

Dr. Robert Hein

Marie Curie Postdoctoral Fellow

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Research Interests

My scientific interests are highly interdisciplinary and lie at the interface of molecular nanotechnology, supramolecular, surface- and electrochemistry. This encompasses the synthesis of novel supramolecular host systems for the recognition and subsequent sensing of ions and small molecules, the development of novel analytical techniques and assays as well as the study of supramolecular assemblies, motors and (redox) switches.

I will start my independent research group at the Organisch-Chemisches Institut, Universität Münster in July 2024

Employment

09/2022 - to date	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 (Scale: 1.00 (best) - 5.00 (failing)) 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 (Scale: 4.30 (best) - 0.00 (failing))

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

11 as first author, 3 as (co)corresponding author; Google Scholar Profile (13.03.2024): Citations: 1158, h-index: 16

† - Equal contribution * - Corresponding author

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, e2023159.
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**, 10.1002/chem.202302775.
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

1. P. D. Beer, J. J. Davis, **R. Hein**, S. C. Patrick, 2021, "Redox capacitance sensing of particles under flow", WO-2023079269.

Oral Presentations

16. **The 5th ERC Grantees Conference**, Edinburgh, 07/2023, "Redox-Switchable Chalcogen Bonding for Anion Recognition and Sensing"
15. **University of Ulm**, 05/2023, Osnabrück, Germany, "Supramolecular Electrochemistry: Novel Approaches for Sensing and Redox Switching" (*Invited lecture*)
14. **University of Münster**, 05/2023, Osnabrück, 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. **Sao Paulo State University**, 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"

Poster presentations: 7 at international conferences

Teaching and Mentoring

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

Funding and Awards

Liebig-Fellowship, Fonds der Chemischen Industrie, from 07/2024

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

Marie Skłodowska-Curie Postdoctoral Fellowship, EU, 09/2022-08/2024

Feodor-Lynen Fellowship, Alexander von Humboldt Foundation, declined

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), Electrochem. Commun., Mater. Horiz., J. Elecanal. Chem.
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)