



Annual Report 2022

*Chemistry
research
that matters*

Van 't Hoff Institute
for Molecular Sciences

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Executive summary

In the course of 2022, we could finally resume our regular day-to-day activities and leave the COVID pandemic behind us. Although members of our staff experienced occasional infections and, in some cases, prolonged effects of the disease, as an institute we were able to return to what we do best: conducting cutting-edge research and providing high-quality education. We like to thank all staff and students for their resourcefulness and perseverance during the pandemic.



HIMS director Prof. Wybren Jan Buma: "In 2022, we have worked hard to follow up on our strategy to enhance cross-disciplinary collaborations, which is now starting to pay off in terms of joint research efforts and publications." Photo: FNWI.

The researchers at our institute were very successful in **acquiring external grants**. Among many others are the high-impact personal grants of Giulia Giubertoni, and Bob Pirok (all Veni laureates), the ERC Consolidator Grants for professors Timothy Noël and Wim Noorduin, and the Rubicon grants for Dr Tessel Bouwens and Dr Eduard Bobylev.

In total, 23 young researchers **obtained their PhD at our institute**. Dr Eduard Bobylev received his doctorate with the distinction 'cum laude'. A number of 247 peer-reviewed publications arose, including 9 joint publications from collaborating HIMS groups, often involving interdisciplinary collaborations across the different HIMS themes.

We have seen a number of noteworthy **changes in the HIMS staff**. Dr Ioana M. Ilie started as a tenure track assistant professor in computational biophysics as part of the 'Connecting Science' programme of the Faculty of Science. Dr Joen Hermans was appointed as an assistant professor of Conservation Science on a position shared with the Amsterdam School for Heritage, Memory and Material Culture (AHM) at the Faculty of Humanities. We also recruited assistant professors Dr Tomáš Šolomek and Dr Alberto Pérez de Alba Ortíz to start their work in 2023. We welcomed entrepreneur Ruud Koornstra as an Honorary Fellow of the Faculty of Science, contributing to research, education and valorisation in the field of sustainability. We said farewell to Peter Timmermans after being professor by special appointment of Protein Mimetic Chemistry for fifteen years. Finally, Dr Jocelyne Vreede was appointed as the new programme director of the Chemical Sciences Bachelor taught as a joint degree with the Vrije Universiteit Amsterdam, succeeding Dr Sape Kinderman who held the position for over eight years.

In 2022, HIMS researchers received notable **awards and recognitions**. On the day of his valedictory speech and the symposium marking his retirement, Prof. Peter Schoenmakers was named Knight of the Order of the Netherlands Lion. It honoured his exceptional achievements in the field of analytical chemistry that were further underpinned by an ACS Award in Chromatography and the LCGC Lifetime Achievement in Chromatography award. Dr Tessel Bouwens received the Dick Stufkens Prize of the Holland Research School of Molecular Chemistry for her PhD thesis. The 'Sisters in Science' initiative of our colleagues Lotte Schreuder, Mimi den Uyl and Noor Abdulhussain was awarded the Van Marum prize of the Royal Netherlands Association of Chemistry (photo) in recognition of their contributions to enhance the visibility of chemistry. Prof. Timothy Noël received a ACS Sustainable Chemistry & Engineering Lectureship Award. Alumnus Milo Cornelissen was awarded a

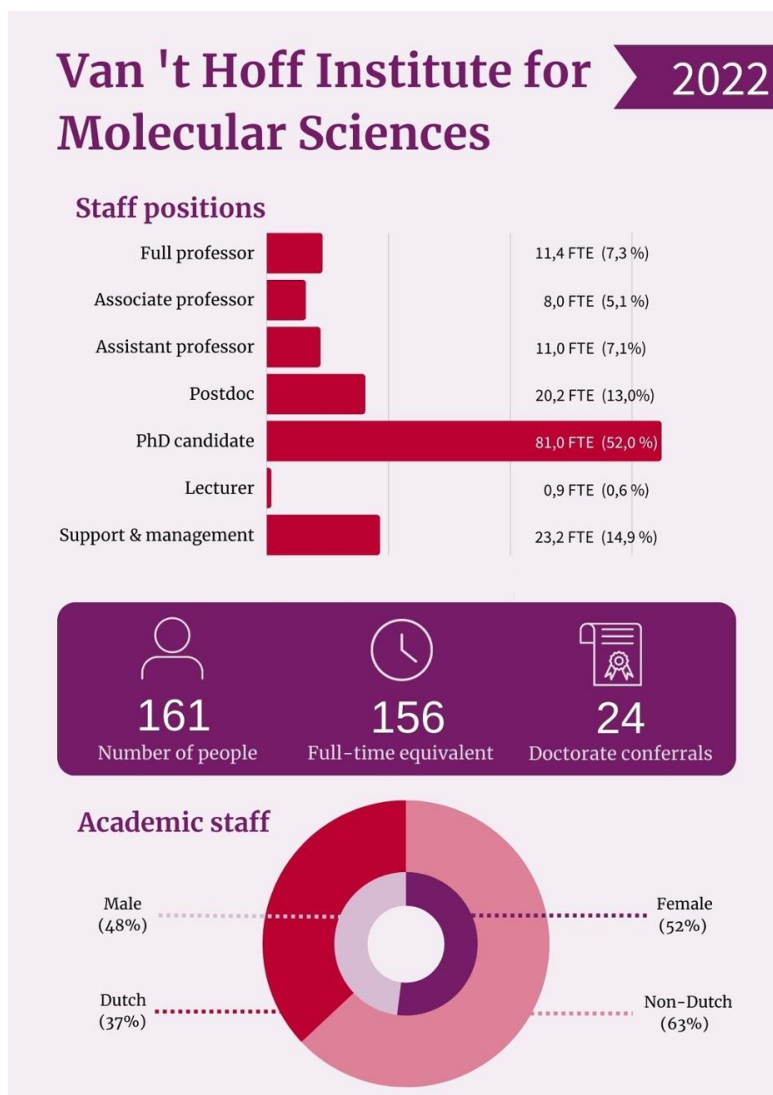


Photo: KNCV

Unilever Research Prize for his remarkable Master's research and assistant professors Dr Andrea Gargano and Dr Bob Pirok were featured in 'Top 40 Under 40' of analytical scientists worldwide.

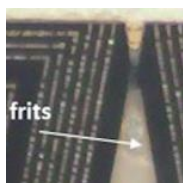
The **valorisation of HIMS research** and knowledge had several highlights worth sharing. Postdoc researcher Tijmen Bakker was selected among the first fellows of the Dutch national Faculty of Impact programme to further develop his idea for solar cells for greenhouses, which generate electricity while still leaving light available for plant growth. Prof. Sander Woutersen and Dr Giulia Giubertoni were awarded an NWO Demonstrator Grant for the development of a structure- and size-sensitive chemical probe based on the combination of microfluidic technology and infrared spectroscopy. Dr Stefania Grecea and Dr Olivier Lugier were awarded a Proof-of-Concept grant by Innovation Exchange Amsterdam (IXA) to advance a newly developed method for the synthesis of hybrid core-shell nanoparticles and bring these promising nanomaterials from lab to market. Finally, the University of Amsterdam reached a license agreement with the Gouda-based company *atum3D* on a method for fast, large-scale 3D-printing with sub-micron resolution, developed at our institute.

Finally, since HIMS has grown significantly over the past years, a **reorganization and relocation** of office space and laboratories has been initiated. Thanks to the willingness of all of HIMS this has been a successful effort that is in fact still ongoing. To conclude, we mention that in 2022 we have worked hard to follow up on our strategy to enhance cross-disciplinary collaborations, which is now starting to pay off in terms of joint research efforts and publications.



Scientific Highlights

Fabrication of monolithic features for chip-based multidimensional separation devices - 9 February 2022



In a paper published in the journal *Separation Sciences*, analytical chemists Noor Abdulhussain, Suhas Nawada and Peter Schoenmakers presented the fabrication and use of polymeric monoliths, both as frits and columns, in two dimensions of a three-dimensional spatial separation device.

Noor Abdulhussain, Suhas H. Nawada, Sinéad A. Currivan, Peter J. Schoenmakers: *Fabrication of monolithic frits and columns for chip-based multidimensional separation devices*. *Journal of Separation Science*, first published 23 January 2022. DOI: [10.1002/jssc.202100901](https://doi.org/10.1002/jssc.202100901)

Great interest in review on CO₂ sensing with metal-organic frameworks - 8 March 2022



A review article on “Metal-organic framework based systems for CO₂ sensing” by Dr Stefania Tanase-Grecea and coworkers at the Functional Materials research group has turned out to be one of the most popular articles of 2021 of the *Journal of Materials Chemistry C*. It was also designated as a 'Hot Paper' by the editors of the journal.

Andreea Gheorghie, Olivier Lugier, Bohui Yea and Stefania Tanase: *Metal-organic framework based systems for CO₂ sensing*. *J. Mater. Chem. C*, 2021, 9, 16132 DOI: [10.1039/D1TC02249K](https://doi.org/10.1039/D1TC02249K)

Dye-sensitized photosynthesis cell for oxidation of glycerol - 24 March 2022



Prof. Joost Reek and coworkers at the Homogeneous, Supramolecular and Bio-Inspired Catalysis research group have developed an aqueous dye-sensitized photoelectrochemical cell that is capable of oxidation of glycerol under irradiation with sunlight, while producing hydrogen at the same time. They described their cell in a paper in *Angewandte Chemie International Edition*.

