

Jun.-Prof. Dr. Robert Hein

Juniorprofessor

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Research Interests

My scientific interests are highly interdisciplinary and lie at the interface of molecular nanotechnology, supramolecular, surface- and electrochemistry. A particular focus is the use of electrochemical tools to both study and control redox-active (supra)molecular systems, and their application as, among others, sensors, responsive materials and redox-driven switches and machines.

Employment

04/2025 - to date	University of Münster, Germany W1-Juniorprofessor, Organic Chemistry Institute
07/2024 - 03/2025	University of Münster, Germany Independent Junior Research Group Leader, Organic Chemistry Institute Mentor: Prof. B. J. Ravoo
09/2022 - 06/2024	University of Groningen, Netherlands Marie Curie Postdoctoral Fellow with Prof. B. L. Feringa Project: Redox-driven molecular switches and motors
07/2020 - 07/2022	University of Oxford, U.K. Postdoctoral Research Associate in Supramolecular Chemistry with Prof. P. D. Beer Project: Development of fluorescent ion sensors

Education

10/2016 - 11/2020	University of Oxford, Lady Margaret Hall, U.K. DPhil (PhD) in the Department of Chemistry with Prof. P. D. Beer and Prof. J. J. Davis Thesis: "Electrochemical Anion Sensing in Solution and at Receptive Interfaces"
08/2013 - 06/2016	Jacobs University Bremen, Germany Bachelor of Science in Chemistry, GPA: 1.15 (<i>Scale: 1.00 (best) - 5.00 (failing)</i>) Research group of Prof. W. M. Nau Thesis: "Synthesis of BODIPY Dyes for Supramolecular Reporter Pairs"
08/2015 - 01/2016	Cornell University, USA Exchange Semester at the College of Agriculture and Life Sciences, GPA: 4.03 (<i>Scale: 4.30 (best) - 0.00 (failing)</i>)

Research Stays

08/2019 - 09/2019	Research Group of Prof. P. R. Bueno, UNESP Araraquara, Brazil Collaboration: Origins of capacitive phenomena at ion-receptive interfaces
08/2015 - 01/2016	Research Group of Prof. G. W. Coates, Cornell University, USA Undergraduate Research: Catalyst development, Dehydrogenation polymerizations
06/2015 - 08/2015	Research Group of Prof. O. A. Scherman, University of Cambridge, U.K. Internship: Synthesis and characterization of biocompatible hydrogels as drug carriers
06/2014 - 08/2014	Fraunhofer Institute for Polymers and Composites PYCO, Germany Internship: Synthesis of ephedrine derivatives

Publications

14 as first author, 4 as (co)corresponding author; Google Scholar Profile (01.04.2025): Citations: 1583, h-index: 16

