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UNIVERSIDADE DE MACAU
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應用物理及材料工程研究院
INSTITUTO DE FÍSICA APLICADA E ENGENHARIA DE MATERIAIS
INSTITUTE OF APPLIED PHYSICS AND MATERIALS ENGINEERING

IAPME Newsletter

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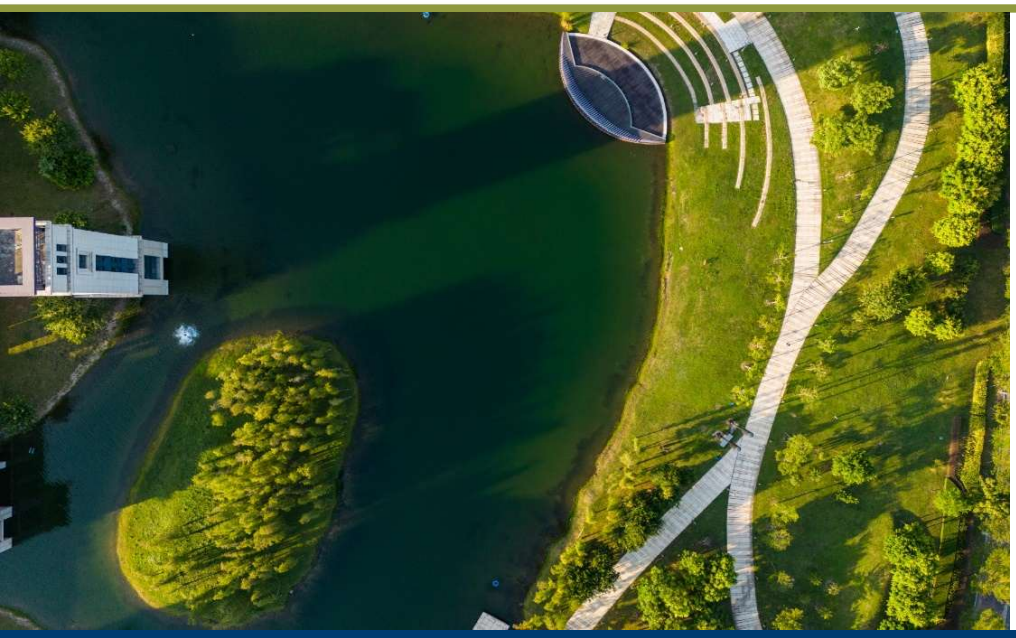