Didjay F. Bruggeman, Annechien A. H. Laporte, Remko J. Detz, Simon Mathew and Joost N. H. Reek: *Aqueous Biphasic Dye-sensitized Photosynthesis Cells for TEMPO-based Oxidation of Glycerol* *Angewandte Chemie International Edition*, First published: 10 March 2022. DOI: [10.1002/anie.202200175](https://doi.org/10.1002/anie.202200175)

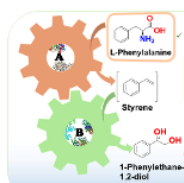
Synthetic relevance of unique cobalt(III) N-enolate carbene radicals - 24 March 2022



In an article in *Nature Chemistry*, PhD student Roel Epping and Prof. Bas de Bruin presented a strategy for effective and high yielding cyclopropanation reactions at room temperature using acceptor-acceptor iodonium ylides. They reveal how porphyrin ligand modification by acceptor-acceptor iodonium ylides can slow down other deactivation pathways of a metalloradical cobalt(II)-tetraphenylporphyrin catalyst.

Roel F. J. Epping, Mees M. Hoeksma, Eduard O. Bobylev, Simon Mathew, Bas de Bruin: *Cobalt(II)-tetraphenylporphyrin-catalysed carbene transfer from acceptor-acceptor iodonium ylides via N-enolate-carbene radicals*. *Nature Chemistry*, published online 21 March 2022. DOI: [10.1038/s41557-022-00905-4](https://doi.org/10.1038/s41557-022-00905-4)

Enzymatic cascades for high-yield synthesis of enantiopure products - 4 April 2022



In a paper in the ACS journal *Organic Process Research & Development*, researchers at the Biocatalysis group presented the concept of using multienzyme cascades for the conversion of bio-based, renewable and low-cost substrates into high-value chiral products. As a proof of concept, they describe the conversion of L-phenylalanine into enantiomerically pure 1,2-amino alcohols with a very high yield and atom-efficiency, while generating very little waste.

Maria L. Corrado, Tanja Knaus, Ulrich Schwaneberg, and Francesco G. Mutti: *High-Yield Synthesis of Enantiopure 1,2-Amino Alcohols from 2 L-Phenylalanine via Linear and Divergent Enzymatic Cascades*. *Organic Process Research & Development*, Published online March 28, 2022. DOI: [10.1021/acs.oprd.1c00490](https://doi.org/10.1021/acs.oprd.1c00490)

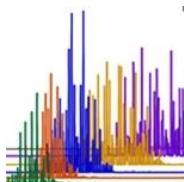
How to design safe and sustainable chemicals - 12 April 2022



With many human-made chemicals, problems regarding public health and the environment become apparent only years after their widespread use. In the journal *Chemosphere* a team of researchers from the University of Amsterdam and Utrecht University proposed a way to change that. They described a method for (re)designing safe and sustainable chemicals.

Joanke van Dijk, Hannah Flerlage, Steven Beijer, J. Chris Slootweg, Annemarie P. van Wezel: *Safe and sustainable by design: A computer-based approach to redesign chemicals for reduced environmental hazards*. *Chemosphere* 296: 134050 (June 2022). DOI: [10.1016/j.chemosphere.2022.134050](https://doi.org/10.1016/j.chemosphere.2022.134050)

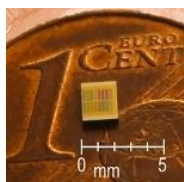
Characterization of the SARS-CoV-2 Spike Receptor-Binding Domain by HILIC-MS - 21 April 2022



A paper in *Analytical Chemistry* described a novel separation approach to characterize the structure of the receptor-binding domain of SARS-CoV-2 Spike protein by means of hydrophilic interaction chromatography (HILIC) hyphenated to mass spectrometry. It was the result of collaborative work of Dr Andrea Gargano and MSc Marta Passamonti with researchers at Pacific Northwest National Laboratory (USA).

Jesse W. Wilson, Aivett Bilbao, Juan Wang, Yen-Chen Liao, Dusan Velickovic, Roza Wojcik, Marta Passamonti, Rui Zhao, Andrea F. G. Gargano, Vincent R. Gerbasi, Ljiljana Paša-Tolić, Scott E. Baker, and Mowei Zhou: *Online Hydrophilic Interaction Chromatography (HILIC) Enhanced Top-Down Mass Spectrometry Characterization of the SARS-CoV-2 Spike Receptor-Binding Domain*. *Anal. Chem.* 2022, 94, 15, 5909–5917. DOI: [10.1021/acs.analchem.2c00139](https://doi.org/10.1021/acs.analchem.2c00139)

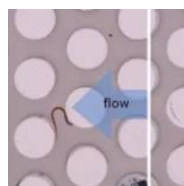
Illicit-drug detection with a miniaturized integrated NIR sensor - 23 May 2022



In a recent paper in *Talanta*, a scientific journal in *Analytical Chemistry*, researchers at the Van 't Hoff Institute for Molecular Sciences together with colleagues at the Dutch National Police and Eindhoven University of Technology present an integrated InGaAs-on-silicon sensor for on-site detection of illicit-drugs. First author of the paper is PhD candidate Ruben Kranenburg.

Ruben F. Kranenburg, Fang Ou, Petar Sevo, Maurangelo Petruzzella, Renee de Ridder, Anne van Klinken, Kaylee D. Hakkell, Don M.J. van Elst, René van Veldhoven, Francesco Pagliano, Arian C. van Asten, Andrea Fiore: *On-site illicit-drug detection with an integrated near-infrared spectral sensor: A proof of concept*, *Talanta*, Volume 245, 2022, 123441 DOI: [10.1016/j.talanta.2022.123441](https://doi.org/10.1016/j.talanta.2022.123441)

Worms in a maze - 13 June 2022



Particles that can move on their own (“active matter”) are currently a hot topic in physics. The theory to describe such particles is still being developed. Bachelor student Tess Heeremans performed experiments which she managed, for the first time, to sort active matter by activity level. To this end, she used a method from chemistry: chromatography. The active “particles” were... tiny worms.

Tess Heeremans, Antoine Deblais, Daniel Bonn, Sander Woutersen, *Chromatographic separation of active polymer-like worm mixtures by contour length and activity*, *Sci. Adv.* **8**, eabj7918 (2022) DOI: [10.1126/sciadv.abj7918](https://doi.org/10.1126/sciadv.abj7918)

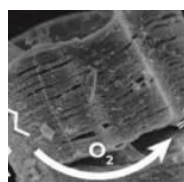
Revealing the original brilliance of a faded yellow rose - 21 June 2022



A team of researchers of the Rijksmuseum, the University of Amsterdam and the University of Antwerp has investigated the faded yellow rose in Abraham Mignon’s famous painting *Still Life with Flowers and a Watch*. In a paper in *Science Advances*, they reveal its originally intended, quite brilliant appearance as well as Mignon’s great effort in detailing the rose to provide it with a nearly three-dimensional appearance.

Nouchka De Keyser, Frédérique Broers, Frederik Vanmeert, Steven De Meyer, Francesca Gabrieli, Erma Hermens, Geert Van der Snickt, Koen Janssens, Katrien Keune: *Reviving degraded colors of yellow flowers in 17th century still life paintings with macro- and microscale chemical imaging*. *Sci. Adv.* **8**, eabn6344 (2022) 8 June 2022. DOI: [10.1126/sciadv.abn6344](https://doi.org/10.1126/sciadv.abn6344)

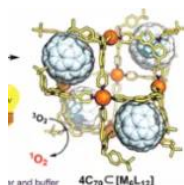
Two-dimensional MXene catalysts go flat out for butane oxidative dehydrogenation - 4 July 2022



In a paper in *ChemCatChem*, researchers from the three HIMS catalysis research groups demonstrated that a Ti-MXene material can catalyse the oxidative dehydrogenation of butane. The research followed upon earlier discoveries about the catalytic properties of a Ti-MAX phase material.

M. Ronda-Lloret, T.K. Slot, N.P. van Leest, B. de Bruin, W.G. Sloof, E. Batyrev, A. Sepúlveda-Escribano, E.V. Ramos-Fernandez, G. Rothenberg, Shiju N Raveendran: *The role of vacancies in a Ti₂CT_x MXene-derived catalyst for Butane Oxidative Dehydrogenation*. *ChemCatChem*, First published: 04 June 2022 DOI: [10.1002/cctc.202200446](https://doi.org/10.1002/cctc.202200446)

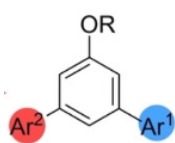
Fullerene binding metal-ligand nanospheres as vehicles for singlet oxygen formation - 25 August 2022



In an article in the *Journal of the American Chemical Society*, researchers at the Homogeneous, Supramolecular and Bio-inspired Catalysis group presented metal-ligand nanospheres that can bind fullerenes. These enable an effective and versatile method to generate singlet oxygen in various reaction media using white LED light. They also hold potential for clinical photodynamic therapy treatment of tumours.

