

Curriculum Vitae Prof. Dr. J.N.H. Reek

Personal details

Name: Prof. Dr. Joost N.H. Reek
Date and place of birth: 23 June 1967, 's-Hertogenbosch
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Summary

Joost Reek finished his masters at the University of Nijmegen in 1991 and received his PhD in 1996 at the same university. His research was done in the group of [Prof. R.J.M. Nolte](#), where he acquired expertise in the field of supramolecular chemistry and synthesis. He attended the group of [Prof. M.J. Crossley](#) in Sydney as a postdoctoral fellow in 1996, where he got experienced in porphyrin chemistry and dendrimers.

In January 1998 he became lecturer (senior lecturer in 2003) in the group of Prof. P.W.M.N. van Leeuwen at the University of Amsterdam (UvA) where he got experienced with transition metal catalysis. Collaborative research activities with Van Leeuwen focused on transition metal catalysis, catalyst immobilization and dendritic transition metal catalysis. In this period he started his own successful new line of research on the border of transition metal catalysis and supramolecular chemistry, which has resulted in several patents, many papers in high impact journals and an appointment as full professor (chair supramolecular catalysis) at the UvA in 2006. In addition he founded the company Cat-fix in 2006 to commercialize some of the inventions in the area of supramolecular catalysis. He launched InCatT (innovative catalyst technologies) as a second spin-off company in 2009. He was scientific director of the [Van 't Hoff Institute for Molecular Sciences \(HIMS\)](#) of the UvA (122 fte) from 2013-2017. Since 2016 he is the scientific director of NIOK. In 2017 he became distinguished faculty professor at the Faculty of Science of the University of Amsterdam

In 2005 he was elected a young member of [Royal Netherlands Academy of Arts and Sciences \(KNAW\)](#). As a young member of the KNAW he visited high schools, organized meetings on interdisciplinary research topics and he took part in the committee judging the KNAW recognized research schools in the area of natural sciences. In 2013 he was elected as a new member of the Royal Holland Society of Sciences and Humanities ([KHMW](#)), in 2018 he was honoree member of the Israel Chemical Society, and since 2015 he is elected member of the KNAW. In 2019 he became elected member of the European academy of science. As a KNAW member he takes part in various committees including van 't Hoff committee and science domain KNAW committee, and he is the chair of KNAW section chemistry. He received numerous grants (total value over M€ 13) including a grant for talented young chemists, Vici grant (2002) and TOP grants of the national research funding agency NWO, a large grant from economic affairs and in 2013 the ERC advanced grant. On top of that Reek collaborates with numerous industries, and he was selected scientist for the CBBC consortium. He was the coordinator of a successful European research training network, and is involved in other EU networks.

Joost Reek currently heads a research group of around 40 people, with 22 PhD students and 9 post-docs, working on various topics related to supramolecular chemistry and transition metal catalysis. So far, he has been (co-) supervisor of over 50 PhD students. He was member of the management team of the [NRSCC](#) (top research school catalysis), member of the board of the European journal of inorganic chemistry, and chair of the study group Coordination chemistry and homogeneous catalysis of NWO, board member of the [KNCV](#) (Royal Netherlands Chemical Society) and board member of the national BioSolarCell research program. He is the scientific director of NIOK, the national research school on catalysis.

With over 350 scientific papers published, his H-index is currently 74 (in 2010 he entered the top 1000 of most cited chemists in the world (643th position), at the age of 43). He has (co)edited a book on dynamic combinatorial chemistry, a new field of science that is strongly inspired by natural selection events. Reek gave many invited lectures like the Troisième cycle (Switzerland, 2007), the DSM-lecture at the ICOMC (Rennes, 2008) and the Erdtman Lecture in 2009, the molecular science frontier lecture of ICCAS (Chinese academy of science) in 2018, IFOC lectureship award (Japan 2018), and the Earl Muetterties lecture in Berkeley. In 2011 he was invited to a DoE workshop on CO₂ reduction, to advise the Department of Energy in US. In 2014 and 2016 he explained on television ([De kennis van nu](#) and toekomstmakers) one of his scientific dreams to the public.