† - Equal contribution * - Corresponding author

28. K. I. Assaf[†], F. N. Tehrani, G. E. Quintero, **R. Hein**, M. E. Aliaga, W. M. Nau^{*}, "Regioselective Dimerization of Methylcyclopentadiene inside Cucurbit[7]uril", *Chem. Eur. J.*, **2024**, e202403964.)
27. **R. Hein**^{*}, C. N. Stindt, B. L. Feringa^{*}, "Mix and Match Tuning of the Conformational and Multistate Redox Switching Properties of an Overcrowded Alkene", *J. Am. Chem. Soc.*, **2024**, 146, 26275-26285.
26. M. Fellert[†], **R. Hein**[†], A. Ryabchun, Y. Gisbert, C. N. Stindt, B. L. Feringa^{*}, "A Multiresponsive Ferrocene-Based Chiral Overcrowded Alkene Twisting Liquid Crystals", *Angew. Chem.Int. Ed.*, **2024**, e202413047. (Highlighted in ChemistryViews)
25. S. C. Patrick, **R. Hein**, P. D. Beer, J. J. Davis^{*}, "Non-Faradaic Capacitive Cation Sensing Under Flow", *Chem. Sci.*, **2024**, 10.1039/D4SC05271D. (Highlighted in Chem. Sci. 2024, 10.1039/D4SC90214A)
24. E. Sidler[†], **R. Hein**[†], D. Doellerer, B. L. Feringa^{*}, "Redox-Switchable Aromaticity in a Helically Extended Indeno[2,1-c]fluorene", *J. Am. Chem. Soc.*, **2024**, 146, 19168-19176.
23. H. Bagha, **R. Hein**, W. K. Myers, M. R. Sambrook, P. D. Beer^{*}, "Phosphate selective binding and sensing by halogen bonding tripodal copper (II) metallo-receptors in aqueous media", *Dalton. Trans.*, **2024**, 10.1039/D4DT01585A.
22. A. J. Taylor[†], **R. Hein**^{†*}, S. C. Patrick, J. J. Davis, P. D. Beer^{*}, "Redox-Modulated Fluorescent Halogen Bonding and Hydrogen Bonding Anion Sensing", *Angew. Chem.Int. Ed.*, **2024**, 63, e202315959.
21. H. Bagha, **R. Hein**, J. Y. C. Lim, C. B. Durr, M. R. Sambrook, P. D. Beer^{*}, "Halogen Bonding Tripodal Metallo-receptors for Phosphate Recognition and Sensing in Aqueous containing Organic Media", *Chem. Eur. J.*, **2023**, 30, e202302775.
20. M. Sharafeldin, **R. Hein**, J. J. Davis^{*}, "Catalysed amplification of faradaic shotgun tagging in ultrasensitive electrochemical immunoassays", *Chem. Commun.*, **2022**, 58, 9472-9475.
19. **R. Hein**, P. D. Beer^{*}, "Halogen Bonding and Chalcogen Bonding Mediated Sensing", *Chem. Sci.*, **2022**, 13, 7098-7125.
18. **R. Hein**, A. Docker, J. J. Davis^{*}, P. D. Beer^{*}, "Redox-Switchable Chalcogen Bonding for Anion Recognition and Sensing", *J. Am. Chem. Soc.*, **2022**, 144, 8827-8836.
17. F. N. Tehrani, K. I. Assaf^{*}, **R. Hein**, T. C. Nugent, W. M. Nau^{*}, "Supramolecular Catalysis of a Catalysis-Resistant Diels-Alder Reaction: Rapid Dimerization of Cyclopentadiene inside Cucurbit[7]uril", *ACS Cat.*, **2022**, 12, 2261-2269.
16. **R. Hein**^{*}, P. D. Beer^{*}, "Organometallic receptors for charged and neutral guest species", in: *Comprehensive Organometallic Chemistry IV*, Elsevier, **2022**, 14, 418-462. DOI: 10.1016/B978-0-12-820206-7.00132-3
15. S. C. Patrick[†], **R. Hein**^{†*}, P. D. Beer^{*}, J. J. Davis^{*}, "Continuous and Polarisation-tuned Redox Capacitive Anion Sensing at Electroactive Interfaces", *J. Am. Chem. Soc.*, **2021**, 143, 19199-19206. (Highlighted as Spotlight)
14. S. C. Patrick[†], **R. Hein**[†], M. Sharafeldin, X. Li, P. D. Beer, J. J. Davis^{*}, "Real-time Voltammetric Anion Sensing Under Flow", *Chem. Eur. J.*, **2021**, 27, 17700-17706.
13. Y. C. Tse, **R. Hein**, E. J. Mitchell, Z. Zhang, P. D. Beer^{*}, "Halogen-Bonding Strapped Porphyrin BODIPY Rotaxanes for Dual Optical and Electrochemical Anion Sensing", *Chem. Eur. J.*, **2021**, 27, 14550-14559. (HOT paper)
12. S. C. Patrick, **R. Hein**, A. Docker, P. D. Beer^{*}, J. J. Davis^{*}, "Solvent Effects in Halogen and Hydrogen Bonding Mediated Electrochemical Anion Sensing in Aqueous Solution and at Interfaces", *Chem. Eur. J.*, **2021**, 27, 10201-10209. (HOT paper)
11. **R. Hein**, X. Li, P. D. Beer^{*}, J. J. Davis^{*}, "Enhanced Interfacial Voltammetric Anion Sensing at Halogen and Hydrogen Bonding Ferrocenyl SAMs", *Chem. Sci.*, **2021**, 12, 2433-2440. (HOT paper)
10. C. Jiang, F. Hopfner, A. Katsikoudi, **R. Hein**, S. Evetts, Y. Huang, H. Wang, J. W. Ryder, G. Kuhlenbäumer, G. Deuschl, A. Padovani, D. Berg, B. Borroni, M. T. Hu, J. J. Davis, G. K. Tofaris^{*}, " α -Synuclein in serum neuronal exosomes precedes and predicts Parkinson's disease", *J. Neurol. Neurosurg. Psychiatry*, **2020**, 91, 720-729.

