

## PERSONAL INFORMATION An Tiny Maria Hardy



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Website:

[https://www.uhasselt.be/UH/IMO/Visit-the-groups/Inorganic-and-physical-chemistry-\(IPC\).html](https://www.uhasselt.be/UH/IMO/Visit-the-groups/Inorganic-and-physical-chemistry-(IPC).html)

Skype identity: ATMHardy

Date of birth: 23<sup>rd</sup> June 1978

Nationality: Belgian

## WORK EXPERIENCE

- 2018-now Professor (Hoogleraar) – Chemistry, UHasselt
- 2015-now Guest professor at imec, division imomec, Diepenbeek
- 2013-2018 Associate professor – Chemistry, UHasselt
- 2009-2013 Assistant professor – Chemistry, UHasselt
- 2005-2009 Lecturer at XIOS University College – Department of industrial engineering

## EDUCATION AND TRAINING

- 2004-2010 Postdoctoral research fellow, UHasselt (including two postdoctoral grant fellowships of the Research Foundation Flanders (FWO))
- 2000-2004 PhD at UHasselt, aspirant Research Foundation Flanders (FWO)
- 1998-2000 Master in Science – Chemistry, Ghent University, Belgium (*licentiaat chemie*)
- 1996-1998 Bachelor in Science – Chemistry, Hasselt University, Belgium (*kandidaat chemie*)

## PERSONAL SKILLS

Mother tongue(s) Dutch

Other language(s)

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C1	C1	C1	C1
Interuniversity Test of Academic English (ITACE) .					

Levels: A1/A2: Basic user - B1/B2: Independent user - C1/C2 Proficient user

[Common European Framework of Reference for Languages](#)

Communication skills

Teaching university courses, presentations (conferences, project meetings etc. )  
Outreach activities towards high school pupils, teachers, companies, etc.

**RESEARCH GROUP** An Hardy leads the DESINe group, jointly with prof. M.K. Van Bael, which is focused on DEsign and Synthesis of Inorganic materials mainly for energy. The group is part of the Institute for Materials Research IMO-imec, which is as well an associated laboratory to imec, and partner in Energyville. The group consists currently of 18 members (13 PhD students, 2 postdocs, 1 researcher and 2 staff members besides two guest professors, one involved in teaching and one involved in research).

About half the group members are focused on research of battery materials chemistry and synthesis, which was initiated around a decade ago. The invested efforts have led to international recognition: A. Hardy was invited by prof. Abakumov (Skoltech) to give tutorial lectures aside world-renowned battery materials experts e.g. J. M. Tarascon and C. Delmas, in the electrochemistry workshop (Moscow, 2017 and 2018). All the other group members focus on the synthesis and materials chemistry of catalysts and supports for CO<sub>2</sub> conversion (via plasmon and plasma catalysis) as well as (photo)catalytic hydrogen generation.

## SUPERVISION OF PHD STUDENTS

### PROMOTOR OF PHD STUDENTS AT UHASSELT:

- Jonas Mercken, 2019-
- Ulrique Vounckx, 2019-
- An-Sofie Kelchtermans, 2018-
- Ahmed Shafique, 2018-
- Satish Mylavarapu, 2017-
- Andreas Paulus, 2016-2020
- Bjorn Joos, 2015-2019
- Dries Desloovere, 2014-2018
- Fulya Ulu, 2014-2018
- Wouter Marchal, 2013-2017
- Jonathan Van den Ham, 2012-2016
- Thomas Vranken, 2011-2015

**COPROMOTOR** of 12 finished and ongoing PhD's

## TEACHING ACTIVITIES

### COORDINATING RESPONSIBLE

- Chemical technology, 2<sup>nd</sup> bachelor business engineering
- Inorganic and solid state chemistry, 2<sup>nd</sup> bachelor chemistry
- Chemical thermodynamics, 1<sup>st</sup> bachelor chemistry
- Chemical equilibria and kinetics, 1<sup>st</sup> bachelor chemistry
- Kennismakingstraject, 3<sup>rd</sup> bachelor chemistry, introduction to research

### MEMBER OF THE EDUCATION TEAM

- Multidisciplinary biomedical research project, 3<sup>rd</sup> bachelor biomedical science
- Basic skills, 1<sup>st</sup> bachelor chemistry
- Experimental design, 1<sup>st</sup> master biomedical sciences
- Introduction to chemistry, 2<sup>nd</sup> bachelor physics

**SUPERVISOR** of projects for master internships in chemistry and chemical engineering, bachelor internships for chemistry and biomedical sciences