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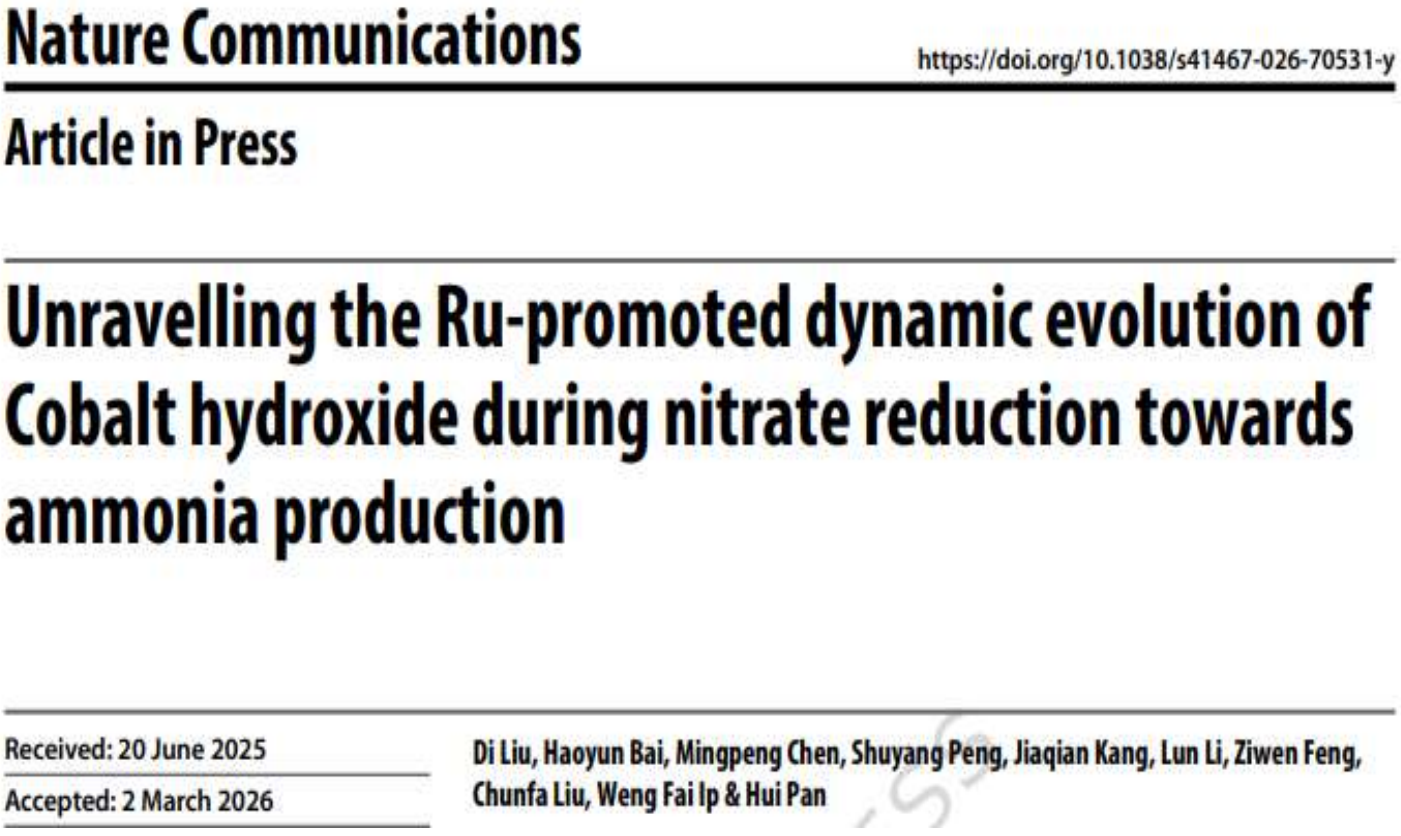
✧ Content

❖ Publications (IF≥8, and/or nature Index; *corresponding author)

1. **Di Liu**, Haoyun Bai, Mingpeng Chen, Shuyang Peng, Jiaqian Kang, Lun Li, Ziwen Feng, Chunfa Liu, Weng Fai Ip, and **Hui Pan***. Unravelling the Ru-promoted dynamic evolution of Cobalt hydroxide during nitrate reduction towards ammonia production. *Nature Communications*, (2026). DOI: 10.1038/s41467-026-70531-y. [2024 IF=15.7]



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Article in Press

Unravelling the Ru-promoted dynamic evolution of Cobalt hydroxide during nitrate reduction towards ammonia production

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Di Liu, Haoyun Bai, Mingpeng Chen, Shuyang Peng, Jiaqian Kang, Lun Li, Ziwen Feng, Chunfa Liu, Weng Fai Ip & Hui Pan