Eduard O. Bobylev, David A. Poole III, Bas de Bruin, and Joost N.H. Reek: *M₆L₁₂ Nanospheres with Multiple C₇₀ Binding Sites for ¹O₂ Formation in Organic and Aqueous Media* *J. Am. Chem. Soc.* 2022, publication date: 17 August, 2022. DOI: [10.1021/jacs.2c05507](https://doi.org/10.1021/jacs.2c05507)

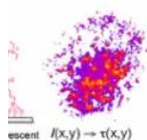
Highly efficient meta-C–H arylation of anisole derivatives - 6 September 2022



Researchers led by associate professor Tati Fernández-Ibáñez at the research group Synthetic Organic Chemistry developed a highly efficient method for meta-selective C–H arylation of aryl ethers, based on a new catalytic system containing palladium/norbornene (Pd/NBE) and an S,O-ligand. In *Angewandte Chemie* they showed how the reaction proceeds with a broad range of aryl ethers and how unsymmetrical meta-diarylation of aryl ethers can be accomplished using a novel norbornene.

Verena Sukowski, Manuela van Borselen, Dr. Simon Mathew, Prof. Dr. M. Ángeles Fernández-Ibáñez: *S,O-Ligand Promoted meta-C–H Arylation of Anisole Derivatives via Palladium/Norbornene Catalysis*. *Angew. Chem. Int. Ed.* **2022**, 61, e202201750. DOI: [10.1002/anie.202201750](https://doi.org/10.1002/anie.202201750)

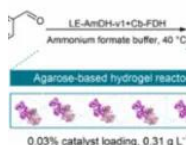
Detailed insight into friction: How objects start to slide - 22 September 2022



Chemists and physicists provided insight into a crucial aspect of friction: how things begin to slide. Using fluorescence microscopy and dedicated fluorescent molecules, they were able to pinpoint how and when the friction at the contact between two objects is overcome and sliding starts to occur. They reported on the details of this important transition in *The Journal of Physical Chemistry Letters*.

Chao-Chun Hsu, Feng-Chun Hsia, Bart Weber, Matthijn B. de Rooij, Daniel Bonn, and Albert M. Brouwer: *Local Shearing Force Measurement during Frictional Sliding Using Fluorogenic Mechanophores*. *J. Phys. Chem. Lett.* **2022**, 13, 8840–8844. DOI: [10.1021/acs.jpcclett.2c02010](https://doi.org/10.1021/acs.jpcclett.2c02010)

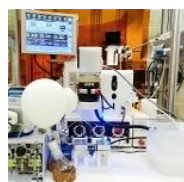
Biocatalytic reductive amination in a 3D-printed continuous flow microreactor - 4 October 2022



A cooperation between the research groups of Biocatalysis and Analytical Chemistry led to a paper in *ChemBioChem*. It describes joint research showing that the use of 3D printed flow microreactors can significantly improve the synthetic applicability of reductive amination catalysed by amine dehydrogenases.

Federico Croci, Jan Vilím, Theodora Adamopoulou, Vasilis Tseliou, Peter J. Schoenmakers, Tanja Knaus, and Francesco G. Mutti: *Continuous flow biocatalytic reductive amination by coentrapping dehydrogenases with agarose gel in a 3D-printed mould reactor*. *ChemBioChem* **23** (2022), 22, e202200549
DOI: [10.1002/cbic.202200549](https://doi.org/10.1002/cbic.202200549)

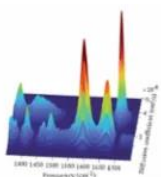
Bringing photocatalysis from laboratory to industry - 18 October 2022



In a paper in *Nature Communications*, researchers at the Flow Chemistry group described an approach that helps to bring photocatalysis from laboratory to industry. In cooperation with the British company Vapourtec, they developed a continuous-flow system that combines a micro-flow photoreactor with a nanofiltration device for photocatalyst recycling.

Zhenghui Wen, Diego Pintossi, Manuel Nuño, Timothy Noël: *Membrane-based TBADT recovery as a strategy to increase the sustainability of continuous-flow photocatalytic HAT transformations* *Nat Commun* **13**, 6147 (2022).
DOI: [0.1038/s41467-022-33821-9](https://doi.org/10.1038/s41467-022-33821-9)

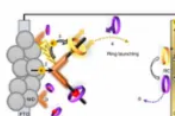
New experimental method IR-DOSY reveals molecular structure and size - 27 October 2022



A novel approach to infrared spectroscopy was developed that enables simultaneous characterization of molecular structure and size. Called Infrared Diffusion-Ordered Spectroscopy (IR-DOSY), the method nicely separates molecules with different sizes into distinct sets of IR peaks. The results were presented in a paper in *Angewandte Chemie*.

Giulia Giubertoni, Gijs Rombouts, Federico Caporaletti, Antoine Deblais, Rianne Van Diest, Joost Reek, Daniel Bonn, and Sander Woutersen: *Infrared Diffusion-Ordered Spectroscopy Reveals Molecular Size and Structure*. *Angewandte Chemie*, Accepted Article, first published 19 October 2022. DOI: [10.1002/anie.202213424](https://doi.org/10.1002/anie.202213424)

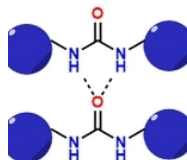
How supramolecular machinery can enhance the efficiency of dye-sensitized solar cells - 28 October 2022



In a paper in *Nature Chemistry*, Tessel Bouwens and co-workers presented a strategy for directional charge propagation in photoelectrochemical devices. They showed how pseudorotaxane motifs can be used as molecular machinery to reduce charge recombination in p-type dye-sensitized solar cells, thus enhancing their efficiency.

T. Bouwens, T. M. A. Bakker, K. Zhu, J. Hasenack, M. Dieperink, A. M. Brouwer, A. Huiser, S. Mathew, J. N. H. Reek: *A Bioinspired Strategy for Directional Charge Propagation in Photoelectrochemical Devices Using Supramolecular Machinery* *Nat. Chem.* (2022). DOI: [10.1038/s41557-022-01068-y](https://doi.org/10.1038/s41557-022-01068-y)

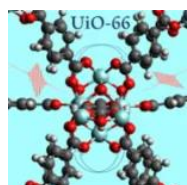
Novel isocyanate-free synthesis of polyurea - 9 November 2022



Researchers at the Homogeneous, Supramolecular and Bio-inspired Catalysis group developed a novel synthesis route for polyurea that avoids the use of toxic isocyanates. In the journal *Macromolecules* they described their method of ruthenium catalyzed carbene insertion into the N–H bonds of urea. It paves the way to use transition-metal-catalyzed reactions in alternative routes to polyureas.

Felix J. de Zwart, Petrus C. M. Laan, Nicole S. van Leeuwen, Eduard O. Bobylev, Erika R. Amstalden van Hove, Simon Mathew, Ning Yan, Jitte Flapper, Keimpe J. van den Berg, Joost N. H. Reek, and Bas de Bruin: *Isocyanate-Free Polyurea Synthesis via Ru-Catalyzed Carbene Insertion into the N–H Bonds of Urea*. *Macromolecules* 2022 Publication date October 17, 2022 DOI: [10.1021/acs.macromol.2c01457](https://doi.org/10.1021/acs.macromol.2c01457)

Direct probing of vibrational dynamics in a metal-organic framework using femtosecond two-dimensional infrared spectroscopy - 10 November 2022

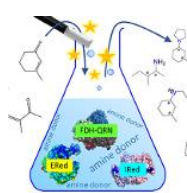


Researchers of the Functional Materials research teamed up with colleagues at the Ultrafast Spectroscopy research group at AMOLF for the first study of the vibrational dynamics of the UiO-66 metal-organic framework (MOF). In a paper in the *Journal of Physical Chemistry Letters*, they presented their results obtained with femtosecond two-dimensional infrared spectroscopy.

Korotkevich AA, Sofronov OO, Lugier O, Sengupta S, Tanase S, Bakker HJ: *Direct Probing of Vibrational Interactions in UiO-66 Polycrystalline Membranes with Femtosecond Two-Dimensional Infrared Spectroscopy*. *J Phys Chem Lett.* 2022 Oct 27;13(42):9793-9800. DOI: [10.1021/acs.jpcllett.2c02509](https://doi.org/10.1021/acs.jpcllett.2c02509).

Enzymatic synthesis of primary, secondary and tertiary amines containing two stereocenters

15 November 2022



In a paper in ACS Catalysis, the Biocatalysis research group presented a versatile method for the synthesis of primary, secondary, and tertiary amines containing two stereogenic centers. Using a biocatalytic enzyme cascade that combines ene-reductases (EReds) with either imine reductases or reductive aminases (IReds/RedAms) for the conversion of α,β -unsaturated ketones, they achieved excellent stereoselectivity and a very high chemical purity.

Tanja Knaus, Maria L. Corrado and Francesco G. Mutti: *One-Pot Biocatalytic Synthesis of Primary, Secondary, and Tertiary Amines with Two Stereocenters from α,β -Unsaturated Ketones Using Alkyl-Ammonium Formate*. ACS Catalysis 2022, 12, 14459-14475 DOI: [10.1021/acscatal.2c03052](https://doi.org/10.1021/acscatal.2c03052)

Formate as a key intermediate in carbon dioxide utilization - 18 November 2022



Research at the Industrial Sustainable Chemistry group features at the cover of Green Chemistry, a journal of the Royal Society of Chemistry. Together with colleagues from the Catalysis Engineering group and in cooperation with researchers from the University of Manchester, their 'perspective' paper draws a comprehensive picture of formate as a potential key intermediate in carbon dioxide utilization.