9. C. Jiang[†], G. Wang[†], **R. Hein**[†], N. Liu, X. Luo*, J. J. Davis*, "Antifouling Strategies for Selective In Vitro and In Vivo Sensing" *Chem. Rev.*, **2020**, *120*, 3852-3889. (5th Place in "YourFavoriteReview" poll)
8. A. Baradoke, **R. Hein**, X. Li, J. J. Davis*, "Reagentless Redox Capacitive Assaying of C-Reactive Protein at a Polyaniline Interface", *Anal. Chem.*, **2020**, *92*, 3508-3511.
7. P. R. Bueno*, **R. Hein**, A. Santos, J. J. Davis*, "The Nanoscopic Principles of Capacitive Ion Sensing Interfaces", *Phys. Chem. Chem. Phys.*, **2020**, *22*, 3770-3774. (HOT paper)
6. **R. Hein**, P. D. Beer*, J. J. Davis*, "Electrochemical Anion Sensing: Supramolecular Approaches", *Chem. Rev.*, **2020**, *120*, 1888-1935.
5. **R. Hein**, A. Borissov, M. D. Smith, P. D. Beer*, J. J. Davis*, "A halogen-bonding foldamer molecular film for selective reagentless anion sensing in water", *Chem. Commun.*, **2019**, *55*, 4849-4852.
4. J. Piccoli, **R. Hein**, A. H. El-Sagheer, T. Brown, E. M. Cilli, P. R. Bueno*, J. J. Davis*, "Redox Capacitive Assaying of CRP at a Peptide Supported Aptamer Interface", *Anal. Chem.*, **2018**, *90*, 3005-3008.
3. M. J. Rowland, C. C. Parkins, J. H. McAbee, A. Kolb, **R. Hein**, X. J. Loh, O. A. Scherman*, "An Adherent Tissue-inspired Hydrogel Delivery Vehicle Utilized in Primary Human Glioma Models", *Biomater.*, **2018**, *179*, 199-208.
2. M. A. Alnajjar, J. Bartelmeß, **R. Hein**, P. Ashokkumar, M. Nilam, W. M. Nau, K. Rurack, A. Hennig*, "Rational design of boron-dipyromethene (BODIPY) reporter dyes for cucurbit[7]uril", *Beilstein J. Org. Chem.*, **2018**, *14*, 1961-1971.
1. **R. Hein**, C. Uzundal, A. Hennig*, "Simple and rapid quantification of phospholipids for supramolecular membrane transport assays", *Org. Biomol. Chem.*, **2016**, *14*, 2182-2185.

Patents

2. P. D. Beer, **R. Hein**, 2024, "Sulphide sensing assembly", *WO2024161140A1*
1. P. D. Beer, J. J. Davis, **R. Hein**, S. C. Patrick, 2023, "Redox capacitance sensing of particles under flow", *WO2023079269A1*

