

Curriculum Vitae A.N.R. (René) Bos

René Bos is currently Senior Principal Researcher within the department *Next Generation Breakthrough Research* at Shell Projects & Technology, Amsterdam. Since June 2018 he is also part time seconded to Ghent University as guest professor "Industrial Reaction Engineering" at the *Laboratory of Chemical Technology* (LCT).

He received his chemical engineering degree from University Twente where he also obtained his PhD in 1992 on "Reactor and catalyst dynamics and stability - the hydrogenation of ethyne in ethene" in the research group *Industrial Processes and Products* of Prof. Roel Westerterp.

He joined Shell in September 1991 where he has had a variety of roles in Amsterdam, Pernis and Houston, mostly within research and technology but also at manufacturing sites as advising technologist. From 1991 to 2007 he worked as (senior) scientist on topics comprising ethylene oxide, ethylene glycol, DeNO_x, EpiChloroHydrin, Methanol To Olefins, catalytic oxidation of NH₃, Versatic Acids production, Butadiene Rubber, Carilon and Carilite, PIB/MALA production and SMPO (Styrene + Propylene Oxide). In January 2008 he became Principal Scientist and overall project lead for all Fischer-Tropsch / GTL exploratory and explanatory R&D, with an annual budget varying between 5 and 10 Million US\$/yr. In 2013 he took on the role of Team Lead Process Innovation within *Emerging Technologies*, focusing on lead generation, experimental proof of concept and subsequent process development. Since then, he and the team worked in the field of Gas to Chemicals (C1 – C3 to bulk chemicals, most notably E-ODH and OCM), the broader field of Methane to Products including routes via acetylene, on alternative syngas technologies and thermo-catalytic conversions of CO₂, most notably catalytic reverse water gas shift where we run a full-scale pilot at MAN Energy Solutions in Deggendorf. In our lab we work with a wide range of experimental equipment, including small pilot plants, many micro-flow reactors suitable for high pressures and temperatures (up to 50 bar, 1400 °C) as well as several advanced analytical / surface science techniques. Next to this, he also co-runs the "Reactor Engineering skill network" and the advanced internal course "Industrial Reaction Engineering and Conceptual Process Design".

In 2021 he was appointed as Senior Principal Science Expert (Process Development). In 2024 he won the Shell.ai Gold award in the category "Prolific inventor; through in-depth research, publications and patents".

Externally from Shell, he has been several times invited lecturer for the post-graduate OSPT-course *Process Development and Scale-up* (University Amsterdam), the graduate course "Scale-up of fixed and moving bed reactors" (University Twente), the post graduate NIOK course *Advanced Catalysis Engineering* (TU Delft) and invited lecturer on Reaction Engineering (TU Eindhoven and TU Delft).

With Prof. Guy Marin (Ghent, but then TU Eindhoven) and representatives from DSM and DOW, he was one of the "founding fathers" of the consortium *EuroKin*, which is still operative today. From 2005 to 2010 he represented Shell as executive officer of the Dutch-Belgium branch of the American Institute of Chemical Engineers and from 2013 onwards as member of "College van Toezicht" of the University of Applied Sciences Utrecht.

Overall, he (co-) authored 51 scientific publications in the open literature (next to >100 Shell internal research reports) and is (co-)inventor of 47 Patent Applications. He co-edited a book on Methane Conversion Routes and co-authored a new textbook on Multiphase Reactors (without math), both published in 2023.

Career

2023–present	Senior Principal Researcher Chemical Engineering, Shell, Amsterdam
2018–present	Guest Professor Industrial Reaction Engineering, Ghent University
2021–present	Senior Principal Science Expert, Process Development
2019	Principal Researcher Emerging Technologies, Shell, Amsterdam
2013	Team Lead Emerging Technologies, Shell, Amsterdam
2008	Principal Scientist & Overall Project Lead GTL Exploratory/Explanatory, Shell, Amsterdam
2003	Senior Research Technologist Styrene Monomer / Propylene Oxide, Shell, Amsterdam
1999	Senior Research Technologist Ethylene Oxide and Ethylene Glycols, Shell, Amsterdam
1998	Process Development Engineer EO/EG, Shell Oil Company, Houston
1995	Advising Technologist Versatic Acids Plant, Shell Nederland Chemie, Pernis
1991	Reactor Engineer, Koninklijke Shell Laboratorium, Amsterdam (KSLA)

Education

1992	PhD in Chemical Engineering, University Twente; promotor/advisor Prof. Westerterp Committee: Prof. van Swaaij, Prof. Eigenberger, Prof. van den Berg, Prof. Ross and Prof. Geus
1987	Scheikundig Ingenieur (Master in Chemical Engineering), University Twente

Attached: List of publications, books and patent applications

List of publications (51), books (2) and patents (47) of A.N.R. Bos, dd August 2024.