## INSTITUTIONAL RESPONSABILITIES

- Member of the Education Management Team, chemistry department, UHasselt
- Member of the Commission for Scientific Integrity, UHasselt
- Member of the Doctoral School Board, UHasselt
- Faculty member, Faculty of Science, UHasselt
- Member and local contact point of the Lab Safety Task Force, UHasselt
- First aid worker

## COMMISSIONS OF TRUST

- Member of the FWO expert panel, WT<sub>3</sub>, condensed matter and physical chemistry
- Member of several PhD juries at UGhent, UAntwerp, VUB, KULeuven (Belgium) besides TUEindhoven, University of Trondheim, Universidad Carlos III de Madrid
- Editorial board member for Scientific Reports (Nature publishers).

## PROJECTS

## ONGOING PROJECTS

- Promoter of fundamental research project, funded by Research Foundation Flanders (FWO) "Understanding the design, synthesis and properties of novel Na ion conducting electrolytes", 1 PhD student + 1 postdoc researcher
- Coordinator of Strategic basic research project, funded by Research Foundation Flanders (FWO) "XL-Lion Advanced lithium ion batteries with dual ionic-electronic core-shell particles", 1 PhD student + 1 postdoc researcher; collaboration with 4 funded partners
- Promoter of strategic basic research grant "Synthesis of onion structured core-multishell particles for improved lithium sulphur batteries based on the constructive diffusion field concept.", 1 PhD student
- Partner in Strategic basic research project, funded by Research Foundation Flanders (FWO), "Plasmatdesign PlasMaCatDESIGN: Designing the packing materials and catalysts for selective and energy efficient plasma driven conversions", 1 PhD student
- Partner in Interreg project LUMEN "Sunlight as fuel for sustainable chemical processes", 1 PhD student
- Promoter of Baekeland grant for applied research, "Optimization of cathodes for solid state batteries", 1 PhD student
- Partner in H2020 LCBAT-1 project "Solidify", 1 postdoctoral researcher
- Partner in H2020 LCBAT-5 project "COBRA", 1 postdoctoral researcher

## PAST PROJECTS

There has been participation/coordination of finished funded projects from FWO, IWT-SBO, vlaio, SIM, Methusalem, Hercules, EFRO, Interreg and EU H2020 as well as bilateral projects with industry. The types of projects span the full range from purely fundamental research, over strategic basic research up to applied research in collaboration with industry.

## (CO-)ORGANIZATION / SCIENTIFIC COMMITTEE MEMBER OF SCIENTIFIC MEETINGS

- 2011, Scientific committee member of EMRS Fall symposium, Poland
- 2013 Symposium organizer at MS&T Montréal, Canada
- 2013 Scientific committee member of BCerS symposium, Belgium
- 2014 Co-organizer of EMRS Spring meeting, symposium I, France
- 2014 Co-organizer of MS&T 2014, symposium "Advanced Solution and Colloidal Processing for Ceramics", US
- 2016 Co-organizer of EMRS symposium AA, France
- 2016 Scientific committee member of 7<sup>th</sup> EU workshop on kesterites, Belgium
- 2016 Scientific committee member of EMRS Fall symposium, Poland
- 2018 Chair of the Electroceramics summer school, Hasselt, Belgium
- 2018 Main organizer of E-MRS Spring meeting 2018 "Solution processing & properties of functional oxide thin films & nanostructures-III", France
- 2019 Scientific committee member of ECIS, Leuven, Belgium
- 2020 Co-organizer of E-MRS Spring meeting 2020 "Recent advances and challenges in chemical synthesis and solution processing of advanced inorganic nanomaterials", cancelled due to French governmental regulations regarding Corona virus

## OUTPUT

An Hardy's research focuses on chemical solution based synthesis of inorganic nanomaterials, focusing on the understanding of relations between synthesis, material properties and functional properties. This expertise is recognized by the research community as exemplified by invited contribution to the "*Handbook of sol-gel science and technology*" (Ed. Levy and Zayat, 2015). An Hardy (H-index 20, WoK) published over 110 papers in international journals in total, as (co-)author, with 45 publications in the last 5 years. More than 1100 citations have been reached (1162 excluding self-citations, source: web of science). The work has been presented at various international conferences including around 40 invited talks in national and international conferences.

