Radboud University | VU Vrije Universiteit Amsterdam | Universiteit Leiden | Universiteit van Amsterdam

HOLLAND RESEARCH SCHOOL OF MOLECULAR CHEMISTRY

ANNUAL REPORT 2018



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1. General

This annual report presents an overview of the research and educational activities of the graduate research school 'Holland Research School of Molecular Chemistry' (HRSMC) during 2018. The University of Amsterdam legally represents the HRSMC. The research school was founded in 1994 and has been re-accredited by the Royal Netherlands Academy of Arts and Sciences (KNAW) in 1999, 2005 and 2012. The HRSMC is now in its fourth period 2012-2018. The HRSMC is a collaboration between top research groups of four Dutch Universities: the University of Amsterdam (UvA), the VU University Amsterdam (VU), Leiden University (UL) and the Radboud University (RU). The HRSMC harbours a powerhouse of expertise in Synthetic, Physical, and Theoretical Chemistry as well as Spectroscopy and Molecular Physics. This multidisciplinary character makes the School unique in the Netherlands and abroad; it allows it to operate in a broad field that addresses fundamental scientific problems but also challenges society currently faces in areas like sustainability, energy, and health.

This report presents a survey of the activities and achievements of the HRSMC, both educational and scientific, as well as the scientific achievements of the participating research groups. As an interuniversity research school, the HRSMC has two main targets:

(A) to promote and facilitate research aimed at the three HRSMC research themes: (1) 'Synthesis, Characterisation, Properties and Reactivity of Molecules', (2) 'Physical Chemistry and Spectroscopy' and (3) 'Theoretical Chemistry'. The HRSMC board strives for coherence in the research activities of its members by promoting collaboration between the research groups and safeguarding complementarities with respect to infrastructure and expertise.
(B) to facilitate and provide a coherent, high-level educational programme to its PhD students, which offers a seamless connection to the Master degree programme. The primary aim is to teach PhD researchers to answer key questions in molecular science and to use their insights in a multidisciplinary approach.

The extensive educational programme (Schools, Courses, Symposia and other activities like career advice events) offered by the HRSMC means that for all practical purposes the school takes care of the educational program of its PhD students and safeguards their progress. Importantly, the educational activities of the HRSMC are also accessible for (advanced) MSc students and thereby seamlessly connect to the undergraduate programs of the participating universities.

Besides organizing several educational activities, the HRSMC organized two application rounds within the Fellowship Programme, which has been established in 2015.

Prof. dr. Wybren Jan Buma
Scientific Director of the HRSMC

2. The research program

The research program of the HRSMC is embedded in top research groups of the VU University Amsterdam (VU), the University of Amsterdam (UvA), Leiden University (UL) and the Radboud University (RU). It is organized around three different research themes in molecular chemistry which complement and mutually reinforce each other.

Theme 1: Synthesis, Characterisation, Reactivity and Properties of Molecules



This theme deals, among others, with the design, synthesis and characterization of new compounds, the development of new (bio)catalytic reactions, and the investigation of their mechanisms.

Theme 2: Physical Chemistry and Spectroscopy



Theme 2 addresses the issue of experimentally uncovering the fundamental factors behind molecular properties through the interaction between light and molecular matter. Advanced spectroscopic techniques are employed to probe and utilize fundamental processes such as catalytic events, reaction mechanisms and dynamics, and energy and electron transfer.

Theme 3: Theoretical Chemistry



Research within this theme is fully dedicated to understanding the structure of molecules and their chemistry from first principles. HRSMC's theoretical chemistry groups cover method and software development, computational chemistry, and the development of models and guiding principles for rational design of catalysts and sustainable processes. They are working on a broad range of time and length scales (atomic, molecular, supra-molecular, condensed-phase/membrane processes), naturally leading to a multi-scale approach of fundamental and applied theoretical chemistry.

