**VNU JOURNAL OF SCIENCE: NATURAL SCIENCES AND TECHNOLOGY**

**Editorial Board Chairman**

Truong Vu Bang Giang
Vietnam National University, Hanoi, Vietnam

**Editorial Board Deputy Chairman**

Vu Tuan Anh
Vietnam National University, Hanoi, Vietnam

**Editorial Board on Natural Sciences and Technology**

**Managing Editors**

Nguyen Van Noi - VNU University of Science, Hanoi, Vietnam
Phan Tuan Nghia - VNU University of Science, Hanoi, Vietnam
Le Thanh Son - VNU University of Science, Hanoi, Vietnam
Pham Thanh Dong - VNU University of Science, Hanoi, Vietnam
Vu Thi Thom - VNU University of Medicine and Pharmacy, Hanoi, Vietnam

**Associate Editors**

Nguyen Tuan Anh - Hong Kong University of Science and Technology, Hong Kong
Simon Cutting - Royal Holloway University of London, UK
Tran Anh Duc - VNU University of Science, Hanoi, Vietnam
Dao Van Duong - PhenikaaUniversity, Hanoi, Vietnam
Phan Minh Giang - VNU University of Science, Hanoi, Vietnam
Vu Thi Thu Ha - Vietnam Institute of Industrial Chemistry, Hanoi, Vietnam
Esteban Mejia - Leibniz Institute of Catalysis, Germany
Pham The Hai - VNU University of Science, Hanoi, Vietnam
Nguyen Xuan Hoan - VNU University of Science, Hanoi, Vietnam
Nguyen Huy Hoang - Vietnam Academy of Science and Technology, Hanoi, Vietnam
Mac Dinh Hung - VNU University of Science, Hanoi, Vietnam
Nguyen Hung Huy - VNU University of Science, Hanoi, Vietnam
Nguyen Ngoc Lam - Institute of Oceanography, Nha Trang, Vietnam
Nguyen Hoang Loc - University of Sciences, Hue University, Hue, Vietnam
Chu Hoang Mau - Thai Nguyen University Of Education
Tu Binh Minh - VNU University of Science, Hanoi, Vietnam
Nguyen Thanh Nam - VNU University of Science, Hanoi, Vietnam
Hoang Thi My Nhung - VNU University of Science, Hanoi, Vietnam
Peter Langer - Rostock University, Germany
Dong Van Quyen - Vietnam Academy of Science and Technology, Hanoi, Vietnam
Takehiko Kitamori - National Tsing Hua University, Taiwan and Tokyo University, Japan
Trinh Hong Thai - VNU University of Science, Hanoi, Vietnam
Nguyen Trung Thanh - VNU University of Science, Hanoi, Vietnam
Vu Thu Trang - Hanoi University of Science and Technology, Hanoi, Vietnam
Nguyen Tien Trung - Quy Nhon University, Quy Nhon, Vietnam
Nguyen Quang Truong - Vietnam Academy of Science and Technology, Hanoi, Vietnam
Nguyen Van Tuyen - Vietnam Academy of Science and Technology, Hanoi, Vietnam

**Secretary**

Ngo Thi Thu Binh - VNU Journal of Science, Hanoi, Vietnam
Tel.: (84) 983030634; E-mail: binhntt@vnu.edu.vn

## Aims and Scope

*VNU Journal of Science: Natural Sciences and Technology* publishes *double-blinded* peer-review research papers, communications and reviews dealing with: Biology, Bio-technology, Chemistry, Chemical engineering, Energy, Environmental technology, Materials engineering.

## Publication Information

The journal publishes *quarterly in March, June, September, December* by the Vietnam National University, Hanoi. As a fully open access publication, the journal will provide maximum exposure for published articles, making the research available to all to read and share. A corresponding print version is also available.

Any manuscript followed the journal's scope and author guideline will be assigned to managing editors. All manuscripts undergo an editorial screening and a double-blinded peer review by at least one independent expert in the field. The managing editors make an editorial decision, which is subject to endorsement by the Editor-in-Chief.

Further Information is available through the journal website: http://js.vnu.edu.vn

Publication Permit No 40/GP-BVHTTDL, issued on May 20th 2025. Printed at Multicolour Printing Company Limited, No.7 Xuan Phuong, Nam Tu Liem, Hanoi, Vietnam. Legal Deposit: Quarter IV/2026.