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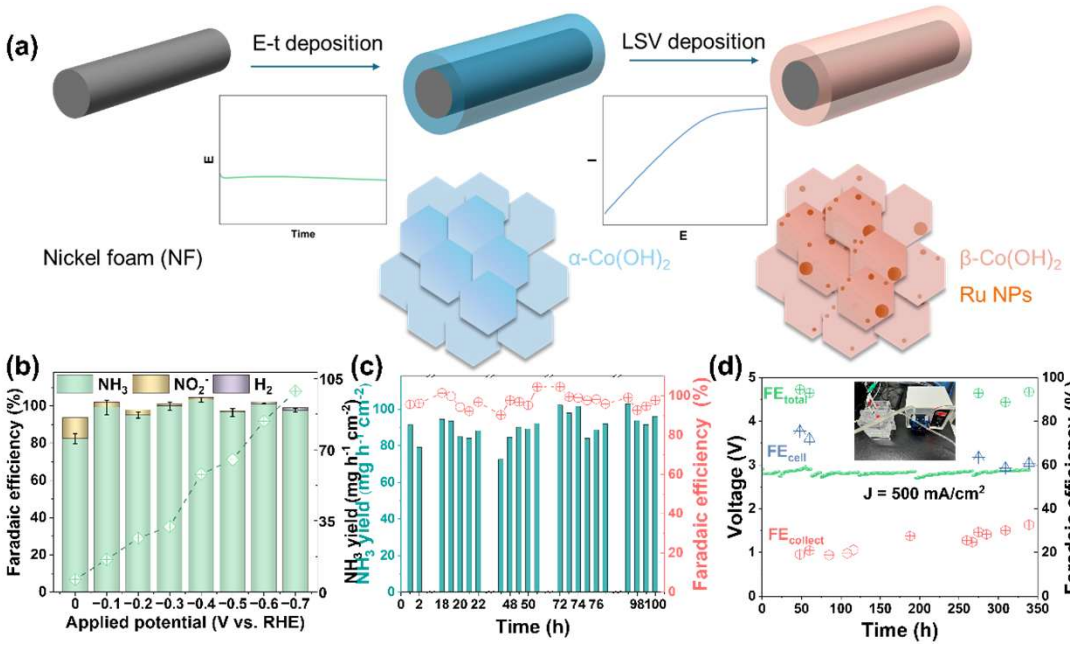
❖ Research Stories

UM research team unraveled the Ru-promoted dynamic evolution of Cobalt hydroxide during nitrate reduction towards ammonia production

- Geen ammonia synthesis through electrochemical nitrate reduction (e-NO_3R) using cost-effective Co-based catalysts is promising, but the inevitable structural evolution induced by reductive potentials compromises long-term stability and hinders practical implementation. Focusing β-$Co(OH)_2$, which serves as the active phase in e-NO_3R systems, this team combines experimental analysis and computational studies to reveal a dynamic surface *OH evolution process: *OH cleavage under negative potentials and *OH generation by the dissociation of NO_3^-.

Dr. Di Liu (劉地)

Prof. Hui Pan (潘暉)



- Notably, Ru nanoparticles anchored on β-$Co(OH)_2$ nanosheets promote structural evolution by facilitating *OH cleavage and generation, thereby sustaining a highly active and selective OH-terminated surface. Correspondingly, the $Co(OH)_2$-Ru exhibits superior ammonia selectivity of more than 95% over a broad potential range of -0.1 to -0.7 V vs. RHE. Moreover, $Co(OH)_2$-Ru shows high stability under -0.7 V vs. RHE in a cycled stability test for over 100 h, where the high ammonia FE and corresponding average ammonia yield (~ 90 $mg \cdot h^{-1} \cdot cm^{-2}$) are sustained.

Di Liu, Haoyun Bai, Mingpeng Chen, Shuyang Peng, Jiaqian Kang, Lun Li, Ziwen Feng, Chunfa Liu, Weng Fai Ip, and **Hui Pan***. Unravelling the Ru-promoted dynamic evolution of Cobalt hydroxide during nitrate reduction towards ammonia production. *Nature Communications*, (2026). DOI: 10.1038/s41467-026-70531-y. [2024 IF=15.7]

The first author is Dr. Di Liu, a post-doctoral fellow in the IAPME. Prof. Hui Pan is the corresponding author of this study. This work was supported by the Science and Technology Development Fund (FDCT) from Macau SAR (0050/2023/RIB2, 0023/2023/AFJ, 0002/2024/TFP, 0087/2024/AFJ and 0111/2022/A2), and Multi-Year Research Grants (MYRG-GRG2025-00007-IAPME and MYRG-GRG2024-00038-IAPME) from the University of Macau. The DFT calculations are performed at High-Performance Computing Cluster (HPCC) of Information, Communication Technology Office (ICTO) at University of Macau.