3. Overview of the Research Groups in 2018

Theme 1: Synthesis, Characterisation, Reactivity and Properties of Molecules	
Group/staff members	**University/Group**
Biocatalysis Dr. F. Mutti	UvA/HIMS
Biomimetic Synthesis for Molecular Complexity Prof. dr. T.N. Grossmann	VU/EMS
Heterogeneous Catalysis and Sustainable Chemistry Prof. dr. G. Rothenberg, Dr. S. Grecea, Dr. N.R. Shiju, Dr. N. Yan	UvA/HIMS
Homogeneous, Supramolecular and Bio-Inspired Catalysis Prof. dr. B. de Bruin, Prof. dr. J.N.H. Reek, Dr. M. Tromp, Dr. T.J. Mooibroek, Dr. Ir. J.I. van der Vlugt	UvA/HIMS
Metals in Catalysis, Biomimetics & Inorganic Materials Prof. dr. E. Bouwman, Dr. S. Bonnet, Dr. D. Hetterscheid	UL/LIC
Molecular Inorganic Chemistry Prof. dr. C.J. Elsevier	UvA/HIMS
Organic and Organometallic Chemistry Prof. dr. K. Lammertsma, Dr. A.W. Ehlers, Dr. J.C. Slootweg	VU/EMS
Synthetic and Bio-organic Chemistry Prof. dr. ir. R.V.A. Orru, Dr. E. Ruijter	VU/EMS
Synthetic Organic Chemistry Prof. dr. H. Hiemstra, Prof. dr. J.H. van Maarseveen, Prof. dr. P. Timmerman, Dr. M.Á. Fernández-Ibáñez, Dr. S. Ingemann	UvA/HIMS
Synthetic Organic Chemistry Prof. dr. F.P.J.T. Rutjes, Dr. T.J. Boltje, Dr. J. Mecinovic	RU/SOC

Theme 2: Physical Chemistry and Spectroscopy	
Group/staff members	**University/Group**
Biomolecular Spectroscopy Dr. F. Ariese	VU/LaserLaB
Biophysical Organic Chemistry Prof. dr. H.J.M. de Groot, Dr. Alia, Dr. F. Buda, Dr. G.J.A. Sevink	UL/LIC
Laboratory Astrophysics and Astrochemistry Prof. dr. H. Linnartz	UL/LION
Molecular Nano-Optics and Spins Prof. dr. E.J.J. Groenen, Prof. dr. M. Orrit, Dr. P. Gast, Dr. M. I. Huber	UL/LION
Molecular Photonics Prof. dr. A.M. Brouwer, Prof. dr. W.J. Buma, Prof. dr. S. Woutersen, Dr. ir. A. Petrignani-Taube, Dr. R. M. Williams, Dr. H. Zhang Guest Appointment: Dr. S. Castellanos Ortega (ARCNL)	UvA/HIMS
Molecular Structure and Dynamics - FELIX / Molecular and Biophysics Prof. dr. J. Oomens, Dr. J.M. Bakker, Dr. A.M. Rijs	RU/IMM
Surface Chemistry and Catalysis Prof. dr. M. Koper1, Dr. W.T. Fu, Dr. I.M.N. Groot, Dr. D. Hetterscheid, Dr. L.B.F. Juurlink	UL/LIC
Synthetic Organic Chemistry Prof. dr. F.P.J.T. Rutjes, Dr. T.J. Boltje, Dr. J. Mecinovic	VU/LaserLaB

Theme 3: Theoretical Chemistry	
Group/staff members	**University/Group**
Computational Chemistry Prof. dr. P.G. Bolhuis, Prof. dr. E.J. Meijer, Dr. B. Ensing, Dr. D. Dubbeldam, Dr. J. Vreede	(UvA/HIMS)
Theoretical Chemistry Prof. dr. F.M. Bickelhaupt, Prof. dr. L. Visscher, Prof. dr. C. Fonseca Guerra, Dr. P. Gori Giorgi, Dr. O. Gritsenko	(VU/EMS)
Theoretical Chemistry Dr. J. Meyer	(UL/LIC)
Theoretical Chemistry Prof. dr. ir. G.C. Groenenboom, Dr. H.M. Cuppen	(RU/IMM)

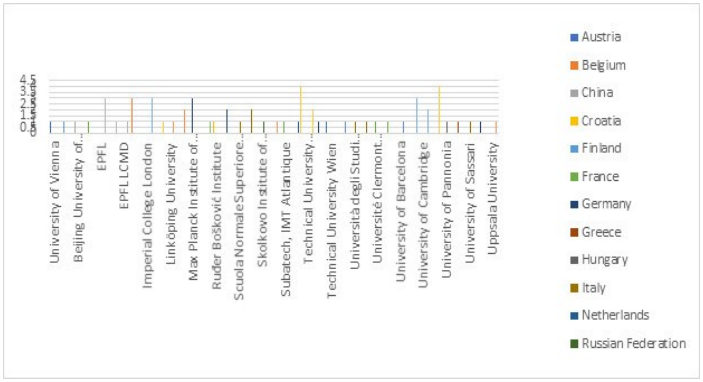
4. Research and Education

Molsim 2018 (January 8-19, 2018)

82 students from China and Europe
21 Master students from University of Amsterdam/VU

Lectures by Prof. Daan Frenkel, Prof. Berend Smit, Prof. Dr. Thijs Vlugt, Dr. Sanne Abeln, Dr. Gregory Voth

From UvA:
Prof. Peter Bolhuis, Prof. Evert Jan Meijer, Dr. Bernd Ensing, Dr. David Dubbeldam

