

# Dr Simon Kahmann

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Institute of Physics  
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15/01/2024

## Research focus: Functional materials for optoelectronics

My research connects the synthesis of novel semiconductors with their eventual application in optoelectronic devices. The core aim is to understand and to exploit the impact of nano-sized tailoring and chemical modification on the photophysical properties of materials processed from solution.

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## EDUCATION & DEGREES

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<b>Double Doctorate in Materials Physics/Materials Science</b> , with distinction (1.0) <sup>1</sup>	2018
University of Groningen, The Netherlands Friedrich-Alexander University Erlangen-Nuremberg, Germany Advisors: Prof. Dr. Maria A. Loi, Prof. Dr. Christoph J. Brabec	
<b>Master of Science in Nanotechnology</b> , with distinction (1.1)	2013
Friedrich-Alexander University Erlangen-Nuremberg, Germany	
<b>Bachelor of Engineering in Microtechnology</b> , very good (1.5)	2011
University of Applied Sciences Zwickau, Germany	

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## PROFESSIONAL EXPERIENCE

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<b>Tenure Track Assistant Professor</b> in Experimental Semiconductor Physics (Juniorprofessur, W1 nach W2), Chemnitz University of Technology, Germany	since 2023
<b>Early Career Fellow, Junior PI</b>	2022-2023
Department of Chemical Engineering and Biotechnology (CEB), University of Cambridge, United Kingdom	
<b>Research Fellow, Senior Postdoc</b>	2021-2022
Cavendish Laboratory & CEB, University of Cambridge, United Kingdom	
<b>DFG Research Fellow, Senior Postdoc</b>	2019-2020
Zernike Institute for Advanced Materials, Groningen, The Netherlands	
<b>Research Associate, Postdoc</b>	2018
Zernike Institute for Advanced Materials, Groningen, The Netherlands	
<b>Research Assistant, PhD student</b>	2014-2017
Institute of Materials for Electronics and Energy Technology, Erlangen, Germany Zernike Institute for Advanced Materials, Groningen, The Netherlands	

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## HONOURS & FUNDING

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<b>Emerging Investigator Award</b> Journal of Materials Chemistry C	2023
<b>Early Career Fellowship</b> <i>Hybrid nanostructures for chiral optoelectronics – polarising communication</i> (ECF-2022-593), Leverhulme Trust, United Kingdom; £118000	2022
<b>Matching funding for Leverhulme ECF</b> Isaac Newton Trust, Cambridge, United Kingdom (22.08(i)); £50000	2022
<b>College Research Associate</b> Sidney Sussex College, Cambridge	2021
<b>Postdoctoral Fellowship</b> <i>Spatio-temporal spectroscopy for characterising perovskite solar cells incorporating low-dimensional structures</i> , German Academic Exchange Service, short-term programme (6 months); €18704	2021

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<sup>1</sup>German grading system: 1.0 is the best grade, below 4.0 counts as failed.

<b>Postdoctoral Fellowship</b> <i>Hot charge carriers in tin-based perovskite solar cells to exceed the Shockley-Queisser limit</i> , German Research Foundation; € 66951	2019
<b>Research Grant</b> , <i>Hot-carrier extraction in tin-based perovskite solar cells to exceed the Shockley-Queisser limit</i> funded by the Dutch Research Council	2018
Grant design and participation in submission in the name of Prof. M. A. Loi Funding volume € 325095	
<b>Membership</b> of graduate college 1896 "In situ Microscopy with Electrons, X-rays and Scanning Probes" of the Deutsche Forschungsgemeinschaft, Erlangen, Germany	2016-2017
<b>Poster Award</b> , Next Generation OPV II conference, Groningen, The Netherlands	2015
<b>Doctoral Scholarship</b> , Ubbo Emmius Foundation, University of Groningen, The Netherlands	2014-2015
<b>Thesis Award</b> for best bachelor's thesis 2011, Mentor e. V., Zwickau, Germany	2013
<b>Student Scholarship</b> , Friedrich Ebert Foundation, Bonn, Germany	2012-2013
<b>Student Scholarship</b> , Erasmus Programme of the European Union	2012

