Curriculum Vitae

Personal data

Name	Jun.-Prof. Dr. rer. nat. Franziska Elisabeth Münzer born Muckel
Date of birth	November 23, 1987
Marital status	married
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Assistant Professor for Electroenergetic Functional Materials
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Research

- Flexible optoelectronic devices made of nanostructured inorganic semiconductors for use in novel applications, e.g. in medical technology
- Electro-optical properties of nanoscale devices based on metal halide perovskites or 2D materials

Academic Career

Since 10/2020	**Assistant Professor for Electroenergetic Functional Materials** **University Duisburg-Essen, Germany**
4/2020 – 9/2020	**Postdoctoral researcher as part of the integration phase of the PRIME program of the DAAD** **University Duisburg-Essen, Germany**
4/2018 – 4/2020	**Research Associate with Prof. David Ginger** **University of Washington, Seattle, USA**

- Development of hybrid materials made of semiconductor nanocrystals and organic-inorganic perovskites for light sensing.
- Manipulation of the emission and absorption properties of 2D perovskites by plasmonic nanoparticles and photonic cavities.

2/2013 – 3/2018	**PhD (Dr. rer. nat., summa cum laude)** **University Duisburg-Essen, Germany** in the Department of Electrical Engineering and Information Technology with Prof. Dr. Gerd Bacher ➢ PhD Thesis: "*Transition Metal Doped Colloidal Semiconductor Nanocrystals: From Functionality to Device Development*"
12/2010 – 12/2012	**M. Sc. NanoEngineering (with distinction – 1.0)** Specialization Nano-(opto)electronics **University Duisburg-Essen, Germany**
8/2011 – 11/2011	**Master project (with Prof. Ilhan A. Aksay)** **Princeton University, Princeton, USA**
10/2007 – 12/2010	**B. Sc. NanoEngineering (with distinction – 1,1)** **University Duisburg-Essen, Germany**

Third-party funds

2024 – 2027	**Development of a CVD growth process to produce $CsPbBr_3$ perovskite layers for light-emitting devices** Scope ~ 290.000 € ➢ DFG Research Grant for a TVL13 position for three years, including consumption funds
2022 – 2027	**Coordinated project in the International Research Training Group 2D Mature/RTG 2803, DFG** Scope ~ 475.000 € ➢ Funding of a TVL13 position for three and a half years including consumption, with the prospect of another position for three and a half years in the second cohort
2022 – 2025	**Admission to the Young College of the Academy of Sciences and Arts of North Rhine-Westphalia, State of North Rhine-Westphalia** Scope ~ 40.000 €
2018 – 2019	**PRIME (Postdoctoral Research International Mobility Experience) Scholarship of the German Academic Exchange Service, DAAD** Scope ~ 140.000 € ➢ Funding for a one-year stay abroad, as well as a subsequent six-month reintegration phase in Germany

Scholarships & Awards

2022	**Admission to the Junges Kolleg of the Academy of Sciences and the Arts of North Rhine-Westphalia**
2019	**VDE Doctoral Award 2019**
2019	**Innovation Award for Engineering Sciences (Doctorate) of the Sparkasse am Niederrhein 2019**
2015 – 2019	**CENIDE Best Paper Award in 2015, 2016, 2017, 2019**
2013	**Award as best Master graduate of the Faculty of Engineering at the University Duisburg-Essen in 2013**
2012	**Scholarship of the "Stiftung Industrieforschung" for the duration of the Master thesis**
2009 – 2011	**„Deutschland“-Scholarship**
2008	**„NRW“-Scholarship**

Involvement in academic and student self-administration

Membership in VDE and CENIDE (Center for Nanointegration Duisburg-Essen)

Reviewer for ACS Applied Electronic Materials, Electronics, The Journal of Physical Chemistry Letters, ACS Applied Nano Materials and others

Since 2021	Liaison lecturer for the Department of Electrical Engineering and Information Technology at the University Duisburg-Essen
Since 2022	Elected member of the examination board "NanoEngineering" of the University of Duisburg-Essen
Since 2021	Elected member of the Faculty Council of Engineering Sciences at the University Duisburg-Essen (now in the second legislative period)
2023 – 2025	Elected spokesperson of the Young College of the Academy of Sciences and the Arts of North Rhine-Westphalia
2009 – 2010	Student member of the examination board of the NanoEngineering program at the University Duisburg-Essen, Germany
2008 – 2010	Founding member and responsible for the finances of the NanoEngineering Student Council

Teaching experience and supervision of doctoral students

University Duisburg-Essen

- "Dielectric and Magnetic Materials" (master’s lecture and exercise, since 2023)
- Design and organization of an interdisciplinary bachelor’s laboratory course (since 2021)
- Conception and implementation of the master’s course "Modern Inorganic Semiconductors for Flexible Optoelectronics" (lecture and laboratory, since 2021)
- Supervision of four PhD students (as of March 2024)
    1. Tamara Czerny, Perovskite photodetectors, since April 2021