Eric Schuler, Michele Morana, Pavel A. Ermolich, Kristian Lüschen, Adam J. Greer, S. F. Rebecca Taylor, Christopher Hardacre, N. Raveendran Shiju and Gert-Jan M. Gruter: *Formate as a key intermediate in CO₂ utilization* Green Chem., 2022, 24, 8227-8258 DOI: [10.1039/D2GC02220F](https://doi.org/10.1039/D2GC02220F), cover: [10.1039/D2GC90097A](https://doi.org/10.1039/D2GC90097A)

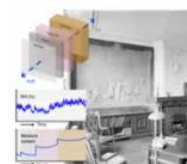
Optimizing hydrogen storage in hydroborate salts - 21 November 2022



Researchers Fran Pope, Noë Watson, Antoine Deblais and Gadi Rothenberg unravel the complexities of concentrated borohydride salt solutions that can be used as a medium to store hydrogen. Their results, published in ChemPhysChem and featured on the cover, bring the team closer to developing a catalyst for industrial-grade hydrogen storage.

Frances Pope, Noë I. Watson, Antoine Deblais, Gadi Rothenberg: *Understanding the Behaviour of Real Metaborates in Solution*. ChemPhysChem, Volume 23, Issue 22 e202200428 DOI: [10.1002/cphc.202200428](https://doi.org/10.1002/cphc.202200428)

How water moves through paintings - 8 December 2022



Applying chemical engineering principles to the field of art conservation, Jorien Duivenvoorden developed a computational approach to study moisture transport in oil paintings. The model simulates the diffusion of water in paintings on canvas and can be coupled to experimental climate data to predict a painting's response to humidity fluctuations. The results were published in the International Journal of Heat and Mass Transfer.

Jorien R. Duivenvoorden, Rick P. Kramer, Margriet H. van Eikema Hommes, Piet D. Iedema, Joen J. Hermans, Katrien Keune: *The distribution and transport of water in oil paintings: A numerical moisture diffusion model*. International Journal of Heat and Mass Transfer, Volume 202, 2023, 123682, DOI: [10.1016/j.ijheatmasstransfer.2022.123682](https://doi.org/10.1016/j.ijheatmasstransfer.2022.123682).

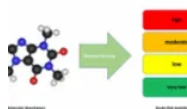
An important step towards strong and durable biobased plastics - 8 December 2022



In a paper in Nature Communications, researchers at the Industrial Sustainable Chemistry group presented an important step towards the production of fully biobased, rigid polyesters. They report on a simple, yet innovative, synthesis strategy to overcome the inherently low reactivity of biobased secondary diols and arrive at polyesters that have very good mechanical and thermal properties, and at the same time high molecular weights. It enables the production of very strong and durable biobased plastics from building blocks that are already commercially available.

Daniel H. Weinland, Kevin van der Maas, YueWang, Bruno Bottega Pergher, Robert-Jan van Putten, BingWang, Gert-Jan M. Gruter: *Overcoming the low reactivity of biobased, secondary diols in polyester synthesis*. Nat Commun **13**, 7370 (2022). DOI: [10.1038/s41467-022-34840-2](https://doi.org/10.1038/s41467-022-34840-2)

Using machine learning to improve the toxicity assessment of chemicals - 13 December 2022



In Environmental Science & Technology Saer Samanipour and co-authors presented a strategy for assessing the toxicity of chemicals using machine learning. The developed models can lead to substantial improvements when compared to conventional ‘in silico’ assessments based on Quantitative Structure-Activity Relationship (QSAR) modelling.

Saer Samanipour, Jake W. O’Brien, Malcolm J. Reid, Kevin V. Thomas, and Antonia Praetorius: *From Molecular Descriptors to Intrinsic Fish Toxicity of Chemicals: An Alternative Approach to Chemical Prioritization*. Environ. Sci. Technol. 2022, Publication Date: December 8, 2022. DOI: [10.1021/acs.est.2c07353](https://doi.org/10.1021/acs.est.2c07353)

Prizes and honours

The quality of HIMS scientists is reflected in the prizes and honours they receive. Noteworthy examples are a Unilver Researchb Prize for Milo Cornelissen, the LCGC Lifetime Achievement Award for Peter Schoenmakers, the Dick Stufkens Prize for Tessel Bouwens and the KNCV Van Marumpenning for the 'Sisters in Science'. Below is a list of news items reporting on these and other honours for HIMS staff members and students.

ACS Sustainable Chemistry & Engineering Lectureship award for Timothy Noël - 31 January 2022



Professor Timothy Noël received a 2022 ACS Sustainable Chemistry & Engineering Lectureship Award. It celebrates his contributions to research in sustainable chemistry and engineering, in particular in the field of continuous flow chemistry.

Jocelyne Vreede is new programme director of BSc in Chemical Sciences - 1 February 2022



Dr Jocelyne Vreede is the new programme director of the Chemical Sciences Bachelor, which is taught as a joint degree with the Vrije Universiteit. Vreede succeeds Dr Sape Kinderman who held the position for over eight years. With a new curriculum and growing appreciation among students, Vreede sees excellent opportunities to further increase the significance of the Amsterdam chemistry study.

Ruud Koornstra appointed Honorary Fellow at the Faculty of Science - 1 February 2022



Sustainability entrepreneur Ruud Koornstra was appointed an Honorary Fellow at the Faculty of Science of the University of Amsterdam, as of 1 February 2022. At the UvA, Koornstra contributes to research, education and valorisation related to the energy transition.

Eduard Bobylev earns cum laude PhD in chemistry - 2 February 2022



On 27 January Eduard Bobylev successfully defended his PhD thesis on the construction, confinement, catalysis and bio application of caged catalysts. He received his doctorate with the distinction 'cum laude', in recognition of his successful approach of a very challenging research subject at the Homogeneous, Supramolecular and Bio-Inspired Catalysis group.

Tenure track position for computational biophysicist Ioana Ilie - 8 February 2022



Dr Ioana M. Ilie was appointed as tenure track assistant professor. In her research, she unravels the complex interplay between the structure and function of biological and bio-inspired systems, using computational modelling based on the underlying biochemistry and physics. The appointment of Dr Ilie is part of the 'Connecting Science' programme of the Faculty of Science.

Peter Schoenmakers receives 2022 ACS Award in Chromatography - 18 March 2022



Prof. Peter Schoenmakers received the 2022 Award in Chromatography from the American Chemical Society during the ACS Spring 2022 National Meeting held 20–24 March in San Diego, for 'outstanding and innovative contributions to the fields of polymer analysis and multidimensional liquid chromatography and his relentless efforts to promote chromatography in general'.

Royal Honour for Peter Schoenmakers - 28 June 2022



Peter Schoenmakers was named Knight of the Order of the Netherlands Lion for his exceptional achievements in the field of analytical chemistry, which earned him international recognition and acclaim. Schoenmakers made a career in industry and science, was one of the founders of the national innovation community COAST and put Amsterdam on the map as an expertise centre in the analytical sciences.

UvA PhD candidate and students win prizes at NFI Science Fair - 6 July 2022



At the recent Science Fair of the Netherlands Forensic Institute (NFI), Mirjam de Bruin won the prize for best research pitch. De Bruin, a PhD candidate supervised by professor Arian van Asten, presented her research on determining the origin of chemical weapons. Also among the prize winners were Master's students in Forensic Science at the UvA's Institute for Interdisciplinary Studies.

HRSMC Class of Excellence Pitch Prize 2022 for Paula Teeuwen - 12 July 2022



Paula Teeuwen, a chemistry student doing her masters research project at the research group for Homogeneous, Supramolecular and Bio-inspired Catalysis, was awarded the Class of Excellence Pitch Prize 2022 by the Holland Research School for Molecular Chemistry (HRSMC). The jury was impressed by her pitch, in particular the way she answered the jury questions in great detail.

Tom Keijer runner up in UvA finals of 3MT PhD pitch competition - 12 September 2022



PhD student Tom Keijer participated in the UvA finals of the 3MT pitch competition that revolves around explaining your PhD research to a lay audience in a video of no more than three minutes. As one of the three representatives selected by the Faculty of Science, he ended as runner up in the university-wide finals

Alessandra Candian appointed as InterSpecial assistant professor at the Faculty of Science

23 September 2022



Astrochemist Dr Alessandra Candian has joined the Anton Pannekoek Institute for Astronomy (API) as an assistant professor. She was appointed as part of the faculty-wide InterSpecial education initiative and the Amsterdam Centre for Origins of Life. Candian already worked as a research assistant professor and guest researcher at HIMS.

Poster award for Mimi den Uijl at chromatography symposium - 4 October 2022



PhD candidate Mimi den Uijl was awarded a poster prize at the 33rd International Symposium on Chromatography held 18-22 September in Budapest. Den Uijl presented her poster on the implementation of light-exposure cells in liquid chromatography, as part of her research within the *Toolbox for studying the Chemistry Of Light-induced Degradation* (TooCOLD) project.

Jorien Duivenvoorden nominated for 'Spotlight' prize - 10 October 2022



On Thursday 13 October, PhD candidate Jorien Duivenvoorden of HIMS and the Rijksmuseum will present her research at the Dutch national 'Evening of Chemistry' (Avond van de Chemie) in Leiden. During this annual meeting, organized by chemistry association KNCV, she competed in the finals for the 'Spotlight' prize of Young KNCV.

Andrea Gargano and Bob Pirok featured in 'Top 40 Under 40' of analytical scientists - 12 October 2022



The magazine The Analytical Scientist published its 'Top 40 Under 40', listing 'analytical science's rising stars'. It featured HIMS analytical chemists Andrea Gargano and Bob Pirok. The magazine presents the list as a celebration of 'analytical science's rising stars, who will, hopefully, provide the answers to the 21st century's biggest questions'.