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## ACADEMIC VISITS & INTERNATIONAL EXPERIENCE

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<b>Visiting researcher</b> in the group Prof. Sam Stranks University of Cambridge	since 2023
<b>Visiting researcher</b> in the group of Prof. Andrea Mura, University of Cagliari, Italy	2019
<b>Visiting researcher</b> in the group of Prof. Andrea Mura, University of Cagliari, Italy	2017
<b>Undergraduate studies</b> at the University of Linköping, Sweden	2012

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## TEACHING EXPERIENCE

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### COURSES

#### Lectures

*Halide Perovskites in Optoelectronics*, self-designed, master level, Chemnitz since 2023

#### Other

*Nanophysics*, assisting lecturer, bachelor level, Groningen 2019

*Nanophysics*, teaching assistant, bachelor level, Groningen 2017-2018

### DOCTORAL PROJECTS

#### (Co-)Supervisor:

Arina Narudin, *Synthesis of novel perovskite compounds for optoelectronics*, Chemnitz since 2023

Mengru Sun, *Spectroscopy and microscopy of novel semiconductors*, Chemnitz since 2023

Shenyu Nie, *Nanomaterials for optical communication*, Cambridge since 2023

#### Daily advisor:

Barnaby Lewis, *Transient absorption spectroscopy on perovskite solar cells*, Cambridge since 2021

Alan Baldwin, *Statistical analysis of charge carrier recombination*, Cambridge 2021-2023

Eelco K Tekelenburg, *Photophysics of novel perovskite materials*, Groningen 2019-2021

### STUDENT THESES

#### Daily advisor:

2 master's projects, 2 bachelor's projects, 3 internships/visits 2014-2023

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## CONFERENCES & SEMINARS

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### ORGANISATION

**Next Generation Solar Energy PhD/Postdoc Series** since 2022

Co-organiser of a bi-weekly seminar series for emerging researchers in the field of materials science and renewable energy

<https://www.ngse.info/phd-postdoc-series>

**2D Perovskites: Synthesis, Properties, and Applications** 2023

Symposium co-organisation at the MATSUS23 Spring Meeting, Valencia, Spain

**Two-Dimensional Perovskites - Fundamentals, Applications, and Perspectives** 2021

Symposium co-organisation at the NanoGe Spring Meeting, online

### CONTRIBUTIONS (last five years)

**Luminescence in 2D perovskites – on trapping and self-trapping** 2023

European Materials Research Society, Warsaw, Poland (**invited**)

**Luminescence in 2D perovskites – on trapping and self-trapping** 2023

ACS Fall2023, San Francisco, USA (**invited**)

**Luminescence in 2D perovskites – on trapping and self-trapping** 2022

Emerging Light Emitting Materials 22, Limassol, Cyprus (oral)

**Beware of the local effects – 2D perovskites under the microscope** 2022

NanoGe Strain and 2D Perovskites (S2DP) seminar, online (**invited**)

**Luminescence in 2D perovskites – on trapping and self-trapping** 2022

Centre for Processable Electronics Annual Symposium *Imperial College, London, United Kingdom*, (**invited**)

**Taking a closer look: the power of optical microscopy to unravel the complex world of two-dimensional perovskites** 2022

Seminar talk in *Next Generation Solar Energy, PhD-postdoc series*, online (**invited**)

**Hot, Bright, and Trapped States: Luminescence of Two-Dimensional Perovskites and Lessons Learnt from Photoluminescence Microscopy** 2021

Seminar talk in *Optoelectronics of Halide Perovskites* series, University of Bayreuth, Germany (**invited**)

**Broad Emission Bands in Two-Dimensional Perovskites and the Role of Exciton Self-Trapping** 2021

NanoGe Fall Meeting, online (oral)