Education

Master Chemistry	1991, University of Nijmegen, Major Organic chemistry, Solid state physics
Ph.D.	1996, University of Nijmegen, supervisor Prof. Dr. R.J.M. Nolte Title of thesis: Synthesis, binding properties and reactivity of molecular clips.

Appointments

• Post-Doc Sydney Australia (University of Sydney)	• 1996-1998
• Assistant professor 1998 (UvA)	• 1998-2003
• Associate professor 2003 (UvA)	• 2003-2006
• Full Professor 2006 (UvA)	• 2006-now
• Faculty Professor UvA/FNWI	• 2017-now

Elected Memberships

• Member of Young academy of science (KNAW)	• 2006-2011
• Member of the Royal Holland Society of Sciences and Humanities (KHMW)	• 2013-now
• Elected member of the KNAW, (Royal Dutch Academy of Science)	• 2015-now
• ARC CBBC (virtual research institute)	• 2016-now
• Honoree member Israel Chemical Society	• 2018-now
• Member European Academy of science	• 2019-now

Management experience

• Management team NRSCC	• 2008-2015
• Director Cat-fix	• 2006-2009
• Director InCatT	• 2009-2013
• Scientific director InCatT	• 2013-now
• Board member KNCV (port folio research)	• 2009-2016
• Chair of NWO work group Coordination and Catalysis	• 2008-2016
• Management team BioSolarCell (Dutch artificial leaf program)	• 2010-2016
• Coordinator of a Research Training Network (EU)	• 2007-2011
• Member UOC UvA (advise committee for the rector and the board of UvA)	• 2010-2031
• Chair UOC UvA	• 2013-2016
• KNAW chair section chemistry	• 2015-now
• KNAW science domain committee	• 2015-now
• Director of research priority area Sustainable Chemistry UvA	• 2013-now
• Director HIMS institute UvA (122 FTE)	• 2013-2017
• Director NIOK (national research school catalysis)	• 2015-now
• Board member Ammodo	• 2018-now
• Chair van 't Hoff committee	• 2019-now

Professional Development

- Advisory Board *Eur. J. Inorg Chem.* 2008-now
- Advisory Board *ChemplusChem* 2011
- Member UOC UvA (University research committee that advises the rector and the board of UvA) 2007-2011
2011-2016
- Member of the World economic forum 2013-2016
- Editorial Board *Eur. J. Inorg Chem.* 2014-
- Chair ISHC 2018 2018

Selection of Committees

- Scientific integrity committee UvA 2015
- Dispute valorization committee 2014-now
- Steering committee Co van Ledden Hulsebosch Center 2013-2016
- Member of commission Exact sciences of the KNAW (evaluation of research schools) 2009
- Member of program committee CHAINS 2011 conference 2011
- Member of program committee CHAINS 2014 conference 2014
- Golden Master award committee 2010-2014
- KNCV golden Medal Committee 2014-2016
- Van't Hoff-committee van de KNAW (chair) 2015-now
- KNAW Raad NTW 2017-2020

Research

My research philosophy is to start with conceptual new ideas and strategies in catalysis, and study these in detail using kinetic analysis, in situ spectroscopy and dft calculations. If these new conceptual tools work as anticipated, the value should be explored in terms of solving issues in catalysis. If this leads to catalysts that perform better in terms of existing systems, real applications should be investigated. This can be done in collaboration with companies that are interested in the new solutions, or by starting spin off companies to economically capitalize on the new inventions. As such, I have started many collaborations with different companies in the past 15 years (DSM, EASTMAN, AKZO, EVONIC, IFP, BASF, Merck, ect) in directly financed bilateral projects or in ppp programs. In addition, I have started two spin-off companies, and I am involved in InCatT since 2009.

