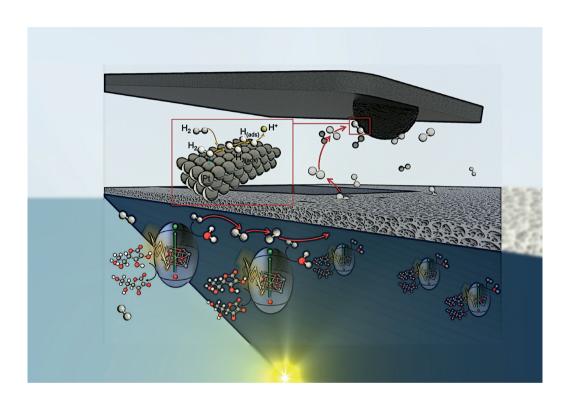
# New Horizons in Nanoelectrochemistry

Nanjing, China and online 14 - 16 October 2024



### **FARADAY DISCUSSIONS**

Volume 257, 2025



The Faraday Community for Physical Chemistry of the Royal Society of Chemistry, previously the Faraday Society, was founded in 1903 to promote the study of sciences lying between chemistry, physics and biology.

### **Editorial Staff**

**Executive Editor** 

Michael A. Rowan

Deputy Editor Edward Gardner

Development Editors

Bee Hockin, Andrea Carolina Ojeda-Porras

Editorial Manager

Gisela Scott

Associate Editorial Manager Chris Goodall

**Publishing Coordinator** 

Konoya Das

**Publishing Editors** 

Kieran Nicholson and Callum Woof

**Editorial Assistant** 

Daphne Houston

**Publishing Assistants** 

Natalie Ford and Huw Hedges

Publisher Sam Keltie

Faraday Discussions (Print ISSN 1359-6640,

Electronic ISSN 1364-5498) is published 8 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park,

Milton Road, Cambridge, UK CB4 0WF. Volume 257 ISBN 978-1-83767-443-5

2025 annual subscription price: print+electronic £1342 US \$2363; electronic only £1279, US \$2250.

Customers in Canada will be subject to a surcharge to cover GST. Customers in the EU subscribing to the electronic version only will be charged VAT.

All orders, with cheques made payable to the Royal Society of Chemistry, should be sent to the Royal Society of Chemistry Order Department, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK Tel +44 (0)1223 432398; E-mail orders@rsc.org

If you take an institutional subscription to any Royal Society of Chemistry journal you are entitled to free, site-wide web access to that journal. You can arrange access via Internet Protocol (IP) address at www.rsc.org/ip

Customers should make payments by cheque in sterling payable on a UK clearing bank or in US dollars payable on a US clearing bank.

Whilst this material has been produced with all due care, the Royal Society of Chemistry cannot be held responsible or liable for its accuracy and completeness, nor for any consequences arising from any errors or the use of the information contained in this publication. The publication of advertisements does not constitute any endorsement by the Royal Society of Chemistry or Authors of any products advertised. The views and opinions advanced by contributors do not necessarily reflect those of the Royal Society of Chemistry which shall not be liable for any resulting loss or damage arising as a result of reliance upon this material. The Royal Society of Chemistry is a charity, registered in England and Wales, Number 207890, and a company incorporated in England by Royal Charter (Registered No. RC000524), registered office: Burlington House, Piccadilly, London W1J 0BA, UK, Telephone: +44 (0) 207 4378 6556.

Printed in the UK





### **Faraday Discussions**

Faraday Discussions are unique international discussion meetings that focus on rapidly developing areas of chemistry and its interfaces with other scientific disciplines.

### Scientific Committee volume 257

Yi-Tao Long, Nanjing University, China

Patrick Unwin, University of Warwick, Frank Marken, University of Bath, UK

### Committee

Justin Gooding, UNSW Sydney, Australia

Minkyung Kang, University of Sydney,

Richard Crooks, University of Texas at Austin, USA

### Faraday Standing Committee on Conferences

Susan Perkin, University of Oxford,

### Secretary

Susan Weatherby, Royal Society of Chemistry, UK

George Booth, King's College London, UK Rachel Evans, University of Cambridge, UK