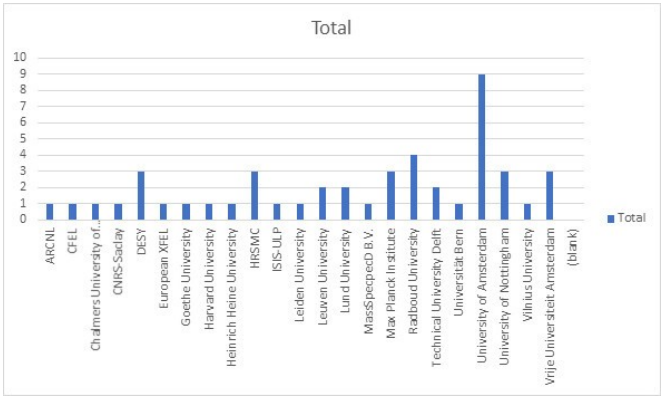


Guest Lecturer: Rodolphe Vuilleumier(ENS-France)

TULIP 2018 (April 3-6, 2018)

30 Participants
11 HRSMC PhD Students,
19 students from The Netherlands, Germany, Belgium and France.

Speakers:
Prof. Christian Bressler European XFEL, Germany
Prof. Adam Cohen, Harvard University, Cambridge U.S.A.
Prof. Thomas Ebbesen, USIAS, University of Strasbourg and College de France, Paris, France
Prof. Samuel Leutwyler, Universität Bern, Switzerland
Prof. Bas van de Meerakker, Radboud University, The Netherlands



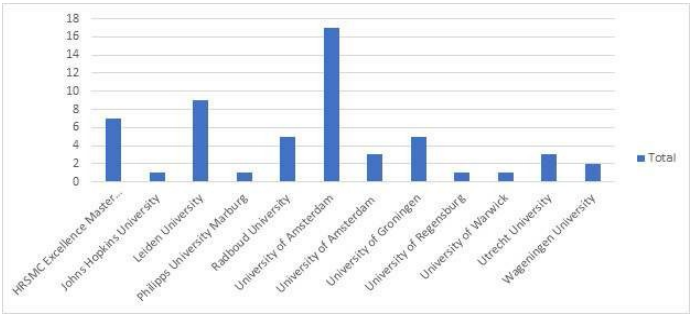
Meissa Diouf (VU) won the prize for the best Poster, awarded by PCCP, and Juan Diego Arias Espinoza (UvA) was awarded the prize for the most active participant.

AMOCC 2018 (September 26 - October 1, 2018)

In total 43 participants coming from US, Germany and The Netherlands

Introduction course: 17 Participants

Speakers:
Prof. Jana Roithová – Organometallic chemistry, Radboud University, Nijmegen
Prof. Robert Deeth – Computational chemistry, University of Warwick, UK
Prof. Burkhard König – Homogeneous catalysis, University of Regensburg, Germany
Prof. Eric Meggers – Coordination chemistry- University of Marburg, Germany
Prof. Ken Karlin – Bioinorganic chemistry, Johns Hopkins University, Baltimore, USA



7 HRSMC Excellence Master Students joined in the course, 6 of which took the introduction course

Symposium, at Leiden University, November 15, 2018
194 Participants

Invited Lecture
Professor Ewine van Dishoeck,
Leiden Observatory, Leiden University

Staff lectures:
Theme 1: Dr. Stefanica Tanase Grecea (UvA)
Theme 2: Dr. Elizabeth.L. von Hauff (VU)
Theme 3: Prof. dr. ir. Gerrit C. Groenenboom (RU)
Lecture by the Dick Stufkensprijs 2018 Winner Stefan Vuckovic

Other Activities:

31 January 2018
HRSMC/KNCV Career Event
for HBO/MSc/PhD/Postdoc, starters and professionals on the job market
65 people, former PhD students but also interested participants via KNCV attended.

Targeted Synthesis Challenges (2017-2018)
Coordinators: Prof.dr. J. van Maarseveen/ Dr. E. Ruijter**:**
Started on May 18 2017 at VU, continued February 20, June 14, 2018 at UvA
17 participants (1 Postdoc, 6 PhD students, 5 Master Students, 4 Bachelor Students, 1 Research Technician attended)

5. The Dick Stufkens Prize 2018

The prize for the best PhD thesis of the Holland Research School of Molecular Chemistry (HRSMC) has been awarded to Dr Stefan Vuckovic. In his thesis, Vuckovic presents a new and innovative approach to the quantum mechanical calculation of atomic and molecular energies. It lays the foundation for a more accurate modelling of drugs, catalysts, solar cells and batteries.