The expertise of our group is broadly centered on homogenous catalysis. We develop new catalytic processes based on 1) rational ligand design in transition metal catalysis 2) Supramolecular catalysis 3) Bio-inspired catalysis. We study crucial aspects of catalysis, including activity, selectivity, stability and recycle-ability of the catalyst. We have expertise in a lot of different reactions, including (asymmetric) hydrogenation, (asymmetric) hydroformylation, cross coupling reactions, C-X bond forming reactions, gold-mediated transformations, polymerization chemistry, metathesis, etc. We have developed many different spectroscopic techniques to study our systems, including HP-NMR, HP-IR, EPR, Electrochemistry, stopped flow kinetics, robotics for kinetics, timer resolved UV Vis/CD. In the past 8 years, part of the research has been focused on solar to fuel devices based on molecular components. In this context, we developed new catalyst for water oxidation and proton reduction, and we can drive these uphill reactions using light as the energy source by combining them with the proper chromophores.

Key publications

- V.C. Slagt, J.N.H. Reek*, P.C.J. Kamer and P.W.N.M. van Leeuwen, Assembly of Encapsulated Transition Metal Catalysts, *Angew. Chem. Int. Ed.*, **2001**, *40*, 4271-4274 (Front cover, highlighted in C2W)
- V.F. Slagt, P.W.N.M. van Leeuwen, J.N.H. Reek*, Multicomponent porphyrin assemblies as functional bidentate phosphite ligands for regioselective rhodium-catalyzed hydroformylation. *Angew. Chem. Int. Ed.* **2003**, *42*, 5619.
- V. F. Slagt, P. C. J. Kamer, P. W. N. M. van Leeuwen, J. N. H. Reek* Encapsulation of Transition Metal Catalysts by Ligand-Template Directed Assembly, *J. Am. Chem. Soc.* **2004**, *126*, 1526.
- R. Chen, R.P.J. Bronger, P. C. J. Kamer, P. W. N. M. van Leeuwen, J. N. H. Reek* "Noncovalent anchoring of Homogeneous Catalysts to Silica Supports with well-defined Binding Sites" *J. Am. Chem. Soc.* **2004**, *126*, 14557.
- V. F. Slagt, M. Röder, P. C. J. Kamer, P. W. N. M. van Leeuwen, J. N. H. Reek* Supraphos: A Supramolecular Strategy To Prepare Bidentate Ligands. *J. Am. Chem. Soc. (communication)* **2004**, *126*, 4056.
- X.-B. Jiang, L. Lefort, P. E. Goudriaan, A. H. M. de Vries, P. W. N. M. van Leeuwen, J. G. de Vries, and J. N. H. Reek*, "Robotic screening of a supramolecular catalyst library in the search for selective catalysts for the asymmetric hydrogenation of a difficult enamide substrate" *Angew. Chem. Int. Ed.* **2006**, *45*, 1223. (Hot Article)
- M. Kuil, T. Soltner, P. W. N. M. van Leeuwen, J.N. H. Reek*, "High-precision catalysts: regioselective hydroformylation of internal alkenes by encapsulated rhodium complexes" *J. Am. Chem. Soc. (communication)* **2006**, *128*, 11344.
- J. Flapper, J. N. H. Reek* "Templated Encapsulation of Pyridyl-Bian Palladium Complexes: Tunable Catalysts for CO/4-*tert*-Butylstyrene Copolymerization" *Angew. Chem. Int. Ed.* **2007**, *46*, 8590
- F.W. Patureau, M. Kuil, A.J. Sandee, J.N.H. Reek*, "METAMORPhos: Adaptive supramolecular ligands and their mechanistic consequences for asymmetric hydrogenation" *Angew. Chem. Int. Ed.* **2008**, *47*, 3180.
- F.W. Patureau, S. de Boer, M. Kuil, J. Meeuwissen, P.-A, R. Breuil, M.A. Siegler, A. L. Spek, A.J. Sandee, B. de Bruin, J.N.H. Reek*, "Sulfonamido-Phosphoramidite Ligands in Cooperative Dinuclear Hydrogenation Catalysis". *J. Am. Chem. Soc. (communication)* **2009**, *131*, 6683-6685.