Dick Stufkens Prize 2022 for Tessel Bouwens - 13 October 2022



The Dick Stufkens Prize 2022 for best PhD thesis of the Holland Research School of Molecular Chemistry (HRSMC) was awarded to Dr Tessel Bouwens for her thesis 'Pseudorotaxane Strategies for Guiding Self-Assembly and the Application of Molecular Machinery in Photoelectrochemical Devices'. Bouwens obtained her doctorate with the qualification 'cum laude' on 15 September 2021.

LCGC lifetime achievement award for Peter Schoenmakers - 26 October 2022



Prof. Peter Schoenmakers was awarded the 16th annual LCGC 'Lifetime Achievement in Chromatography' award. Schoenmakers was honored for his work in liquid chromatography, from his optimization of reversed-phase chromatography to his pioneering work in developing two- and three-dimensional LC methods, particularly for the analysis of polymers.

Poster prizes for Demi Snabilié - 18 November 2022



PhD candidate Demi Snabilié of the research group Homogeneous, Supramolecular and Bio-inspired Catalysis was awarded several prizes for posters representing her research on carbene and nitrene radicals, both at the Annual Symposium of the Holland Research School for Molecular Chemistry and the Summer School for Advanced Metal-Organic Chemistry and Catalysis

Unilever Research Prize 2022 for Milo Cornelissen - 28 November 2022

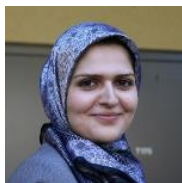


UvA alumnus Milo Cornelissen won a Unilever Research Prize 2022 for his graduate work in the field of synthetic chemistry. He received the award Thursday 24 November during an award ceremony at Unilever's Foods Innovation Centre in Wageningen.

Grants and funding

Below is an overview of news item on grants and funding obtained by HIMS scientists. More on the financial aspects of the institute can be found in the Facts & Figures section of this annual report.

Veni laureate Fatemeh Hashemi joins Functional Materials group - 13 January 2022



Dr Fatemeh Hashemi joined HIMS to develop a novel method for producing Metal Organic Frameworks for gas sensing applications. For this she obtained a Veni grant from the Dutch Research Council NWO in 2020. Hashemi is part of the Functional Materials research group headed by Dr Stefania Grecea.

Funding for green synthesis of electrocatalytic materials - 2 February 2022



Dr Stefania Grecea was awarded a KIEM GoChem grant to develop a novel and environmentally friendly synthesis method for core-shell nanoparticles to be used in electrochemical applications. She works together with Dr Anass Znabet of Inholland University of Applied Sciences and the companies Spark904 (Amsterdam) and VSParticle (Delft).

Funding for flow chemistry research in sustainability - 25 February 2022



The Flow Chemistry group led by Prof. Timothy Noël at the Van 't Hoff Institute for Molecular Sciences has recently been awarded funding in three European research projects. All three focus on using renewable resources and energy to produce molecules with relevance to fuels, pharmaceuticals and other valuable end products.

ERC Consolidator grant for Wim Noorduin - 17 March 2022



Prof. Wim Noorduin of Self-Organizing Matter received an ERC Consolidator grant from the European Research Council (ERC). Noorduin, a group leader at the AMOLF institute in Amsterdam, researches new principles for obtaining chiral molecules. Noorduin is professor by special appointment at HIMS.

ERC Consolidator Grant for Timothy Noël - 17 March 2022



chemicals.

Timothy Noël, professor of Flow Chemistry was awarded a Consolidator Grant by the European Research Council (ERC). He received 2 million euros to develop photochemical flow reactors for the catalytic conversion of small hydrocarbons using organic feedstocks and light. Noël works towards safe and fully sustainable production of functional molecules for applications such as pharmaceuticals and fine

COAST grant to further develop the concept of polymer sequencing by enzymatic hydrolysis

24 March 2022



Analytical Chemistry researcher Dr Andrea Gargano was awarded a 50,000 euro TAFU-XL grant from COAST (Community of Innovation for Comprehensive Analytical Science and Technology). Together with Pieter van Delft of the company Corbion, he further develops the novel concept of polymer sequencing by enzymatic hydrolysis.

Veni grant for analytical scientist Bob Pirok - 15 April 2022



The Dutch Research Council NWO awarded a Veni grant to Bob Pirok of the Analytical Chemistry group. With his grant, Pirok aims to drastically improve the practical performance of modern separation technology and enhance its relevance to society

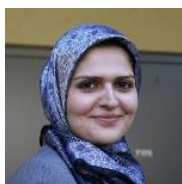
Tessel Bouwens receives NWO Rubicon grant - 22 April 2022



medicines.

Chemist Dr Tessel Bouwens was awarded a Rubicon grant by the Dutch Research Council NWO. She will use this grant to work in the lab of Prof. Erwin Reisner at the University of Cambridge (UK) as a postdoc for two years. In her research, she combines artificial photosynthesis with biocatalysts in bio-hybrid devices that employ solar energy to synthesize important chemicals, such as building blocks for

NWO XS grant for Fatemeh Hashemi - 26 April 2022



Dr Fatemeh Hashemi was awarded a 50,000 euro grant in the Open Competition XS call of the Dutch Research Council NWO (Domain Science). She uses the grant to develop the deposition of microporous thin films with tunable design at the nanometer scale, directly onto integrated circuits.

Marie Curie Postdoctoral Fellowship for Jesús San José Orduna - 26 April 2022



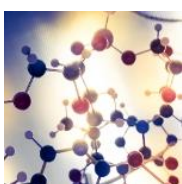
Jesús San José Orduna of the Flow Chemistry group was awarded a two-year Marie Skłodowska-Curie Postdoctoral Fellowship by the European Commission. He was funded with €187,000 to investigate novel methods of editing biologically-active molecules in flow, combining synthetic photoredox catalysis, thorough mechanistic studies and microfluidic technology

Tijmen Bakker among the first ten fellows of the 'Faculty of Impact' - 9 May 2022



Postdoc researcher Dr Tijmen Bakker was selected as a fellow of the 'Faculty of Impact' programme which supports researchers to bring their inventions to market. Bakker received funding of 200,000 euros and started a two-year programme to further develop his idea for solar cells for greenhouses, which generate electricity while still leaving light available for plant growth.

Funding for research into analysis of oligonucleotide therapeutics - 16 May 2022



A consortium of Amsterdam analytical scientists and industry has been awarded funding of 1,2 million euros for their project 'Innovative analytics for therapeutic-oligonucleotide research' (InnovATOR). It is one of eight projects awarded in the 'Key Technologies' call of the Dutch Research Council NWO in the framework of the Knowledge and Innovation Covenant (KIC), aimed at solving societal challenges.

Closing the loop for mixed cotton/polyester waste textiles - 29 June 2022



A consortium led by Prof. Gert-Jan Gruter of Industrial Sustainable Chemistry was awarded funding from the Dutch Research Council NWO to develop a new pathway towards circularity in textiles. The consortium sets out to upcycle mixed cotton/polyester textile waste into high quality molecular building blocks.

AmmoniaDrive: Towards ammonia as a viable renewable shipping fuel - 7 July 2022



The Dutch Research Council (NWO) awarded over two million euros of 'Perspectief' funding for a consortium including Prof. Bob van der Zwaan. Called 'AmmoniaDrive', the consortium sets out to develop ammonia as a viable maritime fuel for fully decarbonising global shipping, by combining Fuel Cell and Internal Combustion Engine technologies.

PLASTICE: Closing the plastics loop with novel conversion routes - 11 July 2022



A consortium involving the Catalysis Engineering group led by Associate Professor Dr. Shiju N. Raveendran was awarded funding from the European Commission for their PLASTICE project. It aims to establish circularity in plastics through the development of innovative and sustainable conversion routes for post-consumer plastic and mixed textile waste.

Eduard Bobylev receives NWO Rubicon grant - 25 July 2022



Chemist Dr Eduard Bobylev was awarded a Rubicon grant by the Dutch Research Council NWO. He will use this grant to work in the lab of Prof. Jeremiah Johnson at the Massachusetts Institute of Technology (Cambridge, US) as a postdoc for two years. The subject of his study will be to develop novel chemically active gels that convert carbon dioxide to higher-value fuels using electricity.

Grant for effective synthesis of antibody-drug conjugates - 22 August 2022



The Dutch Research Council NWO has awarded a grant to Prof. Timothy Noël and Prof. Tom Grossmann at the Vrije Universiteit Amsterdam for joint research into photocatalytic reactions for the labelling of antibodies. The grant has a volume of about 700,000 euros, enabling the appointment of two PhD candidates.

Demonstrator Grant for development of novel chemical probe - 30 August 2022



Prof. Sander Woutersen was awarded a Demonstrator Grant of 160,000 euros by the Dutch Research Council (Domain Applied and Engineering Sciences). Together with his colleague and Veni-fellow Dr Giulia Giubertoni he will further develop IR-DOSY, a chemical probe that can determine molecular structure and size simultaneously in a cost-effective, non-invasive and simple manner.

GoGreen: Developing sustainable strategies for conservation of cultural heritage - 6 October 2022



A European consortium of researchers and conservators led by Prof. Katrien Keune aims to develop and promote preventive and remedial strategies for cultural heritage. Based on green principles, the GoGreen project hopes to spearhead a green revolution within conservation. On 6 and 7 October the participants met in Amsterdam to kick-off the project that has a budget of nearly 5 million euros.