Stefan Vuckovic conducted his research at the Theoretical Chemistry group of the Vrije Universiteit Amsterdam. His dissertation is entitled 'Fully non-local exchange-correlation functionals from the strong-coupling limit of density functional theory'. The defense took place on November 14, 2017, with Prof. Paola Gori Giorgi as promoter and Dr Michael W.J. Seidl as co-Supervisor. Vuckovic will shortly be working in California with an NWO-Rubicon grant, with the well-known DFT theoretician Prof. Kieron Burke.

The calculation of molecular properties with the help of quantum mechanics (the Schrödinger equation) has become an integral part of chemical research. In principle "everything" can be calculated: geometries, excitation energies, NMR, ESR, IR, transition barriers in reactions, etc. etc.. But the accuracy still needs to be improved. A system of many electrons which repel each other and are attracted by the nuclei (an *N*-particle system with *N* possibly quite large) is extraordinarily complicated. The correct incorporation of the instantaneous interaction of the electrons is denoted the electron correlation problem. Exact solutions are not available.
Among the approximate methods the so-called density functional theory (DFT) based ones are currently most popular. This theory simplifies the *N*-particle problem to a number of 1-particle problems. DFT can boast many successes for large systems, ranging from medical drugs to solar cells, catalysts and materials research (e.g. for batteries). Now, Stefan Vuckovic has devised a new approach to achieve a next level of accuracy of DFT calculations. The jury of the Dick Stufkens Prize is impressed by the high level of Vuckovic's thesis and in particular by its innovative character.

New starting point yields new insight

Stefan Vuckovic focuses on the crucial electron correlation energy. In general, DFT calculations contain rather bold approximations of this correlation energy. Vuckovic now takes a new point of departure, i.e. the case of strong correlation. Here, the electron repulsion is taken so large that it dominates all other properties (also the kinetic energy). A necessary constraint is that the electron density is fixed. As it turns out, these extreme conditions lead to completely new and surprising insights, according to the jury: "When this work fulfils on its promise, the application of DFT in (computational) chemistry will make a big step forward, in particular regarding the accuracy of the results."

Elegant and promising approach

In his thesis, Vuckovic presents a thorough mathematical-physical analysis of the "strongly correlated electrons" (SCE) model. The jury was particularly pleased that this analysis leads him to one of the most interesting proposals of recent years for improving DFT methods. He employs the simple concept of an "exchange-correlation hole" that an electron creates around itself by pushing aside the other electrons. A proposal is made for

a completely nonempirical calculation of this exchange-correlation hole. The first results with a simple approximation are promising. Much work will still be needed in order to make the method efficient and competitive, but the solid basis in the physics of electron correlation is a great advantage of this method over the many heavily parametrised and often not very transparent DFT functionals that have come to dominate applications of DFT in chemistry.

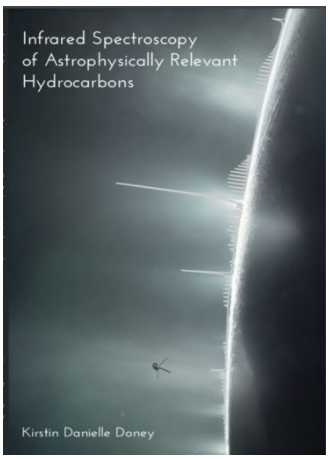
6. HRSMC Class of Excellence

In September 2018 five (5) students started the HRSMC Class of Excellence Programme. Two students obtained their certificate this year after successfully graduating from the programme. Tom Keijer started a PhD Position at the University of Amsterdam in the **Homogeneous, Supramolecular and Bio-Inspired Catalysis** with Prof. dr. Joost Reek and Laura Opdam at Leiden University in the **Biophysical Organic Chemistry** group of Prof. dr. Huub de Groot and Dr. Francesco Buda.

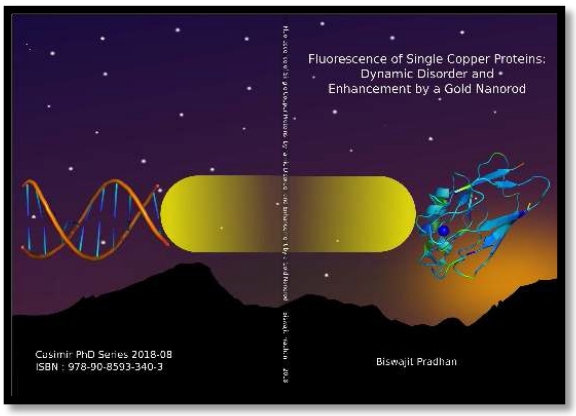
7. PhD Theses

Listed here are PhD theses with HRSMC group leaders as supervisor and/or co-supervisor. In 2018 16 HRSMC certificates have been awarded.