**Hot, bound, and defect states – exploring the rich photophysics of two-dimensional perovskites** 2020

Seminar Talk Photonics and Optoelectronics Lab, University of Cagliari, Italy (**invited**)

**Photoluminescence spectroscopy of perovskites – beyond 3D lead variants** 2020

Seminar Talk for PVsquared group, University of Pavia, Italy (**invited**)

**On the origin of broad luminescence bands in low-dimensional perovskites**

NanoGe International Conference on Perovskite Solar Cells, Photonics and Optoelectronics (NIPHO20), Seville, Spain (oral)

**The remarkable physics of tin halide perovskites: on hot states and dark states** 2019

13<sup>th</sup> International Conference on Optical Probes for Organic and Hybrid Optoelectronic Materials and Applications, Vilnius, Lithuania (oral)

**The remarkable physics of tin halide perovskites: on hot states and dark states** 2019

10<sup>th</sup> International Conference on Materials for Advanced Technologies, Singapore, Singapore (oral)

**The remarkable physics of tin halide perovskites: on hot states and dark states** 2019

Next Generation Photovoltaic Materials IV, Groningen, The Netherlands (oral)

**The photophysics of FASnI<sub>3</sub> thin films – how processing affects hot carriers, scattering mechanisms and long-lived states** 2019  
3<sup>rd</sup> Generation Photovoltaic Technologies and Beyond, King Abdullah University, Saudi Arabia, (poster)

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## PROFESSIONAL SERVICES & OUTREACH

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**Liaison lecturer** Friedrich-Ebert Foundation, Bonn, Germany since 2024  
**German Physical Society (DPG) Member** since 2022  
**Student mentor** Friedrich-Ebert Foundation, Bonn, Germany since 2021  
**Laser safety officer** Department of Chemical Engineering and Biotechnology, University of Cambridge 2022-2023  
**Outreach presentation** *Organische Solarzellen* as part of 'Lüscher Lectures 2023' for Physics teachers at secondary schools, Dillingen, Germany 2023  
**Outreach presentation** *Lead sulphide colloidal quantum dots* for "Francken" student association, Groningen, The Netherlands 2018  
**Outreach presentation** *Electrical power from the sun* as a part of university lecture series *Studium Generale*, Zwickau, Germany 2011  
**Grant reviewer** National Science Centre Poland since 2021  
**Reviewer for Feodor-Lynen scholarships** Alexander von Humboldt Foundation since 2021  
**Peer-reviewer** including for *ACS Nano*, *Adv. Funct. Mater.*, *Adv. Mater.*, *Joule*, *J. Am. Chem. Soc.*, *J. Phys. Chem. Lett.*, *Sci. Adv.*, *Appl. Phys. Lett.*

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## PROFESSIONAL DEVELOPMENT

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**Supervising Postgraduate Research Students** Workshop, University of Cambridge 2022  
**Introduction to Undergraduate Supervision** Online-workshop, University of Cambridge 2021  
**Negotiation and Influencing Skills** Online-workshop, University of Cambridge 2021  
**Collaboration in Research** Online-workshop, University of Cambridge 2021  
**Relationships & Teams** Online-workshop, University of Cambridge 2021  
**Scientific Proposals with Impact** Seminar, University of Groningen 2018  
**Career Planning in Science** Seminar, University of Groningen 2016  
**Academic Writing in English** Seminar, University of Erlangen-Nuremberg 2015  
**Scientific Presentation Skills** Seminar, University of Groningen 2014

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## PUBLICATIONS

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Currently, 47 published reports in international peer-reviewed journals, 17 of which as first author, accumulate a total of 1795 citations with a Hirsch index of 24 and an i10 index of 33 (Google scholar). \* Denotes corresponding authorship.