Oral Presentations

23. **Chemiedozententagung 2025**, Braunschweig, Germany, 03/2025, "Dynamic Redox Switches Based on Overcrowded Alkenes" (*Oral presentation*)
22. **Regionales Stipendiat:innentreffen, RUB**, Bochum, Germany, 01/2025, "Dynamic Redox Switching" (*Oral presentation*)
21. **São Paulo State University, UNESP**, Araraquara, Brazil, 10/2024, "Dynamic Redox Switching – From Sensors to Molecular Machines" (*Invited lecture*)
20. **University of São Paulo, USP**, Sao Carlos, Brazil, 10/2024, "Dynamic Redox Switching – From Sensors to Molecular Machines" (*Invited lecture*)
19. **Brazilian Materials Research Society Conference XXII**, Santos, Brazil 10/2024, "Dynamic Redox Switching – From Sensors to Molecular Machines" (*Invited lecture*)
18. **SupraSys Indo-German Workshop**, Goa, India, 09/2024, "Novel Redox Switches in Solution and at Interfaces"
17. **9th EuChemS Chemistry Congress**, Dublin, 07/2024, "Ion-Dependent Conformational Switching of Bisthioxanthylidenes"
16. **The 5th ERC Grantees Conference**, Edinburgh, 07/2023, "Redox-Switchable Chalcogen Bonding for Anion Recognition and Sensing"
15. **University of Ulm**, 05/2023, Ulm, Germany, "Supramolecular Electrochemistry: Novel Approaches for Sensing and Redox Switching" (*Invited lecture*)
14. **University of Münster**, 05/2023, Münster, Germany, "Supramolecular Electrochemistry: Novel Approaches for Sensing and Redox Switching" (*Invited lecture*)

13. **GDCh-Kolloquium, University of Osnabrück**, 01/2023, Osnabrück, Germany, "Supramolecular Electrochemistry: Novel Approaches for Sensing and Redox Switching" (*Invited lecture*)
12. **SupraChem 2022**, 07/2022, Mainz, Germany, "Redox-Switchable Chalcogen Bonding for Anion Recognition and Sensing"
11. **Matrafured - International Meeting on Chemical Sensors 2022**, 06/2022, Visegrad, Hungary, "Continuous and Polarisation-Tuned Redox Capacitive Ion Sensing at Electroactive Interfaces"
10. **Somerville JRF Symposium 2022**, 05/2022, Oxford, U.K., "Going with the Flow: Development of Sensing Devices for Water Monitoring"
9. **Analytical Research Forum 2021**, Online conference, "Electrochemical Anion Sensing: From Fundamentals to Applications"
8. **Seminar in Chemistry, Mahidol University**, 09/2020 (online), Bangkok, Thailand, "Supramolecular Electrochemistry: Anion Sensing and Fundamental Host-Guest Studies" (*Invited lecture*)
7. **MPLS Graduate Seminar, Lady Margaret Hall 2020**, Oxford, U.K. "Harnessing the Power of Electrochemistry: Sensors and Higher-order Structures"
6. **São Paulo State University, USP**, 08/2019, Araraquara, Brazil, "From Supramolecular Anion Recognition to Electrochemical Sensing"
5. **Oxford Electrochemical Society Chapter Symposium 2019**, Oxford, U.K., "Anion Sensing via non-Faradaic Capacitance Spectroscopy"
4. **Inorganic Graduate Symposium 2019**, Oxford, U.K., "Electrochemical Anion Sensing in Solution and at Receptive Interfaces"
3. **Mahidol University**, 02/2019, Bangkok, Thailand, "Electrochemical Anion Sensing" (*Invited lecture*)
2. **Pure and Applied Chemistry International Conference, PACCON 2019**, Bangkok, Thailand, "Non-Faradaic Capacitive Anion Sensing at Anion Receptive Interfaces"
1. **Macrocyclic and Supramolecular Chemistry Meeting 2018**, Lancaster, U.K., "A Halogen-bonding Foldamer Molecular Film for Selective Reagentless Anion Sensing in Water"

