4. CV of the experienced researcher

PERSONAL INFROMATION

Name Maria Spies
Nationality

EDUCATION

17 Oct 2019 **Ph.D. in Nanophysics** Université de Grenoble-Alpe, France.
29 Sept 2014 **M.Sc. in Physics** at the HHU Düsseldorf, Germany.
(Erasmus at Université de Nantes)
11 Dec 2011 **B.Sc. in Physics** at the New Mexico State University, Las Cruces, USA.
27 July 2008 **Abitur** at Sportgymnasium Magdeburg, Germany.

WORK EXPERIENCE

1 Oct 2016 – 30 Sept 2019 **Doctoral researcher** at *CEA –INAC and CNRS-Institute Neel*, Grenoble, France
- Nanophysics: correlated advanced characterization of heterostructured nano-scale group III-V photodetectors and emitters by microphotoluminesence, scanning and transmission electron microscopy, electrical characterization; device fabrication in clean room, simulations of optical properties with nextnano[3]
- Thesis title: "Correlated electro-optical and TEM studies on single III-N nanowire heterostructures"

10 Feb 2016 – 10 Aug 2016 **Research Engineer** at *Groupe de Physique des Matériaux, Université de Rouen, Normandie*, Rouen, France
- laser wide angle atom probe tomography (APT) and laser LEAP high resolution APT on diamond nanotips, studying the possibility of sub-bandgap absorption

1 Feb 2014 – 30 Sept 2014 **Research Assistant** at *Max-Planck-Institut für Eisenforschung*, Düsseldorf, Germany
- APT, SEM, CL, EDX, EBDS, STEM imaging on semiconductor kesterite
- Thesis title: "Influence of growth conditions on the opto-electronic properties, microstructure and chemistry of $Cu_2ZnSnSe_4$ thin-films"

15 June 2012 – 15 Aug 2012 **Research Assistant** at *Erasmus Medisch Centrum*, Rotterdam, Netherlands
- FFT analysis of ultrasound, photoacoustics response of lipid microbubbles with dyes attached to the shell, transducer recorded

12 June 2011– 25 Aug 2011 **Internship** at *Department of Electrical Engineering*, University of Nebraska-Lincoln, Lincoln, NE, USA
- Ellipsometry study of optical properties of sublimation-deposited epitaxial Graphene on SiC (3C, 4H), spectroscopic mapping

1 Jan 2011 – 15 May 2012 **Research Assistant** at *Department of Physics*, New Mexico State University (NMSU), Las Cruces, NM, USA
- Ellipsometry studies of optical properties of thin films: $SrTiO_3$, NiPt, $LaAlO_3$

15 May 2010 – 31 Dec 2010 **Research Assistant** at *Department of Astronomy*, NMSU, Las Cruces, NM, USA

SKILLS

Optical and material characterization
- Electrical device characterization, TEM, SEM, Microphotoluminescence, FIB, Atom Probe Tomography, Ellipsometry, Cathodoluminescence

Computer skills

- Origin by OriginLab, Nextnano[3] QW device simulation, basic Matlab, Python and Fortran programming

Clean room experience

- Device design, SiN TEM grid fabrication, contacting of single nano-objects, electron beam lithography

PUBLICATIONS & CONFERENCES

Author of 14 (5 first author) publications in peer-reviewed international journals.
Presenter of 6 talks at international conferences.

