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Inaugural editorial: pioneering disruptive materials for next-generation technologies

Zhimei Sun

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Every major leap in technology and industry has been spearheaded by breakthroughs in materials science. From the Stone and Bronze Ages to the silicon-based semiconductor era, the evolution of materials has consistently defined the technological milestones of their time. Today, we stand at the forefront of the Fourth Industrial Revolution. Artificial intelligence, quantum computing, deep space exploration, synthetic biology, and the global imperative for carbon neutrality are reshaping the global technological landscape at an unprecedented pace. Against this backdrop, materials science is undergoing a fundamental paradigm shift, transitioning from traditional "trial-and-error" and "incremental refinement" to a new era driven by data-centric approaches, artificial intelligence, and deep interdisciplinary convergence.

However, the peer-review criteria and evaluation metrics of many traditional academic journals remain largely anchored in single-discipline frameworks and incremental innovation. Consequently, many cross-disciplinary explorations with disruptive potential, though often difficult to evaluate by conventional short-term metrics, struggle to find suitable publication outlets. This is precisely why *Future Materials* was founded. We are committed to transcending traditional material classifications. *Rather than categorizing research strictly by "metals, ceramics, or polymers", we are guided by the pressing demands of emerging technologies.* Our goal is to provide the global scientific community with an international platform dedicated to publishing disruptive materials research that is future-oriented and underpins next-generation technologies.

DEFINING "DISRUPTIVE": OUR EDITORIAL AND PEER-REVIEW PHILOSOPHY

As our name suggests, disruption is at the very heart of our editorial philosophy. At *Future Materials*, *we explicitly reject "me-too" incremental performance tweaks; instead, we champion original work that can trigger a "paradigm shift"*. To ensure a shared understanding between authors and reviewers, we define "disruptive" across three dimensions:

School of Materials Science and Engineering, Beihang University, Beijing 100191, China.

Correspondence to: Prof. Zhimei Sun, School of Materials Science and Engineering, Beihang University, Beijing 100191, China. E-mail: zmsun@buaa.edu.cn

First, disruption in mechanisms and principles. We welcome research that shatters conventional theoretical paradigms and reveals novel physical or chemical mechanisms. Whether exploring new pathways for room-temperature superconductivity, discovering entirely new topological states of matter, or proposing energy conversion mechanisms that break traditional thermodynamic limits, any work grounded in fundamentally novel principles is central to our scope.

Second, disruption through interdisciplinary integration. Major future breakthroughs often occur at the intersections of disciplines. We encourage the introduction of disruptive technologies from other fields into materials science to catalyze transformative advances. For instance, we welcome efforts that combine Large Language Models (LLMs) with robotics to build "self-driving laboratories", introduce synthetic biology concepts into biofabrication, and utilize 4D printing to endow materials with intelligent, time-dependent responses. Such integration is a vital source of innovation that we deeply value.

Third, disruption in applications and scenarios. We seek materials research that solves engineering challenges previously deemed "impossible" or creates entirely new technological paradigms. Examples include flexible neuro-electronic materials for brain-computer interfaces, materials for extreme-environment manufacturing for In-Situ Resource Utilization (ISRU) in space, or next-generation sustainable materials capable of achieving fully closed-loop recycling.

We also call upon our reviewers to step beyond the "comfort zones" of traditional disciplines and evaluate manuscripts with a forward-looking, interdisciplinary mindset. For disruptive research that carries high risk but offers exceptionally high potential returns, we must exercise greater tolerance and offer robust encouragement, ensuring that true innovation is not stifled by conservative peer review.

EMBRACING OPEN SCIENCE: COMMITMENT TO DATA, CODE, AND REPRODUCIBILITY

In the rapidly evolving era of "AI for Science", the research landscape in materials science has been fundamentally transformed. Algorithms, data, and code are now as crucial as experimental results, and have even become the primary forces driving the discovery of new materials. Therefore, *Future Materials* is not merely a journal for publishing academic papers; it is a staunch champion of "Open Science".

To this end, we are officially introducing a rigorous **Data and Code Availability Policy:**

1. **Open Code and Models:** For research papers involving artificial intelligence, machine learning, high-throughput computing, digital twins, and materials informatics, we require (mandate for certain article types) authors to provide executable code links (e.g., GitHub, Zenodo) and model weights. We encourage adherence to the FAIR principles (Findable, Accessible, Interoperable, and Reusable) to enable researchers worldwide to reproduce and build upon these works.

2. **Sharing Underlying Data:** For experimental materials science papers, we encourage authors to share underlying characterization data, raw testing data, and even negative results. The journal will support the publication of accompanying "Data Articles", assigning them independent DOIs.

3. **Data Availability Statements:** All submissions must include a clear "Data Availability Statement" at the end of the main text, detailing how to access the data and code supporting the study's conclusions

We believe that transparency and sharing accelerate scientific discovery. By opening up data and code, we aim to break down data silos, improve reproducibility, and propel materials science toward large-scale collaboration and the integration of large AI models.

VISION AND CONCLUSION

The founding of *Future Materials* is not just about recording history but about shaping the future. We recognize that defining the next generation of materials science and powering the technologies of tomorrow is a formidable endeavor; it requires the collective ingenuity and relentless exploration of top-tier scholars worldwide.

On behalf of the Editorial Board of *Future Materials*, we warmly invite outstanding scholars in materials science, chemistry, physics, engineering, computer science, and related interdisciplinary fields to submit their most disruptive, cutting-edge, and cross-disciplinary research to our journal. Equally, we welcome visionary scholars to join our editorial board and help shape the intellectual identity of this journal.

Together, through *Future Materials*, let us harness disruptive materials innovation to define the future of next-generation technologies.

DECLARATIONS

Authors' contributions

The authors contributed equally to the Editorial.

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Not applicable.

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