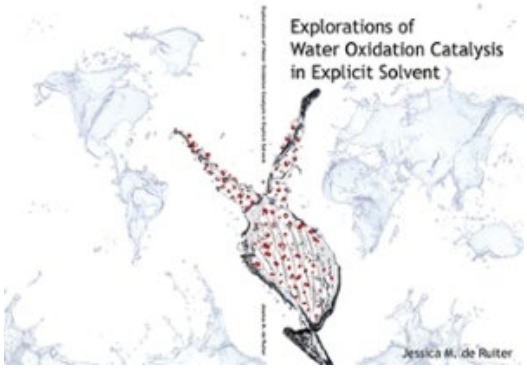
Leiden University



June 20, 2018
Infrared spectroscopy of astrophysically relevant hydrocarbons
Author: K. (Kirstin) D. Doney
Supervisor: H.J. Linnartz, H.V.J.
Co-supervisor: D. Zhao
Link: Read or download this thesis
Astrochemistry

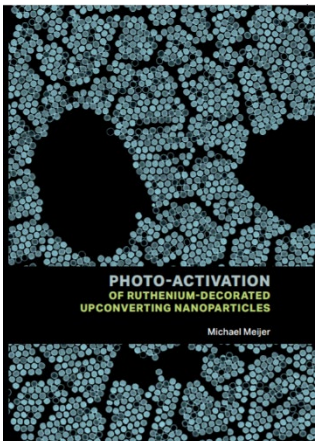


March 3, 2018
Fluorescence of single copper proteins: dynamic disorder and enhancement by a gold nanorod
Author: B. (Biswajit) Pradhan
Supervisors: M.A.G.J. Orrit; G.W. Canters
Group: Molecular Nano-Optics and Spins
Link: Read or download this thesis

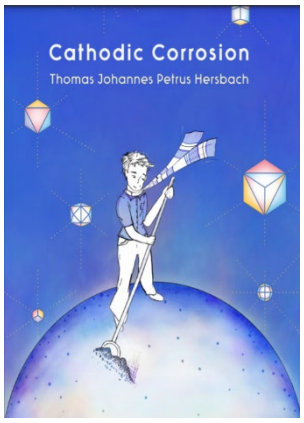


October 30, 2018
Explorations of Water Oxidation Catalysis in Explicit Solvent
Author: J. (Jessica) M. de Ruiter
Supervisor: H.J. de Groot;
Co-Supervisor: F. Buda
Group: Biophysical Organic Chemistry
Link: Read or download this thesis

December 17, 2018
Photo-activation of ruthenium-decorated upconverting nanoparticles
Author: M. (Michael) S. Meijer
Supervisors: S.Bonnet; E. Bouwman
Group: Metals in Catalysis, Biomimetics & Inorganic Materials
Link: Read or download this thesis

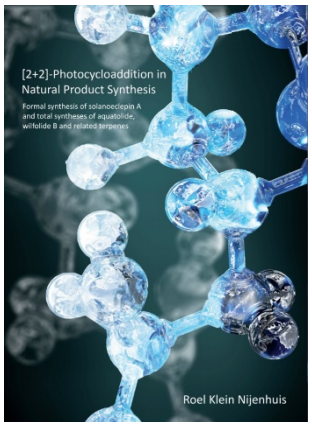


December 19, 2018
Cathodic Corrosion
Author: T. (Thomas) J.P. Hersbach
Supervisor: M.T.M.Koper
Co-supervisor: A.C. Garcia; F. Calle-Valejo
Group: Surface Chemistry and Catalysis
Link: Read or download this thesis

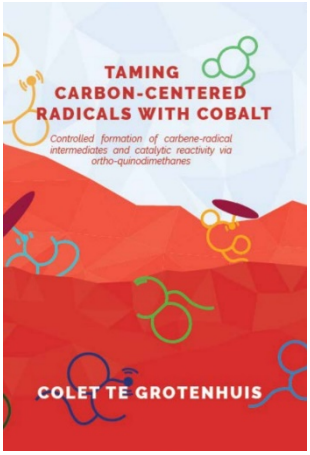


University of Amsterdam

17 May 2018
[2+2]-Photocycloaddition in natural product synthesis
Author: R. (Roel) A. Klein Nijenhuis
Supervisors: J.H. van Maarseveen, H. Hiemstra
Group: Synthetic Organic Chemistry
Link: Read or download this thesis