1. X. Luo, W. Xu, G. Zheng, S. Tammireddy, Q. Wei, M. Karlsson, Z. Zhang, K. Ji, S. Kahmann, C. Yin, Y. Zou, Z. Zhang, H. Chen, L. Marcal, H. Zhao, D. Ma, D. Zhang, Y. Lu, M. Li, C. Deibel, S. D. Stranks, L. Duan, J. Wallentin, W. Huang, F. Gao, Effects of local compositional heterogeneity in mixed halide perovskites on blue electroluminescence (2024)
2. K. W. P. Orr, J. Diao, M. N. Lintangpradipto, D. J. Batey, A. N. Iqbal, S. Kahmann, K. Frohna, M. Dubajic, S. J. Zelewski, A. E. Dearle, T. A. Selby, P. Li, T. A. S. Doherty, S. Hofmann, O. M. Bakr, I. K. Robinson, S. D. Stranks, Imaging light-induced migration of dislocations in halide perovskites with 3d nanoscale strain mapping, *Adv. Mater.* 2305549 (2023)
3. Y. Zou, X. Bai, S. Kahmann, L. Dai, S. Yuan, S. Yin, J. E. Heger, M. Schwartzkopf, S. V. Roth, C.-C. Chen, J. Zhang, S. D. Stranks, R. D. Friend, P. Müller-Buschbaum, A practical approach