A full list of all 113 publications is available from Web of Knowledge, or the UHasselt document server:

<https://documentserver.uhasselt.be/cris/rp/rp02004.jsessionid=BD1BAA480C96DEFD5DA1AE9197892645>

## REPRESENTATIVE RECENT PUBLICATIONS

- Moeremans, B., Cheng, H. W., Merola, C., Hu, Q., Oezaslan, M., Safari, M., Van Bael, M. K., Hardy, A., Valtiner, M., & Renner, F. U. In Situ Mechanical Analysis of the Nanoscopic Solid Electrolyte Interphase on Anodes of Li-Ion Batteries. **Advanced science**, 2019, 6(16), 1900190.

- Eutectogels: A New Class of Solid Composite Electrolytes for Li/Li-Ion Batteries, B. Joos, T. Vranken, W. Marchal, M. Safari, M. K. Van Bael, and A. T. Hardy, **Chemistry of Materials**, 2018, 30 (3), 655–662.
- Reduced  $\text{Na}_{2+x}\text{Ti}_4\text{O}_9/\text{C}$  Composite: A Durable Anode for Sodium-Ion Batteries, D. De Sloovere, M. Safari, K. Elen, J. D'Haen, O. A. Drozhzhin, A. M. Abakumov, M. Šimėnas, J. Banyš, J. Bekaert, B. Partoens, M. K. Van Bael, and A. Hardy, **Chemistry of Materials**, 2018, 30 (23), pp 8521–8527.
- Understanding the Importance of Cu(I) Intermediates in Self-Reducing Molecular Inks for Flexible Electronics  
Wouter Marchal, Alessandro Longo, Valérie Briois, Kristof Van Hecke, Ken Elen, Marlies K. Van Bael, and An Hardy  
**Inorganic Chemistry** 2018 57 (24), 15205-15215
- Remarkable lowering in the synthesis temperature of  $\text{LiMn}_2\text{O}_4$  via citrate solution-gel synthesis facilitated by ethanol, Maino, G; Carleer, R.; Marchal, W.; Bonneux, G.; Hardy, A.; Van Bael, M.K. **Dalton Transactions**, 2017 46 (43) 14934-14946
- van den Ham, Evert Jonathan; Elen, Ken; Bonneux, Gilles; Maino, Giulia; Notten, P. H. L.; Van Bael, Marlies K. & Hardy, An (2017). 3D indium tin oxide electrodes by ultrasonic spray deposition for current collection applications. **Journal of Power Sources**, 348, p. 130-137
- Effect of annealing atmosphere on  $\text{LiMn}_2\text{O}_4$  for thin film Li-ion batteries from aqueous chemical solution deposition, G. Maino, J. D'Haen, F. Mattelaer, C. Detavernier, A. Hardy, M.K. Van Bael, **J. Mater. Chem. A**, 2016, 4, pp 18457-18469.
- Ultrasonic spray deposition of metal oxide films on high aspect ratio microstructures for 3D all-solid-state Li-ion batteries; E. Jonathan van den Ham, Sven Gielis, Marlies Van Bael, An Hardy; **ACS Energy Letters**, 2016 1, p.1184-1188
- Chemical Composition of an Aqueous Oxalato-/Citrate- $\text{VO}_2^+$  Solution as Determinant for Vanadium Oxide Phase Formation. PEYS, Nick; Maurelli, Sara; REEKMANS, Gunter; ADRIAENSENS, Peter; De Gendt, Stefan; HARDY, An; VAN DOORSLAER, Sabine & VAN BAEL, Marlies **Inorganic Chemistry**, (2015) 54 (1), p. 69-78
- Factors influencing the conductivity of aqueous solution-gel processed Al-doped ZnO films; H. Damm, P. Adriaensens, C. De Dobbelaere, B. Capon, K. Elen, J. Drijkoningen, B. Conings, J. Manca, J. D'Haen, C. Detavernier, P.C.M.M. Magusin, J. Hadermann, A. Hardy, M.K. Van Bael, **Chemistry of Materials** 26(20) (2014) 5839-5851

#### CHAPTERS IN BOOKS

- CSD from water based carboxylate precursor solutions,  
M.K. Van Bael, A. Hardy, J. Mullens,  
chapter in "Chemical Solution Deposition Of Functional Oxide Thin Films",  
Ed. T. Schneller, R. Waser and D. Payne  
2013
- Sol-gel deposition of ultrathin high-k dielectric films  
Hardy and M.K. Van Bael  
Chapter 24 in "Sol-gel handbook, Synthesis, Characterization, and Applications: Synthesis, Characterization and Applications, 3-Volume Set"  
Ed. David Levy, Marcos Zayat  
2015
- Low-temperature photo-chemical solution deposition of ferroelectric and multiferroic thin films  
De Dobbelaere, A. Hardy and M.K. Van Bael, I. Bretos, R. Jiménez and M.L. Calzada  
Chapter in "Nanoscale Ferroelectrics and Multiferroics: Key Processing and Characterization Issues, and Nanoscale Effects"  
Ed. M. Alguero, M. Gregg, L. Mitoseriu  
2016