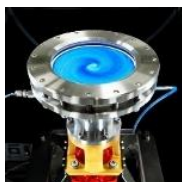
Proof-of-Concept grant for sustainable synthesis of core-shell nanoparticles - 22 November 2022



Dr Stefania Grecea and Dr Olivier Lugier of the Functional Materials group were awarded a Proof-of-Concept grant of 100,000 euros by the Innovation Exchange Amsterdam (IXA) and the University of Amsterdam. It enables them to advance a newly developed method for the synthesis of hybrid core-shell nanoparticles.

PhotoScale: Developing an innovative reactor for industrially relevant photocatalytic conversions

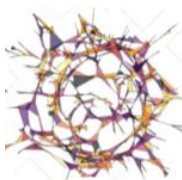
15 December 2022



The Dutch Research Council NWO awarded funding of a million euros for a cooperation between chemistry research groups at the University of Amsterdam (UvA) and Eindhoven University of Technology (TU/e), to develop an innovative reactor for photocatalytic conversions that are relevant to the pharmaceutical industry. The four-year research will be carried out in close cooperation with

industry.

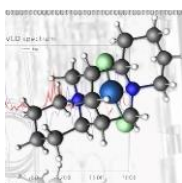
PRONTO: Modelling the properties of polymer networks in prints, coatings and paint - 20 December 2022



The Dutch Research Council NWO awarded funding of 760,000 euros for research into the mathematical modelling of thin polymer films. In the PRONTO project, computational chemists at the University of Amsterdam (UvA) and Utrecht University (UU) work together with industry to develop models and apply them to a variety of fields, such as high speed printing and the ageing of oil paints in historic

masterpieces.

Quantum technology grant for modelling molecular mirror images - 22 December 2022



Prof. Wybren Jan Buma of Molecular Photonics takes part in research using the new Dutch quantum supercomputer. Together with Prof. Luuk Visscher of Theoretical Chemistry at VU University he was granted funding through the National Growth Fund programme Quantum Technology, for the quantum simulation of molecular mirror images.

Dissertations

In 2022, a total of 23 students received their PhD at HIMS. Eduard Bobylev was granted the distinction 'cum laude'. All theses are listed below; a link is provided to download each thesis from the UvA repository.



2 December 2022

Environmental biodegradability of hydrolysable polyesters from renewable resources

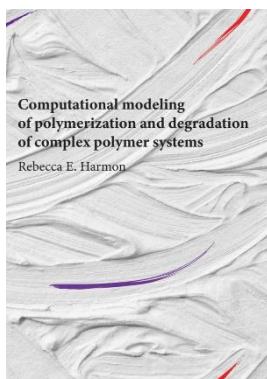
Author: Y. (Yue) Wang

Supervisor: G.J.M. Gruter

Co-supervisors: R.J. van Putten, A. Tietema

Group: Industrial Sustainable Chemistry

Link: [Read or download this thesis](#)



1 December 2022

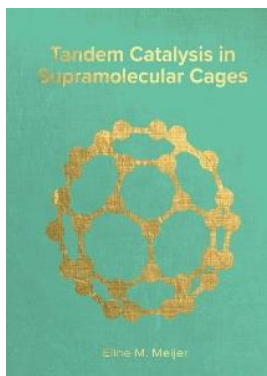
Computational modeling of polymerization and degradation of complex polymer systems

Author: R. (Rebecca) E. Harmon

Supervisors: P.D. Iedema, L.J. Broadbelt

Group: Computational Polymer Chemistry

Link: [Read or download this thesis](#)



16 November 2022

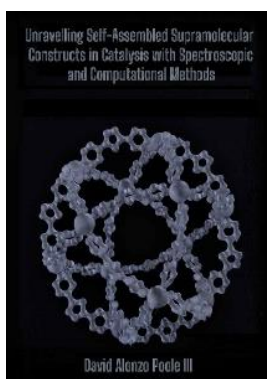
Tandem catalysis in supramolecular cages

Author: E. (Eline) M. Meijer

Supervisors: J.N.H. Reek, B. de Bruin

Group: Homogeneous, Supramolecular and Bio-Inspired Catalysis

Link: [Read or download this thesis](#)



8 November 2022

Unravelling self-assembled supramolecular constructs in catalysis with spectroscopic and computational methods

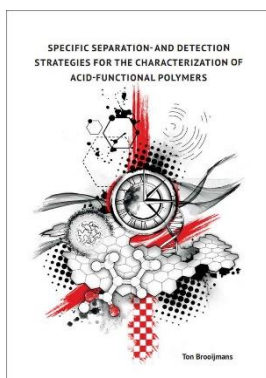
Author: D. (David) A. Poole III

Supervisors: J.N.H. Reek

Co-supervisor: S. Mathew

Group: Homogeneous, Supramolecular and Bio-Inspired Catalysis

Link: [Read or download this thesis](#)



4 November 2022

Specific separation- and detection strategies for the characterization of acid-functional polymers

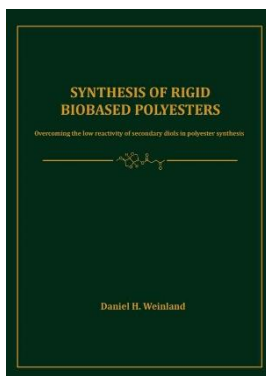
Author: T. (Ton) Brooijmans
Supervisors: R.A.H. Peters, P.J. Schoenmakers
Co-supervisor: B.W.J. Pirok
Group: Analytical Chemistry
Link: [Read or download this thesis](#)



27 October 2022

Towards greater selectivity and peak capacities in multidimensional separations of complex samples

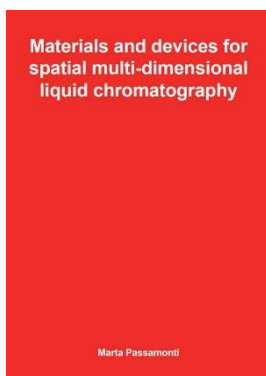
Author: L. (Liana) S. Roca
Supervisor: P.J. Schoenmakers
Co-supervisor: A. Gargano
Group: Analytical Chemistry
Link: [Read or download this thesis](#)



27 October 2022

**Synthesis of rigid biobased polyesters
Overcoming the low reactivity of secondary diols in polyester synthesis**

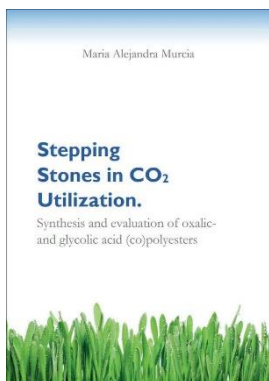
Author: D. (Daniel) H. Weinland
Supervisor: G.J.M. Gruter
Co-supervisor: R.J. van Putten
Group: Industrial Sustainable Chemistry
Link: [Read or download this thesis](#)



21 October 2022

Materials and devices for spatial multi-dimensional liquid chromatography

Author: M. (Martha) Passamonti
Supervisor: P.J. Schoenmakers
Co-supervisor: A. Gargano
Group: Analytical Chemistry
Link: [Read or download this thesis](#)



20 October 2022

**Stepping stones in CO₂ utilization
Synthesis and evaluation of oxalic- and glycolic acid (co)polyesters**

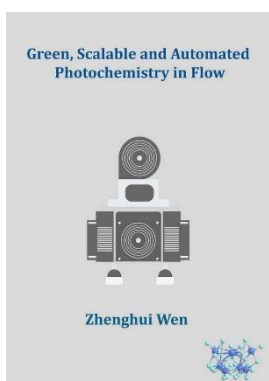
Author: M. (Maria) A. Murcia Valderrama

Supervisor: G.J.M. Gruter

Co-supervisor: R.J. van Putten

Group: Industrial Sustainable Chemistry

Link: [Read or download this thesis](#)



19 October 2022

Green, scalable and automated photochemistry in flow

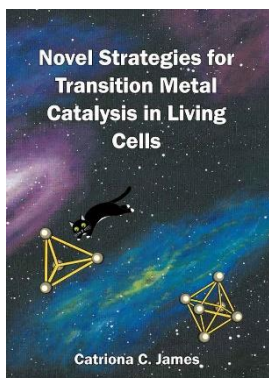
Author: Z. (Zhenghui) Wen

Supervisor: T. Noël

Co-supervisor: B. de Bruin

Group: Flow Chemistry

Link: [Read or download this thesis](#)



11 October 2022

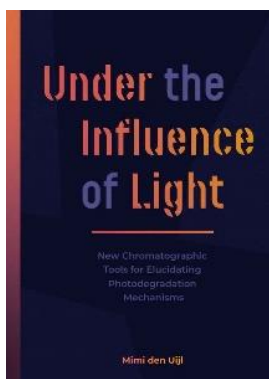
Novel strategies for transition metal catalysis in living cells

Author: C. (Catriona) C. James

Supervisors: J.N.H. Reek, B. de Bruin

Group: Homogeneous, Supramolecular and Bio-Inspired Catalysis

Link: [Read or download this thesis](#)



7 October 2022

**Under the influence of light
New chromatographic tools for elucidating photodegradation mechanisms**

Author: M. (Mimi) J. den Uijl

Supervisors: M.R. van Bommel, P.J. Schoenmakers

Co-supervisor: B.W.J. Pirok

Group: Analytical Chemistry

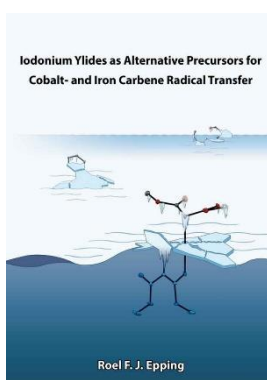
Link: [Read or download this thesis](#)



