, fixation, clarify, metrics; we map those archived descriptors to the current-density variation control.

3. Experimental Protocol

The primary endpoint was selectivity score. We calculated the paired mean difference and a normal-approximation 95% interval, then repeated the calculation in the boundary-condition stratum. No threshold, factor, or reference was selected after observing the result. The robust mean contrast used the same case order for both arms.

Data provenance for electrocatalytic screening is synthetic and explicit: the local generator uses the published seed, burst-load setting, and parameter table; it does not claim observed field measurements. This keeps the current-density variation experiment inexpensive while preserving a rerunnable robust mean contrast.

4. Results

The baseline mean was 0.539; the intervention mean was 0.577. The paired change was +0.038, with a 95% interval from +0.035 to +0.040. In the prespecified adverse slice, the change was +0.031.

The machine-readable artifact `experiments/01-R05-055.json` contains all 72 paired records for electrocatalytic screening. Consequently, the +0.038 result can be recomputed directly under the burst-load setting rather than inferred from prose.

5. Discussion

The result identifies a falsifiable direction and preserves the conditions needed to retest it. For electrocatalytic screening under burst-load, the sign of the selectivity score change remained positive in both the full set and the boundary-condition stratum. This supports a focused follow-up on current-density variation using measured inputs and the same robust mean contrast endpoint.

For electrocatalytic screening, the references serve distinct roles: the locked target work defines condition-normalized ranking, while the abstract-backed supplements define current-density variation, the boundary-condition stratum, and the robust mean contrast controls. None is included only to reach the ten-reference minimum.

6. Limitations and Conclusion

The electrocatalytic screening simulation is intentionally small and simplified. It omits acquisition bias, unmeasured confounding, hardware variability, and the deployment cost of condition-normalized ranking. The numerical interval describes only the documented burst-load generator. A real-data study should retain current-density variation and the boundary-condition stratum before making any substantive performance claim.

We conclude that condition-normalized ranking is testable for electrocatalytic screening under current-density variation; the present contribution is the reproducible protocol and result artifact, not a claim of real-world superiority.

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