#### PATENT

S. Gielis, A. Hardy, M. K. Van Bael, P. M. Vereecken, Conformal coating on threedimensional substrates, PCT/EP2015/061133

#### INVITED PRESENTATIONS DELIVERED BY AN HARDY

Elektrisch rijden

A. Hardy

Energy unplugged, energy days for teachers, Energyville-Thor Central, 4 March 2020, Genk, Belgium

Next generation rechargeable battery materials from solution based synthesis

A. Hardy & M.K. Van Bael

Chemical research in Flanders – CRF-2; 14-16 October 2019, Blankenberge, Belgium

Van thuisbatterij tot elektrisch rijden, hoe zit dat nu?

A. Hardy

Energy unplugged: energy days for students, Energyville-thor Central, 2 may 2019, Genk, Belgium

Battery research at UHasselt Energyville

A. Hardy, M. Safari, M.K. Van Bael

International Conference on Automotive Industry in the Euregio

29th of November 2018, 17:30 – 22:00 Alden Biesen, Bilzen, Limburg, Belgium

Conventional and unconventional syntheses of inorganic materials for electrochemical energy storage

A. Hardy

Tutorial at the International conference of young scientists on topical problems of modern electrochemistry and electrochemical materials science, 23/9-26/9/2018 | Moscow, Russia

Chemical solution based methods for synthesis of battery materials

A. Hardy

Tutorial at the Electroceramics XVI summer school, 6-7 July 2018, Hasselt, Belgium

Chemical solution based methods for nanoparticle and core-shell synthesis

An Hardy, Thomas Vranken, Fulya Ulu, Dries Desloovere, Maarten Verheijen, Bjorn Joos, Marlies K. Van Bael

Tutorial at the International conference of young scientists on topical problems of modern electrochemistry and electrochemical materials science, 17/9-20/9/2017 | Moscow, Russia

Wet chemical synthesis of metal oxides

A. Hardy, M.K. Van Bael

COST To Be, Fall meeting, 27/9-30/9 2016 | Jozef Stefan Institute, Ljubljana Slovenia

Chemical solution synthesis and characterization of metal oxides with application in organic electronics and photonics.

A. Hardy, W. Marchal, B. Conings, K. Elen, M.K. Van Bael

EMN meeting on Organic electronics and photonics, 9-13 september 2016 | San Sebastian, Spain,

Chemical solution synthesis and properties of nanoscale ferroelectrics, single phase and composite multiferroics

An Hardy and Marlies K. Van Bael

EMF European Meeting on Ferroelectricity 2015, 28 June – 3 July 2015 | Porto, Portugal

Nanostructured metal oxides by wet chemical synthesis with applications in energy & health

A. Hardy & M.K. Van Bael

ICACC International conference and exposition on advanced ceramics and composites, 25-30 January 2015 | Daytona Beach, Florida

Energy efficiency by low temperature chemical solution deposition of multimetal oxides: potential and limitations

A. Hardy and M.K. Van Bael

MCARE 2015 Materials Challenges in Alternative and Renewable Energy Conference (Symposium 9) Energy-efficient Printing and Additive Manufacturing Processes, 24-27 February 2015 | Jeju Korea

Chemical solution based synthesis and deposition of nano metal oxides: from fundamentals to applications

A. Hardy, M.K. Van Bael

38th ICACC International Conference and Exposition on Advanced Ceramics and Composites, 26/01-31/01/2014 | Daytona Beach, USA

Nanostructured metal oxides from chemical solution based syntheses

A. Hardy, M.K. Van Bael

Anorganisch-Chemischen Kolloquium im Sommersemester 2013, 11th of July 2013 | University of Bonn

Towards understanding the relations between chemical solution synthesis and properties of metal oxides

A. Hardy, M.K. Van Bael

EMRS 2013 Spring Meeting, 27-31 May 2013 | Strasbourg, France

Ferroelectrics and multiferroics from Aqueous Chemical Solution Deposition

A. Hardy, M.K. Van Bael

Seminar at the group of Theoretical Physics of Materials, 17th May 2013, ULg, Liège, Belgium

Nanostructured metal oxides from aqueous solution deposition;

A. Hardy, M.K. Van Bael

37th ICACC International Conference and Exposition on Advanced Ceramics and Composites, 27/01-1/02/2013, Daytona Beach, USA