2. Jochen Konieczny, 2D/2D photodetectors (2D MATURE), since October 2022
3. Leon Spee, perovskite/2D heterostructure photodetectors, supervision since October 2020
4. We Jian To, Perovskite Light Emitting Diodes, since may 2024

- Supervision of theses (master's, bachelor's and project theses) in the study program "NanoEngineering" and "International Studies of Engineering"

University of Washington

- Mentor for a first-year PhD student

Contributions to international conferences

Invited conference contributions

- 2023 MRS Spring Meeting & Exhibit, San Francisco, USA (2023): *"Photoconducting Devices with Specific Attributes based on 2D Metal-Halide Perovskites"*
- 12th Indo-German Frontiers of Engineering Symposium, Breme, Deutschland (2022): *„Photodetectors for Specific Applications based on Novel Nanostructured Semiconductors"*
- GCSON2022 (Global Conference on Semiconductors, Optoelectronics and Nanostructures), Webinar (2022): „Two Dimensional Perovskites for Photonics and Optoelectronics"

Conference contributions

- MATSUS Spring Meeting 2025, Sevilla, Spain (2025): *„ The Role of Edge States for Charge Carrier Separation in n=1 2D Perovskites"*
- 2024 MRS Spring Meeting & Exhibition, Seattle, USA, (2024): *"Highly Responsive 2D/2D TMDC/ Perovskite Hetero-Photodetectors through Photo-Gating"*
- Unconventional Semiconductors and Their Application - Gordon Research Conference, Ventura, USA (2022): "*Tuning Fano Resonances in 2D Perovskites using Plasmonic Silver Nanoparticles"*
- 2022 MRS Spring Meeting & Exhibit, Honolulu, USA (2022): "*2D Perovskites for Wavelength-Selective Photodetectors"*
- 2021 Virtual MRS Spring Meeting & Exhibit, Online, USA (2021): "*Tuning of a Hybrid Exciton-Photon Fano Resonance in Two-Dimensional Perovskite Thin Films"*
- QD 2020, München, Deutschland (2020): "*Giant Bandgap Shift with Temperature in CdSe Nanoclusters Caused by an Exciton-Driven Change of Phonon Modes"*
- 2019 MRS Fall Meeting & Exhibit, Boston, USA (2019): "*Intermediate Coupling between Organic-Inorganic Perovskite Multi-Quantum Wells and Single Plasmonic Silver Nanoparticles"*
- NaNaX 8, Braga, Portugal (2017): "*Tailoring sp-d exchange coupling in CdSe/Mn:CdS core-shell nanoplatelets"*
- PASPS 2016, Kobe, Japan (2016): "*Manganese doped (CdSe) 13 magic sized cluster"*
- QD 2016, Jeju, Korea (2016): "*Electrically induced excitonic magnetic polaron in a colloidal quantum dot device"*

- 20 Years of Quantum Dots at Los Alamos, Los Alamos, USA (2015)*: "Magneto-optical study of excited states in chemically prepared Mn^{2+}- doped CdSe quantum dots"*

Publications

h-index: 13, citations: 722 (accessed on Google Scholar in March 2025)

- J. Bieniek, W. Baek, S. Lorenz, **F. Muckel**, R. Fainblat, T. Hyeon, G. Bacher*, „Impact of exciton fine structure on the energy transfer in magic-sized (CdSe) 13 clusters"*, Nano Research 17, 10669 **(2024)**, https://doi.org/10.1021/acsaom.4c00113

- L. Spee, J. Konietzka, A. Grundmann, N. Stracke, M. Schroer, M. Winterer, M. Heuken, H. Kalisch, A. Vescan, G. Bacher, **F. Muckel**, *„Photogating through Unidirectional Charge Carrier Funneling in Two-Dimensional Transition Metal Dichalcogenide/Perovskite Heterostructure Photodetectors "*, *ACS Appl. Opt. Mater.* 2, 852 **(2024)**, https://doi.org/10.1021/acsaom.4c00113

- T. E. Czerny, Q. Shen, J. Konieczny, M. Schroer, M. Winterer**, F. Muckel**, "*Efficient Narrowband Photoconductivity of the Excitonic Resonance in Two-Dimensional Ruddlesden–Popper Perovskites Due to Exciton Polarons"*, J. Phys. Chem. Lett. 14, 4850 **(2023**), https://doi.org/10.1021/acs.jpclett.3c00710

- Y. U. Jin, B. Marler, A. D. Karabanov, K. Winkler, I. C. Jie Yap, A. Dubey, L. Spee, M. Escobar Castillo, **F. Muckel**, A. N. Salak, N. Benson, D. C. Lupascu, *"Lead-free organic–inorganic azetidinium alternating metal cation bromide: $[(CH_2)_3NH_2]_2AgBiBr_6$, a perovskite-related absorber",* RSC advances 51, 36079 **(2023)**, https://doi.org/10.1039/D3RA05966A

- **F. Muckel**, K. N. Guye, S. M. Gallagher, Y. Liu, D. S. Ginger, "*Tuning Hybrid Exciton-Photon Fano Resonances in Two-Dimensional Organic-Inorganic Perovskite Thin Films"*, Nano Letters 21, 6124 (**2021**), https://doi.org/10.1021/acs.nanolett.1c01504