16 September 2022

Towards microfluidic devices for multi-dimensional separations

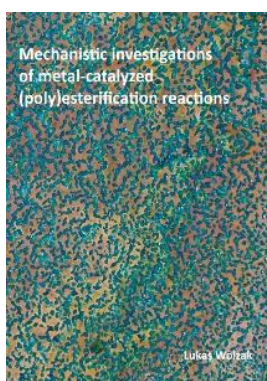
Author: N. (Noor) Abdulhussain
Supervisor: P.J. Schoenmakers
Co-supervisor: S.H. Nawada
Group: Analytical Chemistry
Link: [Read or download this thesis](#)



12 September 2022

Iodonium ylides as alternative precursors for cobalt- and iron carbene radical transfer

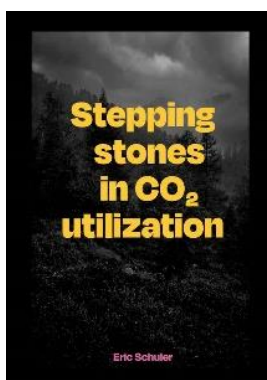
Author: R. (Roel) F.J. Epping
Supervisor: B. de Bruin
Co-supervisor: J.N.H. Reek
Group: Homogeneous, Supramolecular and Bio-Inspired Catalysis
Link: [Read or download this thesis](#)



5 July 2022

Mechanistic investigations of metal-catalyzed (poly)esterification reactions

Author: L. (Lukas) A. Wolzak
Supervisors: M. Tromp, J.N.H. Reek
Co-supervisor: T.J. Korstanje
Group: Homogeneous, Supramolecular and Bio-Inspired Catalysis
Link: [Read or download this thesis](#)

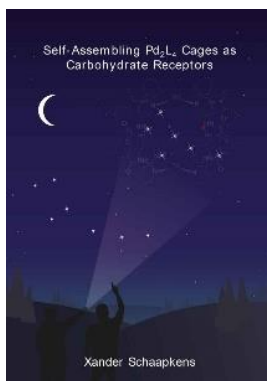


30 June 2022

Stepping stones in CO₂ utilization

Towards process development of oxalic and glycolic acid monomers

Author: E. (Eric) Schuler
Supervisor: G.J.M. Gruter
Co-supervisor: N.R. Shiju
Group: Industrial Sustainable Chemistry
Link: [Read or download this thesis](#)



12 May 2021

Self-assembling Pd₂L₄ cages as carbohydrate receptors

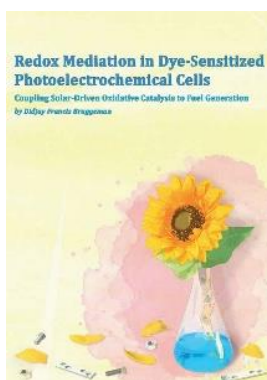
Author: X. (Xander) Schaapkens

Supervisors: J.N.H. Reek

Co-supervisor: T.J. Mooibroek

Group: Homogeneous, Supramolecular and Bio-Inspired Catalysis

Link: [Read or download this thesis](#)



20 April 2022

Redox Mediation in Dye-Sensitized Photoelectrochemical Cells Coupling Solar-Driven Oxidative Catalysis to Fuel Generation

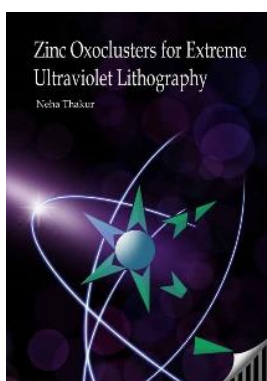
Author: D. (Didjay) F. Bruggeman

Supervisor: J.N.H. Reek

Co-supervisors: S. Mathew, R.J. Detz

Group: Homogeneous, Supramolecular and Bio-Inspired Catalysis

Link: [Read or download this thesis](#)



28 March 2022

Zinc oxoclusters for extreme ultraviolet lithography

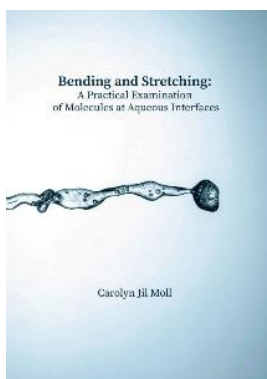
Author: N. (Neha) Thakur

Supervisor: A.M. Brouwer

Co-supervisor: S. Castellanos Ortega

Group: Molecular Photonics

Link: [Read or download this thesis](#)



24 March 2022

Bending and Stretching A Practical Examination of Molecules at Aqueous Interfaces

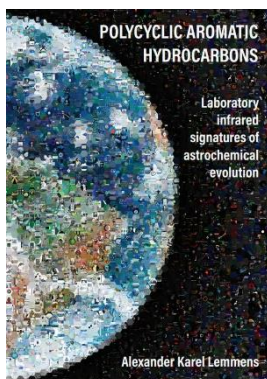
Author: C. (Carolyn) J. Moll

Supervisor: H. Bakker

Co-supervisor: K.K. Meister

Group: Molecular Photonics

Link: [Read or download this thesis](#)



10 March 2022

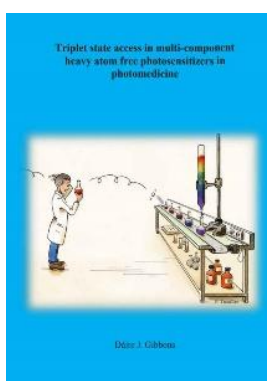
Polycyclic aromatic hydrocarbons
Laboratory infrared signatures of astrochemical evolution

Author: A. (Sander) K. Lemmens

Supervisors: W.J. Buma, A.M. Rijs

Group: Molecular Photonics

Link: [Read or download this thesis](#)



28 January 2022

Triplet state access in multi-component heavy atom free photosensitizers in photomedicine

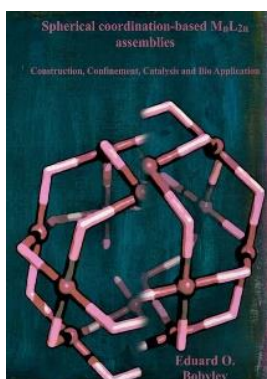
Author: D. (Dáire) J. Gibbons

Supervisors: A.M. Brouwer, S. Leroy-Lhez

Co-supervisor: R.M. Williams, N. Villandier

Group: Molecular Photonics

Link: [Read or download this thesis](#)



27 January 2022

Spherical coordination-based M_nL_{2n} assemblies
Construction, confinement, catalysis and bio application

Author: E. (Eduard) O. Bobylev

Supervisors: J.N.H. Reek, B. de Bruin

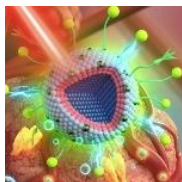
Group: Homogeneous, Supramolecular and Bio-Inspired Catalysis

Link: [Read or download this thesis](#)

Valorisation

Knowledge transfer to industry and society is in the DNA of our institute. We are always looking for partnerships with industry to identify research questions that matter, transfer our knowledge and turn innovative ideas into reality. Below is an overview of valorisation news items in 2022.

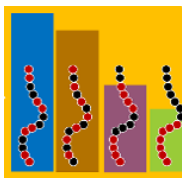
Novel nanoparticles with potential for enhanced deep tumour therapy - 9 March 2022



Researchers Dr Yansong Feng and Prof. Hong Zhang designed and synthesized novel multi-layered, multi-functional nanoparticles that enable a combination of radiotherapy and photodynamic therapy for deep cancer tissue. An initial pre-clinical evaluation of the particles has demonstrated their therapeutic potential and a patent is pending.

COAST grant to further develop the concept of polymer sequencing by enzymatic hydrolysis

24 March 2022



Analytical Chemistry researcher Dr Andrea Gargano has been awarded a 50,000 euro TAFU-XL grant from the Community of Innovation for Comprehensive Analytical Science and Technology (COAST). Together with Pieter van Delft of the company Corbion, he will further develop the novel concept of polymer sequencing by enzymatic hydrolysis.

Demonstrator Lab Science Park officially opened for first projects - 28 March 2022



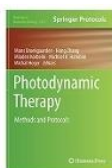
Dr Chris Sloomweg is the director of the Science Park location of the successful university incubator Demonstrator Lab Amsterdam, which was opened on Monday 28 March. Demonstrator Lab Science Park offers employees and students the opportunity to become acquainted with entrepreneurship and product development in a hands-on and innovation-oriented environment

Tijmen Bakker among the first ten fellows of the 'Faculty of Impact' - 9 May 2022



Postdoc researcher Dr Tijmen Bakker was selected as a fellow of the 'Faculty of Impact' programme which supports researchers to bring their inventions to market. Bakker received funding of 200,000 euros and started a two-year programme to further develop his idea for solar cells for greenhouses, which generate electricity while still leaving light available for plant growth.

Hong Zhang editor of new book on photodynamic therapy - 18 May 2022



Prof. Hong Zhang is one of the five editors of the new book 'Photodynamic Therapy: Methods and Protocols' published by Humana Press, an imprint of Springer. It provides a comprehensive update on the research progress of the past decade in the field of photodynamic therapy, from a new generation of photosensitive materials to targeting strategies and molecular research tools.