ORCID ID: 0000-0002-3570-3422

INVITED REVIEWS

[1] **Photodetectors based on wurtzite semiconductor heterostructures**
Maria Spies, and Eva Monroy
Semiconductor Science and Technology 34 (5), 053002 (2019)

[2] **Correlated and in-situ electrical transmission electron microscopy studies and related membrane fabrication**
Maria Spies, Zahra Sadre-Momtaz, Jonas Lähnemann, Minh Anh Luong, Bruno Fernandez, Thierry Fournier, Eva Monroy, Martien I den Hertog
Nanotechnology 0957-4484 (2020)

JOURNAL ARTICLES

[1] **Correlated electro-optical and structural study of electrically tunable nanowire quantum dot emitters**
Maria Spies, Akhil Ajay, Eva Monroy, Bruno Gayral and Martien I. den Hertog
Nano Letters 1, 314- 319 (2019)

[2] **In-Situ Transmission Electron Microscopy Imaging of Aluminum Diffusion in Germanium Nanowires for the Fabrication of Sub-10 nm Quantum Disks**
Minh Anh Luong, Eric Robin, Nicolas Pauc, Pascal Gentile, Masiar Sistani, Alois Lugstein, Maria Spies, Bruno Fernandez, and Martien I. den Hertog
ACS Appl. Nano Mater., 3, 2, 1891-1899 (2020)

[3] **Effect of Bias on the Response of GaN Axial p–n Junction Single-Nanowire Photodetectors**
Sergi Cuesta, Maria Spies, Victor Boureau, Fabrice Donatini, Moïra Hocevar, Martien I. den Hertog, and Eva Monroy
Nano Letters 8, 5506–5514 (2019)

[4] **Intersubband absorption in GaN nanowire heterostructures at mid-infrared wavelengths**
Akil Ajay, Rodrigo Blasco, Jakub Polaczyński, Maria Spies, Martien I. Den Hertog, and Eva Monroy
Nanotechnology 29, 385201 (2018)

[5] **Effect of the nanowire diameter on the linearity of the response of GaN-based heterostructured nanowire photodetectors**
Maria Spies, Jakub Polaczyński, Akhil Ajay, Dipankar Kalita, Minh Anh Luong, Jonas Lähnemann, Bruno Gayral, Martien I den Hertog, and Eva Monroy
Nanotechnology 29, 255204 (2018)

[6] **Monolithic Axial and Radial Metal–Semiconductor Nanowire Heterostructures**
Masiar Sistani, Minh Anh Luong, Martien I. den Hertog, Eric Robin, Maria Spies, Bruno Fernandez, Jun Yao, Emmerich Bertagnolli, and Alois Lugstein

Nano Letters 12, 7692–7697 (2018)

[7] **Thermal Diffusivity of Diamond Nanowires Studied by Laser Assisted Atom Probe**
Laurent Arnoldi, Maria Spies, Jonathan Houard, Ivan Blum, Aurianne Etienne, Rinat Ismagilov, Alexander Obraztsov, and Angela Vella
Applied Physics Letters 112 (14), 143104 (2018)

[8] **Bias-controlled spectral response in GaN/AlN single-nanowire ultraviolet photodetectors**
Maria Spies, Martien I. Den Hertog, Pascal Hille, Jörg Schörmann, Jakub Polaczyński, Bruno Gayral, Martin Eickhoff, Eva Monroy, and Jonas Lähnemann
Nano Letters 17, pp 4231–4239 (2017)

[9] **Impact of Annealing on Electrical Properties of $Cu_2ZnSnSe_4$ Absorber Layers**
Thomas P. Weiss, Alex Redinger, Germain Rey, Torsten Schwarz, Maria Spies, Oana Cojocura-Mirédin, Pyuck-Pa Choi, and Susanne Siebentritt
Journal of Applied Physics 120 (4), 045703 (2016)

[10] **Bulk-like Dielectric Properties from Metallo-Organic Solution–Deposited $SrTiO_3$ Films on Pt-Coated Si Substrates**
Claire V. Weiss, Jilian Zhang, Maria Spies, Lina Abdallah, Stefan Zollner, M. W. Cole, and S.Pamir Alpay
Journal of Applied Physics 111 (5), 054108 (2012)

[11] **Dielectric Function of $LaAlO_3$ from 0.8 to 6 EV between 77 and 700 K**
Cayla M.Nelson, Maria Spies, Lina S. Abdallah, Stefan Zollner, Yun Xu, and Hongmei Luo
Journal of Vacuum Science and Technology - Vacuum Surface Films, 30 (6), 061404 (2012)