Teaching and Mentoring

07/2024 - to date	Supervision as independent research group leader Ongoing: 3 PhD students. Completed: 1 BSc Thesis
10/2023	Lecturer for "Photochemistry and Photoredox Catalysis", University of Groningen MSc Course, 2 lectures + 1 tutorial, substitute for Prof. B. L. Feringa
03/2023 - 05/2023	Supervisor for MSc Student, University of Groningen Project: Chiral Redox Switching in Liquid Crystals
03/2023	Lecturer at Second Dutch selection round for the International Chemistry Olympiad Lecture: Physical-Organic Chemistry
10/2020 - 09/2021	College Advisor, Kellogg College, University of Oxford, U.K. Academic college advisor to nine postgraduate students
09/2019 - 06/2022	Supervisor for three PartII (MChem) Students, University of Oxford Projects: Voltammetric anion and ion-pair sensing, capacitive ion sensing under flow
Michaelmas term 2017	Lab Demonstrator, Physical and Theoretical Chemistry Lab, University of Oxford
Spring term 2016	Teaching Assistant, Jacobs University Bremen: -Advanced Lab Course Physical Chemistry -Organic Chemistry II
Spring term 2015	Teaching Assistant, Jacobs University Bremen: -Advanced Lab Course Physical Chemistry -Organic Chemistry Lab

03/2014 - 2017, 2023 | **Lecturer at Third German selection round for the International Chemistry Olympiad**
Seminars: Organic Chemistry I-III, Physical-Organic Chemistry
Lectures: Supramolecular Chemistry (2x), Dyes

Peer-reviewed Funding

NRW Return Fellowship, State of North Rhine-Westphalia, from early 2025 (1.25 Mio Eur)

CRC1459 Project Leader, project C07, DFG, from 01/2025 (279.000 Eur)

Liebig-Fellowship, Fonds der Chemischen Industrie, from 07/2024 (50k Eur + own position + 1 PhD position)

Marie Skłodowska-Curie Postdoctoral Fellowship, EU, 09/2022-07/2024 (187.600 Eur)

Feodor-Lynen Fellowship, Alexander von Humboldt Foundation, declined

Awards and Prizes

Emerging Investigators Bursary, The 5th ERC Grantees Conference, 07/2023

Fulford Junior Research Fellowship, Somerville College, University of Oxford, 10/2021 - 07/2022

Postdoctoral Research Fellowship, Christ Church, University of Oxford, 2021, declined

Junior Research Fellowship, Kellogg College, University of Oxford, 2021, declined

Research Membership of Common Room, Kellogg College, University of Oxford, 10/2020-09/2021

Santander Academic Travel Award, 2019, for research collaboration in Brazil

One-year Residential Scholarship, Lady Margaret Hall, 2016/17

Fellowship of the Studienstiftung des Deutschen Volkes, 03/2016 - 09/2017

Entry on the President's List of Jacobs University Bremen, 2013 - 2016, Cumulative GPA better than 1.50

Merit-based scholarship, Jacobs University Bremen, 2013-2016

German selection contest for the International Chemistry Olympiad, 2012: Round 3, Place 26; 2013: Round 3 and 4, Place 5 and 8

German selection contest for the International Physics Olympiad, 2013: Round 3, Place 36

Primus-Prize of the city of Frankfurt (Oder), 2013, Prize for outstanding accomplishments in the natural sciences

Professional Service and Extracurricular Activities

Reviewer	Fulbright Poland (Senior Award) , <i>Electrochem. Commun.</i> , <i>Mater. Horiz.</i> , <i>J. Elecanal. Chem.</i> , <i>J. Phys. Chem.</i> , <i>J. Org. Chem.</i> , <i>Chem</i>
07/2019	Mentor for the German National Team at the 51st International Chemistry Olympiad , Paris, France
01/2018 - 12/2018	MCR Social Secretary , Lady Margaret Hall, University of Oxford
07/2016	Scientific Observer for the German National Team at the 48th International Chemistry Olympiad , Tblisi, Georgia
05/2014 - 06/2016	Chemistry Society, Jacobs University Bremen , President (04/2015 - 05/2016)
06/2012 - 06/2017	Förderverein Chemie-Olympiade e.V. (Friends Of The Chemistry Olympiad e.V.) Organiser of the students chemistry competition "Chemie – die stimmt!" in the states of Lower Saxony and Bremen (03/2014 - 06/2017), Member of the advisory board (2013 - 2016)