- A.M. Kluwer, R. Kapre, F. Hartl*, M. Lutz, A.L. Spek, A.M. Brouwer, P.W.N.M van Leeuwen*, J.N.H. Reek* "Self-assembled Biomimetic [2Fe2S]-Hydrogenase Based Photocatalyst for Molecular Hydrogen Evolution" *PNAS*, **2009**, *26*, 10460.
- P. R. Breuil, F. W. Patureau and J. N. H. Reek* 'LEUPhos: Single hydrogen-bonded supramolecular ligands for highly selective rhodium-catalyzed hydrogenation of methyl 2-hydroxymethylacrylate and its derivatives' *Angew. Chem. Int. Ed.*, **2009**, *48*, 2162.
- J. Wassenaar, E. Jansen, W.-J. van Zeist, F. M. Bickelhaupt,* M. A. Siegler, A. L. Spek, and J. N. H. Reek* Catalyst selection based on intermediate stability measured by mass spectrometry, *Nature Chemistry*, **2010**, *2*, 417, highlighted in C&E News.
- P. Dydio, W.I. Dzik, M. Lutz, B. de Bruin, J.N.H. Reek* "Remote Supramolecular Control of Catalyst Selectivity in the Hydroformylation of Alkenes" *Angew. Chem. Int. Ed.*, **2011**, *50*, 396-400.
- A. Cavarzan, A. Scarso*, P. Sgarbossa, G. Strukul, J.N.H. Reek*, "Supramolecular Control on Chemo- and Regioselectivity via Encapsulation of (NHC)-Au Catalyst within a Hexameric Self-Assembled Host" *J. Am. Chem. Soc.* **2011**, *133*, 2848-2851.
- R. Bellini, S. H. Chikkali, G. Berthon-Gelloz,* J. N. H. Reek*, "Supramolecular control of ligand coordination and implications for hydroformylation reaction" *Angew. Chem. Int. Ed.*, **2011**, *50*, 7342-7345.
- P. Dydio, C. Rubay, T. Gadzikwa, M. Lutz, and J. N. H. Reek* "Cofactor"-Controlled Enantioselective Catalysis, *J. Am. Chem. Soc. (communication)* **2011**, *133*, 17176 **Highlighted in C&E News and C2W**.
- T. Gadzikwa, R. Bellini, H.L Dekker, and J. N. H. Reek* "Self-Assembly of a Confined Rhodium Catalyst for Asymmetric Hydroformylation of Unfunctionalized Internal Alkenes", *J. Am. Chem. Soc. (communication)* **2012**, *134*, 2860
- P. Dydio J. N. H. Reek* 'Supramolecular Control of Selectivity in Hydroformylation of Vinyl Arenes: Easy Access to Valuable Beta-Aldehyde Intermediates' *Angew. Chem. Int. Ed.*, **2013**, *52*, 3878. **Highlighted in Nature Chemistry.**
- P. Dydio, R. Detz, J.N.H. Reek* "Precise Supramolecular Control of Selectivity in the Rh-Catalyzed Hydroformylation of Terminal and Internal Alkenes" *J. Am. Chem. Soc.* **2013** *135*, 10817.
- P. Dydio, J.N.H. Reek*, "Scalable and chromatography-free synthesis of 2-(2-formylalkyl) arenecarboxylic acid derivatives through the supramolecularly controlled hydroformylation of vinylarene-2-carboxylic acids" *Nature Protocols*, **2014**, *9*, 1183
- R. Gramage-Doria, J. Hessels, S. H. A. M. Leenders, O. Tröppner, M. Dürr, I. Ivanović-Burmazović, J.N.H. Reek,* "Gold(I) catalysis at extreme concentrations inside self-assembled nanospheres" *Angew. Chem., Int. Ed.*, **2014**, *52*, 13380–13384. **highlighted in C2W**
- Q. Wang, S. Gonell Gomez, S.H.A.M. Leenders, M. Dürr, I. Ivanović-Burmazović & J.N.H. Reek, "Self-assembled nanospheres with multiple endohedral binding sites pre-organize catalysts and substrates for highly efficient reactions." *Nature Chemistry*, **2016** *8*, 225-230
- R. Becker, S. Amirjalayer, P. Li, S. Woutersen, J.N.H. Reek* "An iron-iron hydrogenase mimic with appended electron reservoir for efficient proton reduction in aqueous media" *Science Adv.* **2016**, *2*, e1501014 DOI: 10.1126/sciadv.1501014
- J. Daubignard, R.J. Detz, A.C.H. Jans, B. de Bruin, B., J.N.H. Reek*, J. N. H. Rational Optimization of Supramolecular Catalysts for the Rhodium-Catalyzed Asymmetric Hydrogenation Reaction. *Angew Chem Int Ed* **2017**, *56*, 13056-13060.
- F. Yu, D. Poole III, S. Mathew, N. Yan, J. Hessels, N. Orth, I. Ivanovic-Burmazovic J.N.H. Reek*, J. N. H. Control over Electrochemical Water Oxidation Catalysis by Preorganization of Molecular Ruthenium Catalysts in Self-Assembled Nanospheres. *Angew Chem Int Ed* **2018**, *57*, 11247.
- L.J. Jongkind, J.A.AW Elemans, J.N.H. Reek Cofactor Controlled Encapsulation of a Rhodium Hydroformylation Catalyst. *Angew Chem Int Ed* **2019**, *58*, 2696-2699.
- S.T. Bai, C.B. Bheeter, J.N.H. Reek, *Angew. Chem. Int. Ed. Engl.* **2019**, *58*, 13039-13043.
- R. Zaffaroni, N. Orth, I. Ivanovic-Burmazovic, J.N.H. Reek, *Angew. Chem. Int. Ed. Engl.* **2020**, *59*, 18485-18489.