INVITED CONFERENCES AND SEMINARS

[1] **Correlated electro-optical and TEM studies on single III-V nanowire heterostructures**
Maria Spies, Martien I. den Hertog, Bruno Gayral, and Eva Monroy
CNRS-CRHEA Laboratory, Vallebonne, France, November 14, 2019

[2] **GaN/AlN dots-in-a-wire photodetectors**
Akhil Ajay, Maria Spies, Jonas Lähnemann, Martien I. den Hertog, Bruno Gayral, and Eva Monroy
10th Biannual Conf. on Quantum Dots (QD2018), Toronto, Canada, June 25-29, 2018

[3] **III-Nitride nanowire photodetectors: from linear UV sensors to nanowire-QWIP**
Akhil Ajay, Jonas Lähnemann, Maria Spies, Jakub Polaczyński, Martien I. den Hertog, and Eva Monroy
SPIE Optics + Photonics, San Diego, USA, Aug 19-23, 2018

[4] **GaN/AlN nanowire photodetectors: from the UV to the IR**
Akhil Ajay, Maria Spies, Jonas Lähnemann, Martien I. den Hertog, and Eva Monroy
MRS Fall Meeting 2018, Boston, USA, Nov 25-30, 2018

CONTRIBUTIONS TO INTERNATIONAL CONFERENCES

[1] (Poster) **Understanding the growth and physical properties of single GaN nanowire quantum dots**
M. Spies, A. Ajay, E. Monroy, B. Gayral, and M. I. den Hertog
11th International Conference on Quantum Dots, Muinch, Germany, May 18 – 22, 2020

[2] (Poster) **Electrical tunability of single quantum dots embedded in GaN nanowires**
M. Spies, A. Ajay, F. Donatini, M. I. Den Hertog, E. Monroy and Bruno Gayral
Nanowire Week 2019, Pisa, Italy, September 23 – 27, 2019

[3] (Oral) **Tunable QCSE in GaN/AlN nanowire single quantum dots**
Maria Spies, Akhil Ajay, Fabrice Donatini, Martien I. den Hertog, Eva Monroy, and Bruno Gayral
International Conference on Nitride Semiconductors, Bellevue, WA, USA, July 7-12, 2019

[4] (Poster) **Heterostructured GaN/AlN nanowires with linear photoresponse**
Maria Spies, Jakub Polaczyński, Akhil Ajay, Dipankar Kalita, Jonas Lähnemann, Bruno Gayral, Martien I. den Hertog, and Eva Monroy
International Conference on Superlattices, Nanostructures and Nanodevices, Madrid, Spain, July 23-27, 2018

[5] (Oral) **GaN/AlGaN nanowire heterostructures for mid-infrared intersubband technology**
Akhil Ajay, Rodrigo Blasco, Jakub Polaczyński, Maria Spies, Martien I. Den Hertog, and Eva Monroy
Compound Semiconductor Week 2018, Boston, USA, May 29 - June 1, 2018

[6] (Oral) **Linearity of the photoresponse in heterostructured GaN/AlN nanowires**
Maria Spies, Jakub Polaczyński, Akhil Ajay, Dipankar Kalita, Jonas Lähnemann, Bruno Gayral, Martien I. den Hertog, and Eva Monroy
Nanowire Week, Hamilton, Ontario, Canada, June 11-15, 2018

[7] (Oral) **Single-Nanowire Photodetectors with GaN/AlN superlattice and bias-dependent spectral response**
Maria Spies, Jonas Lähnemann, Martien I. Den Hertog, Pascal Hille, Jörg Schörmann, Jakub Polaczyński, Bruno Gayral, Martin Eickhoff, and Eva Monroy
EMRS Fall Meeting, Warsaw, Poland, Sept 18-21, 2017