Chemical Analysis for Forensic Evidence, a book by Arian van Asten - 21 June 2022



Prof. Arian van Asten authored a book on Chemical Analysis for Forensic Evidence. The book provides a forensic analytical chemistry framework based on how professionals actually use chemistry to solve crimes. It introduces leading principles necessary to understanding the forensic practice and answers key questions, all with a wealth of illustrations and real-world examples.

Demonstrator Grant for development of novel chemical probe - 30 August 2022



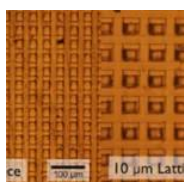
Prof. Sander Woutersen was awarded a Demonstrator Grant of 160,000 euros by the Dutch Research Council (Domain Applied and Engineering Sciences). Together with his colleague and Veni-fellow Dr Giulia Giubertoni he will further develop IR-DOSY, a chemical probe that can determine molecular structure and size simultaneously in a cost-effective, non-invasive and simple manner.

Building a strong Amsterdam Chemistry Network - 22 September 2022



The Amsterdam Chemistry Network (ACN) was expanded with Argent Energy, manufacturer of biofuels in the Port of Amsterdam. Its CEO Erik Rietkerk has taken a seat on the ACN Board of Directors where the University of Amsterdam is represented by Prof. Joost Reek of HIMS.

UvA grants license on fast 3D-printing with sub-micrometre detail - 4 October 2022



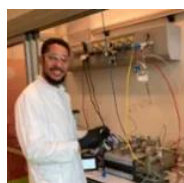
The University of Amsterdam has reached a license agreement with the Gouda-based company atum3D on a method for fast, large-scale 3D-printing with sub-micron resolution. The method, developed at HIMS, combines photo- and stereo-lithography to produce high-resolution features at scale. Potential applications include tissue scaffolds for regenerative medicine, and devices for microfluidics and chromatography.

Book contribution: New Frontiers in Astrobiology - 7 November 2022



Astrochemistry researchers Annemieke Petrigani and Alessandra Candian contributed to the first edition of 'New Frontiers in Astrobiology'. They present a comprehensive overview of the elemental ingredients for life; the interstellar molecules that are out there in the universe; and the prebiotic ingredients that are considered crucial for the emergence of the first rudimentary form of life.

Proof-of-Concept grant for sustainable synthesis of core-shell nanoparticles - 22 November 2022



Dr Stefania Grecea and Dr Olivier Lugier of the Functional Materials group were awarded a Proof-of-Concept grant of 100,000 euros by the Innovation Exchange Amsterdam (IXA) and the University of Amsterdam. It enables them to advance a newly developed method for the synthesis of hybrid core-shell nanoparticles and bring these promising nanomaterials from lab to market.

Outreach

Lectures and other contributions in 2022

For the general public

- Workshop 'De wonder wereld van de astrochemie', Woudschoten Chemie (Annemieke Petrignani)
- Operatie Nachtwacht: Onderzoek en behandeling van Rembrandt's meesterwerk, Science Café (Katrien Keune)
- Overview of the Operation Night Watch Symposium, NICAS colloquium (Katrien Keune)
- Taming electrons and covalently made mechanically interlocked molecules, professional lecture (Jan van Maarseveen)

For high school students and teachers

- Speeddaten, Gemeentelijk Gymnasium Hilversum (Annemieke Petrignani)
- Onderzoek geeft Nachtwacht meer Kleur, Docentendag Scheikunde (Katrien Keune)

HIMS researchers appearing in the media in 2022

Sisters in Science present explanatory videos about chemistry

- ▶ Sisters in Science maken 14 nieuwe uitlegfilmpjes over scheikunde [Laboratorium.nl, 15 December](#)

Research at the Industrial Sustainable Chemistry group is featured in Agro&Chemie

- ▶ Op weg naar sterke en duurzame biobased kunststoffen [Agro&Chemie, 13 December](#)

Peter Schoenmakers is interviewed by C2W on the occasion of this retirement

- ▶ 'Ik vraag me wel eens af hoeveel poten een schaap moet hebben'. [C2W, 5 December](#)
- ▶ 'I sometimes wonder how many legs a sheep should have' [C2W International, 9 December](#)

Gadi Rothenberg comments in NRC on research into generating hydrogen from sea water

- ▶ Waterstof uit zeewater – een elektrische cel kan het en overleeft het zout. [NRC, 1 December](#).

UvA-scheikundigen bouwen een nieuw meetapparaatje voor moleculen

- ▶ Interview with Giulia Giubertoni and Sander Woutersen. [Folia, 28 November](#)



Folia also published a video. Here an image is shown taken from that video.

Timothy Noël on applying photocatalysis in practice

- ▶ Phys Org [18 October](#)

Nobel Prize 2022 for click chemistry

Timothy Noël's prediction in Folia was spot-on. Jan van Maarseveen provided enthusiastic comments in NRC.

- ▶ Nobelprijs voor Scheikunde voor chemische lego of toch voor vaccins? [5 October, Folia](#)
- ▶ Klik – en vast zitten de moleculen [5 October, NRC](#)

Tom Keijer in BNR podcast

What if we could make solar cells that not only capture and convert solar energy, but which - just like plant cells - are also capable of photosynthesis? Tom Keijer talks about it in a BNR podcast.

- ▶ Met kunstmatige fotosynthese zonne-energie omzetten naar brandstof [22 September BNR](#)

Mimi den Uijl interviewed by NRC

Mimi den Uijl, soon to receive her doctorate and one of the Dutch 'Sisters in Science', was interviewed by NRC.

- ▶ Niet elke scheikundige heeft een Einsteinkapsel, wil Mimi den Uijl maar zeggen [15 September NRC](#)



Mimi as portrayed in the NRC article.

Maurice Aalders on forensic research.

Biologists at the Netherlands Forensic Institute examine traces of life forms other than humans. In this tv program Maurice Aalders talks about the work of Co van Ledden Hulsebosch. The feature starts at 14:11 and ends at 17:57.

- ▶ Groene getuigen. [5 September NRT: De Kennis van Nu Special](#)

Ruben Kranenburg on drug identification using a portable NIR sensor

Ruben Kranenburg, laboratory coordinator at the Dutch Police and PhD candidate with Arian van Asten, is interviewed by C2W on crime-site identification of drugs using a portable NIR sensor.

- ▶ Op boevenjacht met een drugssensor [19 August, C2W](#)

Timothy Noël on how to break down PFAS

Timothy Noël was asked by NRC to comment on research into breaking down PFAS molecules

- ▶ Onverwoestbare PFAS zijn toch betrekkelijk eenvoudig af te breken [19 August, NRC](#)

Sander Woutersen on Tubifex worms as a model system for active matter

C2W features Sander Woutersen and his research with Tess Heeremans, Antoine Deblais and Daniel Bonn into *Tubifex* worms as a model system for active matter

- ▶ Chromatografie met aangeschoten slingerwormen [29 June C2W Mens & Molecule](#)

Peter Schoenmakers named Knight of the Order of the Netherlands Lion

- ▶ Professor Peter Schoenmakers benoemd tot Ridder in de Orde van de Nederlandse Leeuw [29 June Nieuwsblad Dijk en Waard](#)

Jan van Maarseveen on structure and function of proteins

Jan van Maarseveen explains in an article in Trouw how the function of proteins strongly depends on their complex spatial structure

- ▶ Iedereen kent zijn eigen spiegelbeeld, maar schijn bedriegt: dit bent u niet. [11 June Trouw](#)

Hannah Flerlage and Chris Slootweg in VNCI's Chemie Magazine

On safe and sustainable design of chemicals.

- ▶ Hoe pas je safe and sustainable by design toe? [May 2022 Chemie Magazine](#)

Maarten van Bommel, Mimi den Uijl and Iris Groeneveld in TV program Atlas

In the Atlas program appears an item about the TooCOLD research that focuses on the discoloration of paintings by van Gogh.

► Hoe zagen schilderijen van Van Gogh er vroeger uit? [25 May 2022 NTR Atlas](#)

Prior to her inaugural speech Katrien Keune talks to Villa VdB about her research

Radio interview with Katrien Keune

► [11 May 2022 Villa VdB Radio NPO1 \(starts at 1:09:14\)](#)

Katrien Keune on paintings as small chemical plants

Katrien Keune is interviewed by NRC on the chemistry of paintings

► Een schilderij als De Nachtwacht is een klein chemisch fabriekje [9 May 2022 NRC](#)



Katrien Keune as portrayed for the NRC article.

Arian van Asten on trace analysis

With the help of chemical analyses, forensic researchers are able to extract more and more information from the smallest traces.

► Chemie spoort de dader op [3 March NEMO Kennislink](#)

How Sisters in Science want to break the science stereotype

Interview with Noor Abdulhussain, Mimi den Uijl en Lotte Schreuders

► Ben jij niet te knap voor een scheikundige? [11 February 2022 Brandpunt plus](#)

Chris Sloopweg on his work on hydrogen carriers

► In een lab op de UvA werken drie chemici aan een waterstofrevolutie in de scheepvaart [17 January 2022 Folia](#)

Gadi Rothenberg comments on the degradation of face masks

Invited by the AVROTROS radio show 'EenVandaag'

► Feit of fictie: Het duurt 450 jaar tot mondkapjes in de natuur zijn afgebroken [12 January 2022 EenVandaag](#)

Sisters in Science on national television

Mimi den Uijl, Noor Abdulhussain and Lotte Schreuders talk about their initiative SistersinScience.nl in NPO tv program Tijd voor MAX

► [10 January 2022 Tijd voor Max](#)