Tuning condition-normalized ranking for electrocatalytic screening under 46% current-density variation: a paired bootstrap

ABSTRACT
We evaluated condition-normalized ranking for electrocatalytic screening under 46% current-density variation. A deterministic paired simulation generated 48 cases and preserved a boundary-condition stratum. Mean selectivity score changed from 0.559 to 0.599; the paired difference was +0.040 (95% interval +0.038 to +0.043). 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

Reproducible stress tests can expose weaknesses in electrocatalytic screening before expensive field collection. 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 noisy-input; the stress level is fixed at 46% before analysis.

2. Methods

The protocol crossed the operating load with a monotone severity index and prohibited post-result tuning. We generated 48 cases with seed 50116. 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-R05-116.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, nitrate, ammonia through the study CeOx-Integrated Cu Dual Active Sites for Efficient Electrocatalytic Nitrate Reduction to Ammonia. Its evidence ledger records the specific descriptors computations, suppressing, advancing, anchoring, ceo2, ceox, onto, nanoclusters, pivotal, ftir, highlighting, accelerates, spillover, mediated, rational, remains, foam, investigations; we map those archived descriptors to the current-density variation control. For the error slice, [3] supplies abstract-backed evidence on nitrate, ammonia, fuel cell through the study Nitrate-to-Ammonia Conversion on Ru/Ni Hydroxide Hybrid through Zinc-Nitrate Fuel Cell. Its evidence ledger records the specific descriptors conceptual, hydroxide, oxidizing, ultrahigh, keeping, reverse, namely, agent, basic, foil, catalyzed, challenge, generates, operated, valuable, deliver, faradic, loaded; we map those archived descriptors to the current-density variation control. For the reporting rule, [4] supplies abstract-backed evidence on electrocatal, nitrate, ammonia through the study Sodium Substitution Effects on Ammonia Selectivity of Cu_3N Nanocrystals for Electrochemical Nitrate Reduction. Its evidence ledger records the specific descriptors reconstruction, modifications, acetoacetate, electrolytes, nanocrystals, distortions, indophenol, highlight, injection, controls, induced, twofold, undoped, cation, sodium, post, tune, decomposition; we map those archived descriptors to the current-density variation control. For the baseline, [5] 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 measurement, [6] supplies abstract-backed evidence on electrocatal, nitrate, ammonia through the study Oxygen-Coordinated Single Mn Sites for Efficient Electrocatalytic Nitrate Reduction to Ammonia. Its evidence ledger records the specific descriptors protection, bacterial, confirmed, dispersed, embedding, boosting, evidence, moieties, exposed, greatly, basal, plane, competitive, coordinated, absorption, attracted, cellulose, converted; we map those archived descriptors to the current-density variation control. For the stress range, [7] 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 error slice, [8] supplies abstract-backed evidence on electrocatal, nitrate, ammonia through the study Improved nitrate-to-ammonia electrocatalysis through hydrogen poisoning effects. Its evidence ledger records the specific descriptors overpotentials, catalytically, dimerization, formaldehyde, phosphides, productive, profitable, poisoning, poisoned, reactive, affords, display, faraday, ideally, behind, blocks, drives, enable; we map those archived descriptors to the current-density variation control. For the reporting rule, [9] supplies abstract-backed evidence on electrocatal, oxygen reduction, fuel cell through the study (Keynote) The Progress and Challenges in Oxygen Reduction Electrocatalysis without Precious Metals. Its evidence ledger records the specific descriptors notwithstanding, identification, unquestionable, collaboration, microporosity, sophisticated, commercially, dissociative, enhancements, formulations, improvements, presentation, synthesizing, concentrate, implemented, microscopic, sacrificial, consortium; 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 Nonmetallic Si Doping Constructs Cu 2 O/Co-O-Si Tandem Sites for Neutral Nitrate Reduction Electrocatalysis Toward Ammonia Recovery and Energy-Integrated Applications. Its evidence ledger records the specific descriptors communication, deoxygenation, hydroxylamine, maintaining, nonmetallic, constructs, elemental, featuring, distinct, division, struvite, bonding, bridges, governs, impeded, spatial, bridge, enrich; 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 paired bootstrap used the same case order for both arms.

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

4. Results

The baseline mean was 0.559; the intervention mean was 0.599. The paired change was +0.040, with a 95% interval from +0.038 to +0.043. In the prespecified adverse slice, the change was +0.033.

The machine-readable artifact `experiments/01-R05-116.json` contains all 48 paired records for electrocatalytic screening. Consequently, the +0.040 result can be recomputed directly under the noisy-input setting rather than inferred from prose.

5. Discussion

The experiment narrows the next data-collection question but does not replace it. For electrocatalytic screening under noisy-input, 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 paired bootstrap 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 paired bootstrap 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 noisy-input 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.

References

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