David Fermin, University of Bristol,

Julia Lehman, University of Birmingham, UK

David Lennon, University of Glasgow,

Andrew Mount, University of Edinburgh, UK

Julia Weinstein, University of Sheffield, UK

### **Advisory Board**

Vic Arcus, The University of Waikato, New Zealand

Dirk Guldi, University of Erlangen-Nuremberg, Germany

Marina Kuimova, Imperial College London UK

Luis Liz-Marzán, CIC biomaGUNE, Spain

Andrew Mount, University of Edinburgh, UK

Frank Neese Max Planck Institute for Chemical Energy Conversion,

Michel Orrit, Leiden University, The Netherlands

Timothy Easun, Cardiff University, UK Zhong-Qun Tian, Xiamen University, China

> Siva Umapathy, Indian Institute of Science, Bangalore, India Bert Weckhuysen, Utrecht University,

The Netherlands Iulia Weinstein, University of Sheffield, UK

Sihai Yang, University of Manchester,

### Information for Authors

This journal is © the Royal Society of Chemistry 2025. Apart from fair dealing for the purposes of research or private study for non-commercial purposes, or criticism or review, as permitted under the Copyright, Designs and Patents Act 1988 and the Copyright and Related Rights Regulation 2003, this publication may only be reproduced, stored or transmitted, in any form or by any means, with the prior permission in writing of the Publishers or in the case of reprographic reproduction in accordance with the terms of licences issued by the Copyright Licensing Agency in the UK. US copyright law is applicable to users in the USA.

@ The paper used in this publication meets the requirements of ANSI/NISO Z39,48-1992 (Permanence of Paper).

Registered charity number: 207890

### **New Horizons in** Nanoelectrochemistry

Faraday Discussions

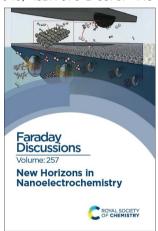
### www.rsc.org/faraday d

A General Discussion on New Horizons in Nanoelectrochemistry was held in Naniing, China and online on the 14<sup>th</sup>, 15<sup>th</sup> and 16<sup>th</sup> of October 2024.

The Royal Society of Chemistry is the world's leading chemistry community. Through our high impact journals and publications we connect the world with the chemical sciences and invest the profits back into the chemistry community.

### **CONTENTS**

ISSN 1359-6640; ISBN 978-1-83767-443-5



### Cover

See Giada Caniglia, Christine Kranz et al., Faraday Discuss., 2025, 257, 224-239.

An atomic force microscopy cantilever modified with hemispherical platinumblack micro- or nanoelectrodes for local detection of light-driven hydrogen evolution.

Image reproduced with permission of Christine Kranz and Giada Caniglia from Giada Caniglia, Christine Kranz et al., Faraday Discuss., 2025, 257, 224-239.

### **INTRODUCTORY LECTURE**

Spiers Memorial Lecture: New horizons in nanoelectrochemistry Oluwasegun Wahab and Lane A. Baker

### PAPERS AND DISCUSSIONS

- Electrochemical kinetic fingerprinting of single-molecule coordinations in confined nanopores
  - Chao-Nan Yang, Wei Liu, Hao-Tian Liu, Ji-Chang Zhang, Yi-Tao Long and Yi-Lun Ying
- Ion current oscillation of polyelectrolyte modified micropipettes 44 Tianyi Xiong, Wenjie Ma and Ping Yu
- Non-sticky SiN<sub>x</sub> nanonets for single protein denaturation analysis Yuanhao Wang, Nan An, Bintong Huang and Yueming Zhai

Open Access Article. Published on 19 February 2025. Downloaded on 3/9/2025 2:33:31 PM.

This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.



### FARADAY COMMUNITY FOR PHYSICAL CHEMISTRY



## Nanoscale



# Nanoscale Advances

60	Molecular sandwich-based DNAzyme catalytic reaction towards transducing efficient nanopore electrical detection of antigen proteins
	Lebing Wang, Shuo Zhou, Yunjiao Wang, Yan Wang, Jing Li, Xiaohan Chen,
	Daming Zhou, Liyuan Liang, Bohua Yin, Youwen Zhang and Liang Wang

73 Regulation of transmembrane current through modulation of biomimetic lipid membrane composition

Zhiwei Shang, Jing Zhao, Mengyu Yang, Yuling Xiao, Wenjing Chu, Yilin Cai, Xiaoqing Yi, Meihua Lin and Fan Xia