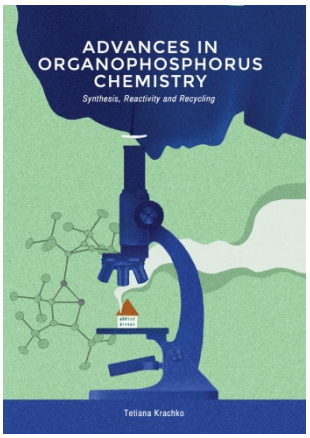
01 June 2018
Taming carbon-centered radicals with cobalt
Author: C. (Colet) te Grotenhuis
Supervisor: B. de Bruin
Co-Supervisor: J.N.H. Reek
Group: Homogeneous, Supramolecular and Bio-Inspired Catalysis
Link: Read or download this thesis



19 June 2018

Advances in organophosphorus chemistry: Synthesis, reactivity and recycling

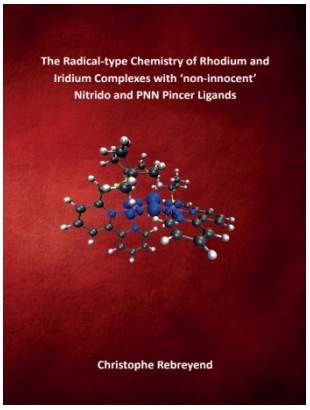
Author: R. (Tetiana) Krachko
Supervisors: J.C. Slootweg, A.W. Ehlers
Group: Synthetic Organic Chemistry
Link: Read or download this thesis



22 June 2018

The radical-type chemistry of rhodium and iridium complexes with 'non-innocent' nitrido and PNN pincer ligands

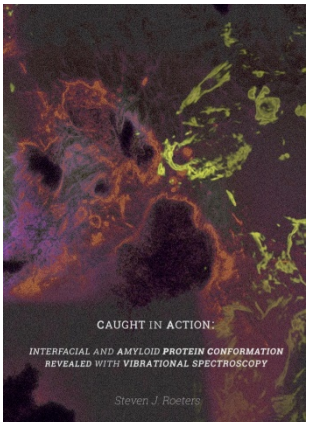
Author: C. (Christophe) Rebreyend
Supervisor: B. de Bruin
Co-Supervisor: J.L. Van der Vlugt
Group: Homogeneous, Supramolecular and Bio-Inspired Catalysis
Link: Read or download this thesis



5 September 2018

Caught in action: interfacial and amyloid protein conformation revealed with vibrational spectroscopy

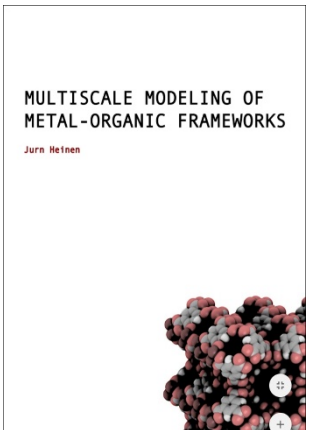
Author: S. (Steven) J. Roeters
Supervisor: S. Woutersen
Co-Supervisors: V. Subramaniam
Group: Molecular Photonics
Link: Read or download this thesis



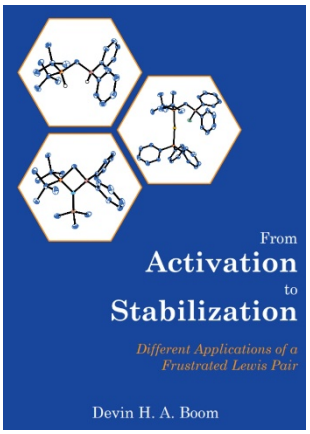
16 October 2018

Multiscale modeling of metal-organic frameworks

Author: J. (Jurn) Heinen
Supervisor: E.J. Meijer
Co-Supervisor: D. Dubbeldam
Group: Computational Chemistry
Link: Read or download this thesis



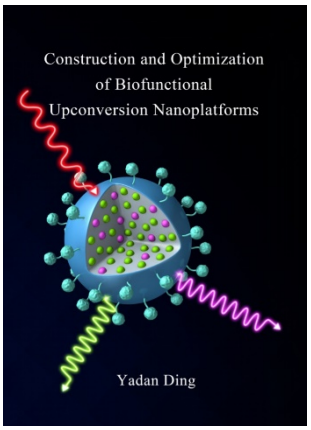
7 December 2018
From activation to stabilization - Different applications of a frustrated Lewis pair
Author: D. (Devin) H.A. Boom
Supervisors: J.C. Slootweg, A.W. Ehlers
Group: Synthetic Organic Chemistry
Link: Read or download this thesis