[8] (Poster) **Bias-controlled spectral response in GaN/AlN nanowire photodetectors**
Maria Spies, Jonas Lähnemann, Pascal Hille, Jörg Schörmann, Jakub Polaczyński, Martien I. den Hertog, Bruno Gayral, Martin Eickhoff, and Eva Monroy
12th International Conference on Nitride Semiconductors (ICNS12), Strasburg, France, July 24-28, 2017

[9] (Poster) **Bias-controlled spectral response in GaN/AlN nanowire photodetectors**
Maria Spies, Jonas Lähnemann, Pacal Hille, Jörg Schörmann, Jakub Polaczyński, Martien I. den Hertog, Bruno Gayral, Martin Eickhoff, and Eva Monroy
17th TEM-UCA Workshop, Cadiz, Spain, July 17-21, 2017

[10] (Oral) **GaN/AlN nanowire photodetectors with bias-controlled spectral response**
Maria Spies, Jonas Lähnemann, Pascal Hille, Jörg Schörmann, Jakub Polaczynski, Martien I. den Hertog, Bruno Gayral, Martin Eickhoff, and Eva Monroy
Nanowire Week, Lund, Sweden, May 29 - June 2, 2017

[11] *(Oral)* **Atom Probe Tomography analysis of single-crystal diamond mirco-needles**
Maria Spies, Jonathan Houard, Ivan Blum, Aurianne Etienne, and Angela Vella
5th International Workshop on Nanocarbon Photonics and Optoelectronics, Imatra, Finland, Aug 1-6, 2016

[12] (Oral) **Sequential process or co-evaporation: Comparison of IVT and admittance data**
Thomas Paul Weiss, Alex Redinger, Germain Rey, Torsten Schwarz, Maria Spies, Oana Cojocura-Mirédin, Pyuck-Pa Choi, and Susanne Siebentritt
MRS Spring Meeting, San Francisco, CA, USA, April 6-10, 2015

[13] *(Oral)* **High temperature coevaporation of $Cu_2ZnSnSe_4$**
Alex Redinger, Germain Rey, Torsten Schwarz, Maria Spies, Oana Cojocura-Mirédin, Pyuck-Pa Choi, and Susanne Siebentritt
E-MRS Spring Meeting, Lille, France, May 26-30, 2014

ACCOMPLISHMENTS & AWARDS

Athletic Achievements in swimming:

- University level (USA):
  - Athletic scholarship at Division I swim team at NMSU (Aug 2008- May 2012)
  - 4x school record holder, 3x WAC Champion, Outstanding Swimmer 2009
  - participant at NCAA championships (one of the most competitive in the world)
- Nationwide (Germany):
  - Junior National Team 2005, 2006

- participant Olympic Trials 2008, 2012
- 3rd at open National Championships 2008

RESEARCH GAP

2015 For a better evaluation of my track record, one should consider the loss of one research year before the start of my PhD. The need for personal reflection had arisen after 11 years (2002-2013) of highest level athletic competition (> 20 hours of physical training alongside school work and university studies, regular week-long absences due to training camps, many regional/ national/ international competitions and championships throughout each season). The time served as a period of reorientation which resulted in the start of my research career in 2016.

INDEPENDENT THINKING AND LEADERSHIP QUALITIES

During my research career I have demonstrated my ability to work and think independently. While I was working on my PhD with axially heterostructured nanowires I have noticed and subsequently circumvented the aging process detrimental to the photoemission from quantum dots. I have likewise optimized the fabrication of in-situ compatible Si_3N_4 membrane chips with further chip labels (accessible during micro-photoluminescence and TEM measurements), alternative etching techniques and a design less prone to parasitic etching at chip intersections.

During my PhD in Grenoble I had the opportunity to co-supervise and train two M2 Master's students and one M1 Master's student. That involved training them in electrical device transport measurements, photocurrent measurements, electron beam lithography and clean room fabrication techniques.