Key review papers

- G.E. Oosterom, J.N.H. Reek,* P.C.J. Kamer, and P.W.N.M. van Leeuwen,* Transition metal catalysis using functionalized dendrimers. *Angew. Chem. Int. Ed. Engl.* **2001**, *40*, 1828.
- R. van Heerbeek, P.C.J. Kamer, P.W.N.M. van Leeuwen, J. N. H. Reek,* Dendrimers as soluble support to anchor homogeneous catalysts” *Chem. Rev.*, **2002**, *102*, 3717.
- A.J. Sandee, J. N. H. Reek,*” Supramolecular ligands: the future for transition metal catalysis?” *Dalton.Trans.* **2006**, 2308
- T.S. Koblenz, J. Wassenaar J. N. H. Reek* ”Reactivity within a confined self-assembled nanospace” *Chem. Soc. Rev.*, **2008**, *37*, 247 (inside cover)
- P.E. Goudriaan, P. W. N. M. van Leeuwen, M.N. Birkholz, J. N. H. Reek* “Libraries of bidentate phosphorus ligands; synthesis strategies and application in catalysis”, *Eur. J. Inorg. Chem.* **2008**, 1309. (Front cover)
- J. Meeuwissen and J.N.H Reek*, “New directions in supramolecular catalysis,” *Nature Chemistry*, **2010**, *2*, 615.
- D. Hetterscheid, J. N. H. Reek,” Mononuclear water oxidation catalysts” *Angew. Chem. Int Ed.* **2012**, *51*, 9740.
- P. Dydio, J.N.H. Reek*, “Supramolecular control of selectivity in transition-metal catalysis through substrate preorganization” *Chem. Sci.*, **2014**, *5*, 2135.
- S.H.A.M., Leenders, R. Gramage-Doria, B. de Bruin, J.N.H. Reek*, “Transition metal catalysis in confined spaces” *Chem. Soc. Rev.*, **2015**, *44*, 433 – 448.
- S. S. Nurttala, P. R. Linnebank, T. Krachko, J.N.H. Reek*. Supramolecular Approaches To Control Activity and Selectivity in Hydroformylation Catalysis. *ACS Catal.* **2018**, *8*, 3469-3488.
- L.J. Jongkind, X. Caumes, A.P.T Hartendorp, J.N.H. Reek*, “Ligand template strategies for catalyst encapsulation” *Acc. Chem. Res.* **2018**, *51*, 2115–2128
- T. Keijer, T. Bouwens, J. Hessels, J.N.H. Reek, *Chem. Sci.* **2021**,*12*, 50-70.