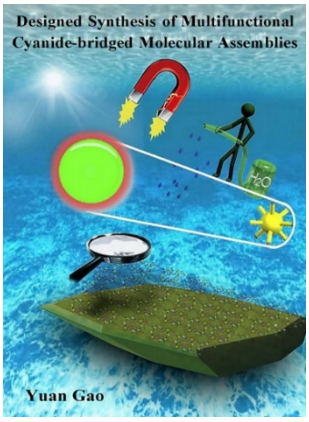
30 November 2018
Multicyclic peptides manufactured via scaffold-assisted CLIPS/CuAAC technology
Author: G. (Gaston) J.J. Richelle **(Cum Laude)**
Supervisors: P. Timmerman, J.H. van Maarseveen
Group: Synthetic Organic Chemistry
Link: Read or download this thesis



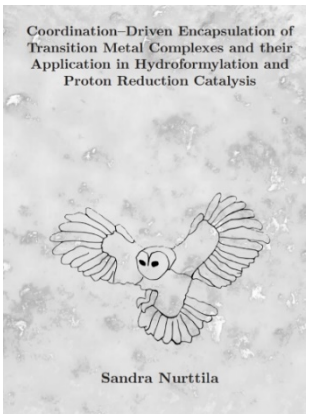
6 December 2018
Construction and Optimization of Biofunctional Upconversion Nanoplatforms
Author: Y. (Yadan) Ding
Supervisor: W.J. Buma, H. Zhang
Group: Molecular Photonics
Link: Read or download this thesis



14 December 2018
Designed synthesis of multifunctional cyanide-bridged molecular assemblies
Author: Y. (Yuan) Gao
Supervisor: G. Rothenberg, S. Grecea
Group: Heterogeneous Catalysis and Sustainable Chemistry
Link: Read or download this thesis

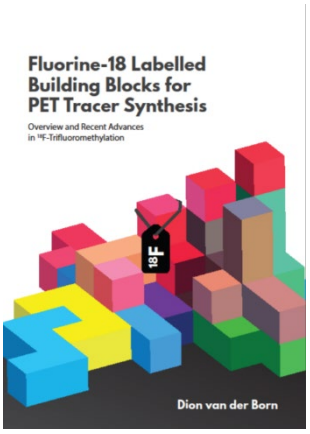


19 December 2018
Coordination-driven ensapsulation of transition metal complexes in molecular capsules and their Application in Hydroformylatioin and Proton Reduction Catalysis
Author: S. (Sandra) S. Nurttila
Supervisor: J.N.H. Reek
Co-Supervisor: T.J. Mooibroek
Group: Homogeneous, Supramolecular and Bio-Inspired Catalysis
Link: Read or download this thesis

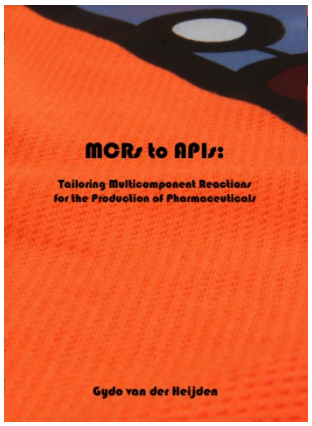


Vrije Universiteit Amsterdam

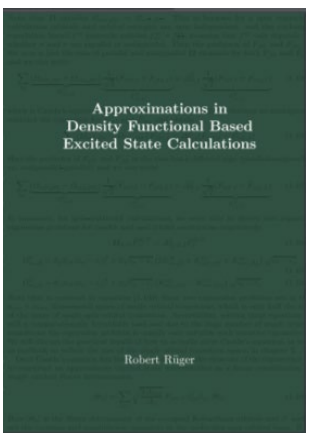
January 11, 2018
Fluorine-18 Labelled Building Blocks for PET Tracer Synthesis: Overview and Recent Advances in 18F-Trifluoromethylation
Author: D. (Dion) van der Born
Supervisor: R.V.A. Orru
Group: Synthetic and Bio-organic Chemistry
Link: Read or download this thesis



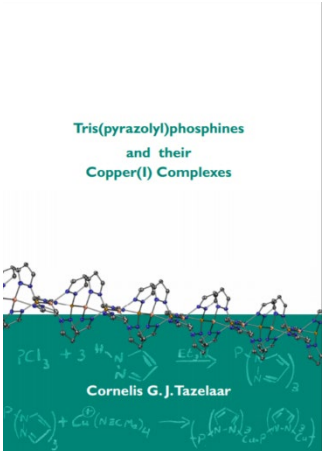
January 18, 2018
MCRs to APIs: Tailoring Multicomponent Reactions for the Production of Pharmaceuticals
Author: G. (Gydo) van der Heijden
Supervisor: R.V.A. Orru
Co-supervisor: E. Ruijter
Group: Synthetic and Bio-organic Chemistry
Link: Read or download this thesis



February 14, 2018
Approximations in Density Functional Based Excited State Calculations
Author: R. (Robert) Rüger
Supervisors: L. Visscher
Group: Theoretical Chemistry
Link: Read or download this thesis