- S. Sanders, G. Simkus, J. Riedel, A. Ost, A. Schmitz, **F. Muckel**, M. Heuken, A. Vescan, G. Bacher, "*Showerhead-assisted Chemical Vapor Deposition of CsPbBr3 films for LED application"*, Journal of Materials Research 36, 1813 (**2021**), https://doi.org/10.1557/s43578-021-00239-w

- F. Jiang, J. Pothoof, **F. Muckel**, R. Giridharagopal, J. Wang, D. Ginger, "*Scanning Kelvin Probe Microscopy Reveals that Ion Motion Varies with Dimensionality in 2D Perovskites"*, ACS Energy Letters 6, 100 **(2021)**, https://dx.doi.org/10.1021/acsenergylett.0c02032

- **F. Muckel**, S. Lorenz, J. Yang, T. A. Nugraha, E. Scalise, T. Hyeon, S. Wippermann, G. Bacher, "*Exciton-driven change of phonon modes causes strong temperature dependent bandgap shift in nanoclusters"*, Nature Communications 11, 4127 **(2020)**, https://doi.org/10.1038/s41467-020-17563-0

- R. Fainblat, **F. Muckel**, G. Bacher, "*Tailoring exchange interactions in magnetically doped II-VI nanocrystals"* in "Chalcogenide - From 3D to 2D and Beyond", Elsevier **(2020)**, https://doi.org/10.1016/B978-0-08-102687-8.00014-2

- J. Yang*, **F. Muckel***, B. K. Choi, S. Lorenz, I. Y. Kim, J. Ackermann, H. Chang, T. Czerney, V. S. Kale, S.-J. Hwang , G. Bacher, T. Hyeon, *"Co^{2+}-Doping of Magic-Sized CdSe Clusters: Structural Insights via Ligand Field Transitions"*, Nano Letters 18, 7350 (**2018**), https://doi.org/10.1021/acs.nanolett.8b03627

- **F. Muckel***, S. Delikanli*, P. L. Hernández-Martínez, T. Priesner, S. Lorenz, J. Ackermann, M. Sharma, H. V. Demir, G. Bacher, "*sp-d Exchange Interactions in Wave Function Engineered Colloidal CdSe/Mn:CdS Hetero-Nanoplatelets"*, Nano Letters 18, 2047 (**2018**), https://doi.org/10.1021/acs.nanolett.8b00060

- **F. Muckel**, C. Barrows, A. Graf, A. Schmitz, C. S. Erickson, D. R. Gamelin, G. Bacher, "*Current-Induced Magnetic Polarons in a Colloidal Quantum-Dot device"*, Nano Letters 17, 4768 (**2017**), https://doi.org/10.1021/acs.nanolett.7b01496

- J. Yang*, **F. Muckel***, W. Baek, R. Fainblat, G. Bacher, T. Hyeon "*Chemical Synthesis, Doping, and Transformation of Magic-Sized Semiconductor Alloy Nanoclusters"*, JACS 139, 6761 (**2017**), https://doi.org/10.1021/jacs.7b02953

- **F. Muckel**, J. Yang, S. Lorenz, W. Baek, H. Chang, T. Hyeon, G. Bacher, R. Fainblat "*Digital Doping in Magic-Sized CdSe Clusters"* ACS Nano 10, 7135 (**2016**), https://doi.org/10.1021/acsnano.6b03348

- J. Yang, R. Fainblat, S. G. Kwon, **F. Muckel**, J.H. Yu, H. Terlinden, B. H. Kim, D. Iavarone, M. K. Choi, I. Y. Kim, I. Park, H.-K. Hong, J. Lee, J. S. Son, Z. Lee, K. Kang, S.-J. Hwang, G. Bacher, T. Hyeon "*Route to the Smallest Doped Semiconductor: Mn^{2+}-Doped $(CdSe)_{13}$ Clusters"* JACS 137, 12776 (**2015**), https://doi.org/10.1021/jacs.5b07888

- R. Fainblat, **F. Muckel**, C. Barrows, V. A. Vlaskin, D. R. Gamelin, G. Bacher "*Valence-Band Mixing Effects in the Upper-Excited-State Magneto-Optical Responses of Colloidal Mn^{2+}-Doped CdSe Quantum Dots"* ACS nano 8, 12699 (**2014**), https://doi.org/10.1021/nn505610e

- R. Fainblat, J. Frohleiks, **F. Muckel**, J. H. Yu, J. Yang, T. Hyeon, G. Bacher "*Quantum Confinement-Controlled Exchange Coupling in Manganese(II)-Doped CdSe Two-Dimensional Quantum Well Nanoribbons"* Nano Letters 12, 5311 (**2012**), https://doi.org/10.1021/nl302639k

- C. Punckt, **F. Muckel**, S. Wolff, I. Aksay, C. A. Chavarin, G. Bacher, W. Mertin "*The effect of degree of reduction on the electrical properties"* APL 102,023114 (**2013**), https://doi.org/10.1063/1.4775582

* Equally contributed