- towards highly reproducible and high-quality perovskite films based on an aging treatment, *Adv. Mater.* 36, 2307024 (2024)
4. M. Rivera Medina, L. Di Mario, S. Kahmann, J. Xi, G. Portale, G. Bongiovanni, A. Mura, J. C. Alonso-Huíttron, M. A. Loi, Tuning the energy transfer in ruddlesden-popper perovskites phases through isopropylammonium addition - towards efficient blue emitters, *Nanoscale* (2023)
  5. H.-H. Fang, E. K. Tekelenburg, H. Xue, S. Kahmann, L. Chen, S. Adjokatse, G. Brocks, S. Tao, M. A. Loi, Unraveling the broadband emission in mixed tin-lead layered perovskites, *Adv. Opt. Mater.* 11, 2202038 (2023)
  6. \*S. Kahmann, H. Duim, A. Rommens, G. H. Ten Brink, G. Portale, S. D. Stranks, M. A. Loi, Taking a closer look – how the microstructure of dion-jacobson perovskites governs their photophysics, *J. Mater. Chem. C* (2022)
  7. \*S. Kahmann, D. Meggiolaro, L. Gregori, E. K. Tekelenburg, M. Pitaro, S. D. Stranks, F. De Angelis, M. A. Loi, The origin of broad emission in <100> two-dimensional perovskites: Extrinsic vs. intrinsic processes, *ACS Energy Letters* (2022)
  8. O. D. I. Moseley, B. Roose, S. J. Zelewski, S. Kahmann, K. Dey, S. D. Stranks, Tunable multiband halide perovskite tandem photodetectors with switchable response, *ACS Photonics* (2022)
  9. C. Cho, S. Feldmann, K. M. Yeom, Y.-W. Jang, S. Kahmann, J.-Y. Huang, T. C.-J. Yang, M. N. T. Khayyat, Y.-R. Wu, M. Choi, J. H. Noh, S. D. Stranks, N. C. Greenham, Efficient vertical charge transport in polycrystalline halide perovskites revealed by four-dimensional tracking of charge carriers, *Nature Materials* (2022)
  10. S. Kahmann, Z. Chen, O. Hordiichuk, O. Nazarenko, S. Shao, M. V. Kovalenko, G. R. Blake, S. Tao, M. A. Loi, Compositional Variation in  $\text{FAPb}_{1-x}\text{Sn}_x\text{I}_3$  and Its Impact on the Electronic Structure: A Combined Density Functional Theory and Experimental Study, *ACS Appl. Mater. Interfaces* acsami.2c00889 (2022)
  11. D. Bederak, A. Shulga, S. Kahmann, W. Talsma, J. Pelanskis, D. N. Dirin, M. V. Kovalenko, M. A. Loi, Heterostructure from PbS Quantum Dot and Carbon Nanotube Inks for High-Efficiency Near-Infrared Light-Emitting Field-Effect Transistors, *Advanced Electronic Materials* n/a, 2101126 (2022)
  12. J. Warby, F. Zu, S. Zeiske, E. Gutierrez-Partida, L. Frohloff, S. Kahmann, K. Frohna, E. Mosconi, E. Radicchi, F. Lang, S. Shah, F. Peña-Camargo, H. Hempel, T. Unold, N. Koch, A. Armin, F. De Angelis, S. D. Stranks, D. Neher, M. Stollerfoht, Understanding Performance Limiting Interfacial Recombination in *pin* Perovskite Solar Cells, *Advanced Energy Materials* 12, 2103567 (2022)
  13. \*S. Kahmann, H. Duim, A. J. Rommens, E. K. Tekelenburg, S. Shao, M. A. Loi, Grain-Specific Transitions Determine the Band Edge Luminescence in Dion–Jacobson Type 2D Perovskites, *Advanced Optical Materials* 9, 2100892 (2021)
  14. S. Kahmann, H. Duim, H.-H. Fang, M. Dyksik, S. Adjokatse, M. Rivera Medina, M. Pitaro, P. Plochocka, M. A. Loi, Photophysics of Two-Dimensional Perovskites—Learning from Metal Halide Substitution, *Advanced Functional Materials* 31, 2103778 (2021)
  15. J. Liu, B. Van der Zee, D. R. Villava, G. Ye, S. Kahmann, M. Kamperman, J. Dong, L. Qiu, G. Portale, M. A. Loi, J. C. Hummelen, R. C. Chiechi, D. Baran, L. J. A. Koster, Molecular Doping Directed by a Neutral Radical, *ACS Appl. Mater. Interfaces* 13, 29858 (2021)
  16. A. Filippetti, S. Kahmann, C. Caddeo, A. Mattoni, M. Saba, A. Bosin, M. A. Loi, Fundamentals of tin iodide perovskites: a promising route to highly efficient, lead-free solar cells, *J. Mater. Chem. A* 9, 11812 (2021)
  17. S. Shao, W. Talsma, M. Pitaro, J. Dong, S. Kahmann, A. J. Rommens, G. Portale, M. A. Loi, Field-Effect Transistors Based on Formamidinium Tin Triiodide Perovskite, *Advanced Functional Materials* 31, 2008478 (2021)
  18. E. K. Tekelenburg, S. Kahmann, M. E. Kamminga, G. R. Blake, M. A. Loi, Elucidating the Structure and Photophysics of Layered Perovskites through Cation Fluorination, *Advanced Optical Materials* 9, 2001647 (2021)

