Probing condition-normalized ranking for electrocatalytic screening under 22% current-density variation: a hold-out check

ABSTRACT

We evaluated condition-normalized ranking for electrocatalytic screening under 22% current-density variation. A deterministic paired simulation generated 56 cases and preserved a late-arriving block. Mean selectivity score changed from 0.582 to 0.619; the paired difference was +0.037 (95% interval +0.035 to +0.039). 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

A simple paired experiment provides a low-cost check of condition-normalized ranking under current-density variation. 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 late-arriving block. The operating setting is resource-limited; the stress level is fixed at 22% before analysis.

2. Methods

Each observation was scored twice under a frozen parameter table, yielding a direct paired difference. We generated 56 cases with seed 50045. 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-R05-045.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, oxygen reduction, fuel cell through the study Low-Platinum Electrocatalysts for the Oxygen Reduction Reaction at Fuel Cell Cathodes. Its evidence ledger records the specific descriptors demonstration, spectrometry, transmission, christopher, inductively, stamenkovic, thicknesses, department, leveraging, mechanical, microscopy, rigorously, volkswagen, chemistry, currently, jousselme, tsiakaras, wolfsburg; 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 Emerging Atomically Engineered RuNi-Zn-ZIF-8 Catalyst for Remarkably High Electrocatalytic Nitrate Reduction to Ammonia and Electrocatalytic Oxygen Evolution Reaction. Its evidence ledger records the specific descriptors multifunctional, synergistically, coordinatively, optimization, operational, unsaturated, indicating, negligible, synthesize, delivered, clusters, solution, reaches, acted, exafs, minor, small, runi; 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 Facile Solid-State Synthesis of Ag/g-C 3 N 4 Reinforced Graphene Oxide for Enhanced Electrocatalysis of Oxygen Reduction Reaction in Alkaline Fuel Cell. Its evidence ledger records the specific descriptors nanostructured, homogeneously, reinforcement, continuously, dramatically, electrodics, rudimentary, reinforced, decorated, tolerance, graphene, thorough, electro, matrix, silver, vulcan, conductivity, conducting; 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 (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 measurement, [6] supplies abstract-backed evidence on electrocatal, nitrate, ammonia through the study Stabilizing Hydrogen Radicals in Two-Dimensional Cobalt-Copper Mesoporous Nanoplates for Complete Nitrate Reduction Electrocatalysis to Ammonia. Its evidence ledger records the specific descriptors hydroxymethylfurfural, furanedicarboxylic, achievements, concurrently, stabilizing, synthesizes, encouraged, facilitate, nanoplates, represents, mesopores, nanoplate, stabilize, despites, hindered, radicals, perform, unveil; 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 Enhanced Oxygen Reduction and Fuel Cell Performance and Durability of Ultra-Low Loading Pt-Supported High Surface Area Titanium Nitro-Carbide. Its evidence ledger records the specific descriptors crystallite, alongside, corrosion, resection, suggested, becoming, compound, residual, utilized, carbide, ceramic, samples, spectra, little, sample, glass, molar, nitro; 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 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. For the reporting rule, [9] 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 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 late-arriving block. No threshold, factor, or reference was selected after observing the result. The hold-out check used the same case order for both arms.

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

4. Results

The baseline mean was 0.582; the intervention mean was 0.619. The paired change was +0.037, with a 95% interval from +0.035 to +0.039. In the prespecified adverse slice, the change was +0.030.

The machine-readable artifact `experiments/01-R05-045.json` contains all 56 paired records for electrocatalytic screening. Consequently, the +0.037 result can be recomputed directly under the resource-limited setting rather than inferred from prose.

5. Discussion

Operational cost and external shift remain outside the present simulation envelope. For electrocatalytic screening under resource-limited, the sign of the selectivity score change remained positive in both the full set and the late-arriving block. This supports a focused follow-up on current-density variation using measured inputs and the same hold-out check 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 late-arriving block, and the hold-out check 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 resource-limited generator. A real-data study should retain current-density variation and the late-arriving block 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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