March 23, 2018
Tris(pyrazolyl)phosphies and their Copper(I) Complexes
Author: C. (Cornelis) G.J. Tazelaar
Supervisors: K. Lammertsma
Co-supervisors: C. Slootweg; A.W. Ehlers
Group: **Organic and Organometallic Chemistry**
Link: Read or download this thesis



March 29, 2018
Design and Synthesis of Photoactive Molecules
Author: J. (Jeroen) A. Rombouts
Supervisors:R.V.A. Orru; K. Lammertsma
Co-supervisors: A.W. Ehlters, E. Ruijter
Group: Synthetic and Bio-organic Chemistry
Link: Read or download this thesis



8. Awarded HRSMC Fellowships

7th call April 2018

Prof. Mircea Dincă
Massachusetts Institute of Technology, Department of Chemistry
Title of the project: **Bridging the gap between homogeneous and heterogeneous catalysis**
Hosted by: Dr. Stefanea Grecea and Dr.ir. Jarl Ivar van der Vlugt (UvA)
A visit of one month



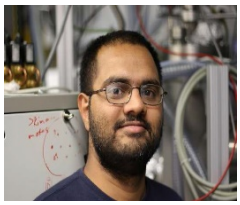
Dr. Zahra Jamshidi
Chemistry and Chemical Engineering Research Center of Iran
Title of the project: **Study of highly magnetic metal cluster with new theoretical method**
Hosted by: Prof. dr. Lucas Visscher (VU, 1st applicant) and Dr. Joost Bakker (Radboud University)
2 visits of in total 3 months



Prof. Xiandong Liu
Nanjing University, Nanjing, China
Title of the project: **Chemical origin of lattice match effect in heterogeneous nucleation**
Hosted by: Evert Jan Meijer and Gadi Rothenberg (UvA)
A visit of 3 months



Dr. Bhargava Ram
Indian Inst. of Science Education and Research, Bhopal, India
Title of the project: **Molecular chirality revealed by femtosecond multiphoton ionization**
Hosted by : Prof. Dr. Wybren Jan Buma (UvA) and Prof. Dr. Luuk Visscher (VU).
A visit of 3 weeks.



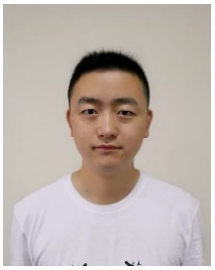
Dr. Jian Yang
Northeast Normal University, CN.
This Fellowship was awarded by the John van Geuns Fonds
Title of the project: **Optical sensing without light excitation based on super long persistent luminescence nanoparticles**
Hosted by : Prof. Hong Zhang and Dr. Stefania Grecea (UvA)
A visit of 5 months



8th call October 2018

Dr. Langping Tu

Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Science
Title of the Project: **Revealing the up-conversion luminescence dynamics in heterogeneous nanostructures**
Hosted by Prof Evert Jan Meijer and Prof Hong Zhang (UvA).
A visit of 3 months



9. Financial Account 2018

Income			Expenses	
Contribution UvA 2018 - faculty[1]	150.000		Donation HIMS Institute[1]	150.000
Contribution UvA 2018 - HIMS[1]	150.000		Personnel Costs	79.379
Tulip School (fee and sponsoring)	33.331		Tulip School	39.214
AMOCC School (fee and sponsoring)	28.943		AMOCC School	29.695
Fellowship – JvGeuns[2]	10.000		Fellowship Programme	35.666
Correction Fellowship 2015-2016	7.920		Symposium	8.776
KNCV career event - contribution KNCV	511		PhMIC, PPP course, Career Event	1.152
Interest	53		Board	490
			Bureau Costs	1.833
			Annual Report 2017	4.131
			Dick Stufkens PhD prize	2.568
			HRSMC Excellence Traject	816
			PhD event	2.530
	€ 380.759			**€ 356.249**
Income minus Expenses	€ 24.510			

1. As of 2014, a new agreement between the VSNU (Association of universities in the Netherlands) and SODOLA (the Dutch network of accredited research schools in all fields of academic research) has become applicable for the funding of Research Schools. Based on this agreement, as of 2015, the HRSMC should get funding of 300 KEuro. Instead of 50 kEuro from the faculty and 5 kEuro from the HIMS Institute, the contribution of the faculty is raised to 150 kEuro and 150 kEuro for the HIMS Institute. As this increase for the HIMS Institute would strongly affect HRSMC affiliated research groups from the UvA/HIMS Institute, the HRSMC Board decided to donate 150 kEuro to the HIMS Institute.

2. The HRSMC is grateful to **the John van Geuns foundation** for its financial support for the the John van Geuns Fellowship.