❖ CCE and Macao Centre for Research and Development in Advanced Materials of IAPME co-organized a Macao Integrated Circuit Research Programme for students of Northwestern Polytechnical University

The Macao Centre for Research and Development in Advanced Materials of IAPME, together with the University of Macau (UM) Centre for Continuing Education (CCE), successfully co-organized the Macao Integrated Circuit Research Programme for 75 undergraduate students from Northwestern Polytechnical University. The programme was held from March 26 to 27.

Over the two-day training, students engaged in a rich curriculum. Following introductions to IAPME, IME, and DPC, lectures covered cutting-edge topics such as:

- Flexible sensing devices for wearable applications
- Material development for next-generation batteries and hydrogen energy systems
- Communications and Signal Processing Microelectronics

In addition to the academic sessions, participants toured UM's Library, Gallery, LCWC and CKPC Colleges, and the State Key Laboratory of Analog and Mixed-Signal. The students responded enthusiastically, providing positive feedback on both the content and the experience.

Our Centre remains committed to offering high-quality training programmes and fostering collaboration between UM and higher education institutions across Mainland China.


Technology

❖ Yangzhou University Delegation Explored Cooperation with our Institute

A delegation from Yangzhou University, led by Party Secretary Prof Jianning Ding (丁建寧), visited our Institute on March 28, 2026, for discussions on research collaboration, talent recruitment, and academic exchange.

During the meeting, Prof. Ding introduced Yangzhou University's development, research strengths, and talent recruitment policies, expressing the university's commitment to deepening cooperation with leading research institutions.

Prof. Qibing Pei, Director of our Institute, then presented UM's educational features, international development strategy, and the Institute's achievements. He stated that the our University warmly welcomes a closer cooperative relationship with Yangzhou University and looks forward to substantial progress in joint research, Unit and student exchanges, and the transformation of research results.

Following the meeting, the delegation had a tour at our exhibition hall, accompanied by Prof. Songnan Qu and Prof. Guoxing Sun. The delegation gained a detailed understanding of our Institute's research achievements in cutting-edge materials, optoelectronics, new energy, and advanced manufacturing, and exchanged views on research platform construction, laboratory management, and collaborative opportunities.

The visit concluded successfully with a luncheon discussion. Both sides expressed their commitment to strengthening communication, concretizing and institutionalizing cooperation, and jointly promoting regional scientific and technological innovation and the cultivation of high-level talent.

❖ Delegation from Guizhou Energy Group Visited IAPME

A delegation from Guizhou Energy Group, led by Mr. Zaigang Xu (徐再剛), Vice President of Guizhou Energy Group Co., Ltd., accompanied by 2 other members visited our Institute.

The delegation was warmly received by Prof. Qibing Pei, along with Prof. Shuangpeng Wang, Prof. Huaiyu Shao, and Prof. Qing Li. During the meeting, representatives from Guizhou Energy Group first introduced the company's overall development, strategic layout, and key business areas in the energy sector. Prof. Pei then provided an overview of our Institute, including its research focus, platform development, and recent achievements. Subsequently, Prof. Wang, Prof. Shao, and Prof. Li presented their respective research areas and latest progress, highlighting strengths in energy materials, battery technologies, and related fields.

The discussions focused on potential collaboration opportunities in the energy sector. Both sides identified strong alignment between Guizhou Energy Group's industrial needs and our Institute's research expertise, particularly in talent cultivation and scientific research collaboration. The two parties explored future cooperation in joint talent training programs, collaborative research projects, and the translation of scientific research into practical applications.

All participants expressed strong interest in establishing long-term collaboration. By combining our scientific research capabilities with Guizhou Energy Group's industrial resources, both sides aim to advance innovation in the energy field and achieve mutually beneficial development.