19. S. Shao, M. Nijenhuis, J. Dong, S. Kahmann, G. H. ten Brink, G. Portale, M. A. Loi, Influence of the stoichiometry of tin-based 2D/3D perovskite active layers on solar cell performance, *J. Mater. Chem. A* 9, 10095 (2021)
20. D. Bederak, N. Sukharevska, S. Kahmann, M. Abdu-Aguye, H. Duim, D. N. Dirin, M. V. Kovalenko, G. Portale, M. A. Loi, On the Colloidal Stability of PbS Quantum Dots Capped with Methylammonium Lead Iodide Ligands, *ACS Appl. Mater. Interfaces* 12, 52959 (2020)
21. S. Kahmann, M. A. Loi, Trap states in lead chalcogenide colloidal quantum dots—origin, impact, and remedies, *Applied Physics Reviews* 7, 041305 (2020)
22. B. G. H. M. Groeneveld, H. Duim, S. Kahmann, O. De Luca, E. K. Tekelenburg, M. E. Kamminga, L. Protesescu, G. Portale, G. R. Blake, P. Rudolf, M. A. Loi, Photochromism in Ruddlesden–Popper copper-based perovskites: a light-induced change of coordination number at the surface, *J. Mater. Chem. C* 8, 15377 (2020)
23. S. Kahmann, O. Nazarenko, S. Shao, O. Hordiichuk, M. Kepenekian, J. Even, M. V. Kovalenko, G. R. Blake, M. A. Loi, Negative Thermal Quenching in FASnI<sub>3</sub> Perovskite Single Crystals and Thin Films, *ACS Energy Lett.* 5, 2512 (2020)
24. S. Kahmann, E. K. Tekelenburg, H. Duim, M. E. Kamminga, M. A. Loi, Extrinsic nature of the broad photoluminescence in lead iodide-based Ruddlesden–Popper perovskites, *Nat Commun* 11, 2344 (2020)
25. J. Dong, S. Shao, S. Kahmann, A. J. Rommens, D. Hermida-Merino, G. H. ten Brink, M. A. Loi, G. Portale, Mechanism of Crystal Formation in Ruddlesden–Popper Sn-Based Perovskites, *Advanced Functional Materials* 30, 2001294 (2020)
26. I. van de Riet, H.-H. Fang, S. Adjokatse, S. Kahmann, M. A. Loi, Influence of morphology on photoluminescence properties of methylammonium lead tribromide films, *Journal of Luminescence* 220, 117033 (2020)
27. M. Abdu-Aguye, D. Bederak, S. Kahmann, N. Killilea, M. Sytnyk, W. Heiss, M. A. Loi, Photophysical and electronic properties of bismuth-perovskite shelled lead sulfide quantum dots, *J. Chem. Phys.* 151, 214702 (2019)
28. G. Demirel, R. L. M. Giesecking, R. Ozdemir, S. Kahmann, M. A. Loi, G. C. Schatz, A. Facchetti, H. Usta, Molecular engineering of organic semiconductors enables noble metal-comparable SERS enhancement and sensitivity, *Nat Commun* 10, 5502 (2019)
29. H. Duim, S. Adjokatse, S. Kahmann, G. H. ten Brink, M. A. Loi, The Impact of Stoichiometry on the Photophysical Properties of Ruddlesden–Popper Perovskites, *Adv. Funct. Mater.* 30, 1907505 (2020)
30. R. Sun, J. Guo, Q. Wu, Z. Zhang, W. Yang, J. Guo, M. Shi, Y. Zhang, S. Kahmann, L. Ye, X. Jiao, M. A. Loi, Q. Shen, H. Ade, W. Tang, C. J. Brabec, J. Min, A multi-objective optimization-based layer-by-layer blade-coating approach for organic solar cells: rational control of vertical stratification for high performance, *Energy Environ. Sci.* 12, 3118 (2019)
31. S. Kahmann, A. Shulga, M. A. Loi, Quantum Dot Light-Emitting Transistors—Powerful Research Tools and Their Future Applications, *Advanced Functional Materials* 30, 1904174 (2020)
32. S. Kahmann, S. Shao, M. A. Loi, Cooling, Scattering, and Recombination—The Role of the Material Quality for the Physics of Tin Halide Perovskites, *Adv. Funct. Mater.* 29, 1902963 (2019)
33. S. Adjokatse, S. Kahmann, H. Duim, M. A. Loi, Effects of strontium doping on the morphological, structural, and photophysical properties of FASnI<sub>3</sub> perovskite thin films, *APL Materials* 7, 031116 (2019)
34. N. Gasparini, S. Kahmann, M. Salvador, J. D. Perea, A. Sperlich, A. Baumann, N. Li, S. Reiberger, E. Spiecker, V. Dyakonov, G. Portale, M. A. Loi, C. J. Brabec, T. Ameri, Favorable Mixing Thermodynamics in Ternary Polymer Blends for Realizing High Efficiency Plastic Solar Cells, *Adv. Energy Mater.* 9, 1803394 (2019)
35. S. Kahmann, M. A. Loi, Hot carrier solar cells and the potential of perovskites for breaking the Shockley–Queisser limit, *J. Mater. Chem. C* 7, 2471 (2019)