- 88 Confined nanopore electrochemistry: general discussion
- Seeing nanoscale electrocatalytic reactions at individual MoS<sub>2</sub> particles under an optical microscope: probing sub-mM oxygen reduction reaction Nikan Afsahi, Zhu Zhang, Sanli Faez, Jean-Marc Noël, Manas Ranjan Panda, Mainak Maiumder. Naimeh Naseri. Jean-Francois Lemineur and Frédéric Kanoufi
- 126 Electrochemical nucleation and growth kinetics: insights from single particle scanning electrochemical cell microscopy studies
  Kenneth Osoro, Sinthia Rahman and Caleb M. Hill
- 137 Electrochemiluminescence microscopy for the investigation of peptide interactions within planar lipid membranes
  Kaoru Hiramoto, Kosuke Ino, Ibuki Takahashi, Ayumi Hirano-Iwata and Hitoshi Shiku
- 151 Spectroelectrochemistry and light active process at nanointerface: general discussion
- 165 Enzyme-modified Pt nanoelectrodes for glutamate detection Peibo Xu, Henry David Jetmore, Ran Chen and Mei Shen
- Integrated scanning electrochemical cell microscopy platform with local electrochemical impedance spectroscopy using a preamplifier Ancheng Wang, Rong Jin and Dechen Jiang
- 194 Revealing the diverse electrochemistry of nanoparticles with scanning electrochemical cell microscopy
  Lachlan F. Gaudin and Cameron L. Bentley
- Nanoscale visualization of the anti-tumor effect of a plasma-activated Ringer's lactate solution

Junichi Usuda, Kenshin Yagyu, Hiromasa Tanaka, Masaru Hori, Kenji Ishikawa and Yasufumi Takahashi

- 224 Scanning electrochemical probe microscopy: towards the characterization of micro- and nanostructured photocatalytic materials
  Giada Caniglia, Sarah Horn and Christine Kranz
- 240 Charge-induced deformation of scanning electrolyte before contact Liang Liu
- Delivery of carbon dioxide to an electrode surface using a nanopipette Jaimy Monteiro, Harry Dunne and Kim McKelvey

264	Controlling the droplet cell environment in scanning electrochemical cell microscopy (SECCM) via migration and electroosmotic flow
	Samuel F. Wenzel, Heekwon Lee and Hang Ren

- 277 Scanning electrochemical probe microscopy: general discussion
- Multimodal nanoparticle analysis enabled by a polymer electrolyte nanopore combined with nanoimpact electrochemistry Eugene Gyasi Agyemang, Samuel Confederat, Gayathri Mohanan, Mahnaz Azimzadeh Sani, Chalmers Chau, Dylan Charnock, Christoph Wälti, Kristina Tschulik, Martin Andrew Edwards and Paolo Actis
- 316 Nafion coated nanopore electrode for improving electrochemical aptamer-based biosensing Grayson F. Huldin, Junming Huang, Julius Reitemeier and Kaiyu X. Fu
- The electrochemical modulation of single molecule fluorescence Ying Yang, Yuanging Ma and J. Justin Gooding
- Ion concentration polarization causes a nearly pore-length-independent conductance of nanopores DaVante Cain, Ethan Cao, Ivan Vlassiouk, Tilman E. Schäffer and Zuzanna S. Siwv
- A micropore nanoband electrode array for enhanced electrochemical generation/ analysis in flow systems Fiona Moore, Ilka Schmueser, Jonathan G. Terry and Andrew R. Mount

374 Single-molecule electrochemical imaging of 'split waves' in the electrocatalytic (EC') mechanism

Wandong Zhao and Jin Lu

- 384 Advanced algorithm for step detection in single-entity electrochemistry: a comparative study of wavelet transforms and convolutional neural networks Ziwen Zhao, Arunava Naha, Nikolaos Kostopoulos and Alina Sekretareva
- Systems nanoelectrochemistry from single entity to ensemble: general discussion

### CONCLUDING REMARKS

New horizons in nanoelectrochemistry: concluding remarks Andrew G. Ewing

### ADDITIONAL INFORMATION

- Poster titles 437
- 440 List of participants