- [100] Penetration-Model-Based Criteria for the Identification of the Instantaneous Regime for Irreversible Gas-Liquid Reactions, Pieter Janssens, Jeroen Poissonnier, Joris W. Thybaut, René Bos, submitted to Chemical Engineering Journal (2024)
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- [96] Autothermal cracking of renewable feedstock, Schoonebeek, Ronald Jan; Bos, Alouisius Nicolaas Renée; Donoeva, Baira; Unruh, Johannes Dominik; De, Shauvik, WO2024146824 (2024)
- [95] Autothermal cracking of hydrocarbons, Schoonebeek, Ronald Jan; Bos, Alouisius Nicolaas Renée; Donoeva, Baira; Unruh, Johannes Dominik; De, Shauvik; van Rossum, Guus, WO2024115470 (2024)
- [94] J. Zhang, C. Tighe, K. Hellgardt, D. Unruh, R. Bos, Generalized Runaway Criteria for Stacked Catalyst Activities, 28th International Symposium on Chemical Reaction Engineering (ISCRE28),Turku, Finland, June 17-19, (2024), https://www.iscre28.org/abstracts/abstract_242_181_1.pdf
- [93] S. De, A.P. van Bavel, R. Bos, A novel electric reactor for methane to acetylene conversion, 28th International Symposium on Chemical Reaction Engineering (ISCRE28),Turku, Finland, June 17-19,2024 https://www.iscre28.org/abstracts/abstract_242_255_1.pdf
- [92] M. Hadian, J. Ramirez, M. De Munck, K.A. Buist, A.N.R. Bos, J.A.M. Kuipers, Comparative analysis of a batch and continuous fluidized bed reactors for thermocatalytic decomposition of methane: a CFD-DEM-MGM approach, Chem. Eng. J. (2024) 149478, [10.1016/j.cej.2024.149478](https://doi.org/10.1016/j.cej.2024.149478)
- [91] Autothermal cracking of hydrocarbons, Schoonebeek, Ronald Jan; Unruh, Dominik Johannes Michael; Van Der Gulik, Patrick Ivor Maurice; Bos Alouisius Nicolaas Renée; Schouwenaar, Robert; De, Shauvik, WO2023126103 (2023)
- [90] Autothermal cracking of hydrocarbons, Schoonebeek, Ronald Jan; Bos, Alouisius Nicolaas Renée; Urade, Vikrant Nanasaheb, van der Sloot, Dennis Patrick; WO2023126104 (2023)
- [89] M. Hadian, K.A. Buist, A.N.R. Bos, J.A.M. Kuipers, Modeling of a catalytic fluidized bed reactor via coupled CFD-DEM with MGM: from intra-particle scale to reactor scale, Chemical Engineering Science 284 (2024) 119473, doi.org/10.1016/j.ces.2023.119473
- [88] Jan Harmsen, René Bos, Multiphase Reactors - Fundamentals, Design, Scale-up and Applications, De Gruyter Textbook, Berlin, 2023, doi.org/10.1515/9783110713770
- [87] Vladimir Galvita, René Bos (Editors), Methane Conversion Routes - Status and Prospects, Royal Society of Chemistry, 2023, doi.org/10.1039/9781839160257
- [86] Pieter Janssens, Jeroen Poissonnier, Anoop Chakkingal, René Bos, Joris W. Thybaut, Recent advances in the use of Steady-State Isotopic Transient Kinetic Analysis data in (micro)kinetic modeling for catalyst and process design, Catalysis Communications 179 (2023) 106688 doi.org/10.1016/j.catcom.2023.106688
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- [84] Pieter Janssens, Jeroen Poissonnier, Joris W. Thybaut, Wim P.M. van Swaaij, René Bos, Improved and Generalized Criteria for the Instantaneous Regime for Multiple Parallel Gas-Liquid Reactions, Chem. Eng. J. 465 (2023) doi.org/10.1016/j.cej.2023.142744
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- [67] Process for oxidatively converting methane to higher hydrocarbon products, Alayon, Evalyn Mae; Bos, Alouisius Nicolaas Renée; Horton, Andrew David; Schoonebeek, Ronald Jan, WO2019048412 (2019)
- [66] Process for oxidatively converting methane to higher hydrocarbon products, Alayon, Evalyn Mae; Bos,

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- A.N.R. Bos, K. Zhu, Activation of Catalysts in Commercial Scale Fixed-Bed Reactors: Dynamic Modelling and Guidelines for Avoiding Undesired Temperature Excursions, keynote Lecture ISCRE-25 Florence 2018.
- A.N.R. Bos, Challenges in multi-phase reactor engineering: An Industrial perspective, WCCE9: 9th World Congress of Chemical Engineering, August 2013.
- A.N.R. Bos, Challenges in multi-phase reactor engineering, Invited key note lecture TU/e symposium Sustainable Energy and Resources, October 2011.
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