36. A. Classen, L. Einsiedler, T. Heumueller, A. Graf, M. Brohmann, F. Berger, S. Kahmann, M. Richter, G. J. Matt, K. Forberich, J. Zaumseil, C. J. Brabec, Absence of Charge Transfer State Enables Very Low  $V_{OC}$  Losses in SWCNT:Fullerene Solar Cells, *Adv. Energy Mater.* 9, 1801913 (2019)
37. A. G. Shulga, S. Kahmann, D. N. Dirin, A. Graf, J. Zaumseil, M. V. Kovalenko, M. A. Loi, Electroluminescence Generation in PbS Quantum Dot Light-Emitting Field-Effect Transistors with Solid-State Gating, *ACS Nano* 12, 12805 (2018)
38. S. Kahmann, W. Gomulya, M. A. Loi, A. Mura, Donor–acceptor photoexcitation dynamics in organic blends investigated with a high sensitivity pump–probe system, *J. Mater. Chem. C* 6, 10822 (2018)
39. S. Kahmann, M. A. Loi, C. J. Brabec, Delocalisation softens polaron electronic transitions and vibrational modes in conjugated polymers, *J. Mater. Chem. C* 6, 6008 (2018)
40. S. Kahmann, M. Sytnyk, N. Schrenker, G. J. Matt, E. Spiecker, W. Heiss, C. J. Brabec, M. A. Loi, Revealing Trap States in Lead Sulphide Colloidal Quantum Dots by Photoinduced Absorption Spectroscopy, *Adv. Electron. Mater.* 4, 1700348 (2018)
41. S. Kahmann, J. M. Salazar Rios, M. Zink, S. Allard, U. Scherf, M. C. dos Santos, C. J. Brabec, M. A. Loi, Excited-State Interaction of Semiconducting Single-Walled Carbon Nanotubes with Their Wrapping Polymers, *J. Phys. Chem. Lett.* 8, 5666 (2017)
42. S. Kahmann, D. Fazzi, G. J. Matt, W. Thiel, M. A. Loi, C. J. Brabec, Polarons in Narrow Band Gap Polymers Probed over the Entire Infrared Range: A Joint Experimental and Theoretical Investigation, *J. Phys. Chem. Lett.* 7, 4438 (2016)
43. S. Chen, Y. Hou, H. Chen, M. Richter, F. Guo, S. Kahmann, X. Tang, T. Stubhan, H. Zhang, N. Li, N. Gasparini, C. O. R. Quiroz, L. S. Khazada, G. J. Matt, A. Osvet, C. J. Brabec, Exploring the Limiting Open-Circuit Voltage and the Voltage Loss Mechanism in Planar CH<sub>3</sub>NH<sub>3</sub>PbBr<sub>3</sub> Perovskite Solar Cells, *Advanced Energy Materials* 6, 1600132 (2016)
44. X. Tang, M. Brandl, B. May, I. Levchuk, Y. Hou, M. Richter, H. Chen, S. Chen, S. Kahmann, A. Osvet, F. Maier, H.-P. Steinrück, R. Hock, G. J. Matt, C. J. Brabec, Photoinduced degradation of methylammonium lead triiodide perovskite semiconductors, *J. Mater. Chem. A* 4, 15896 (2016)
45. H. Chen, Y. Hou, C. E. Halbig, S. Chen, H. Zhang, N. Li, F. Guo, X. Tang, N. Gasparini, I. Levchuk, S. Kahmann, C. O. Ramirez Quiroz, A. Osvet, S. Eigler, C. J. Brabec, Extending the environmental lifetime of unpackaged perovskite solar cells through interfacial design, *J. Mater. Chem. A* 4, 11604 (2016)
46. S. Kahmann, A. Mura, L. Protesescu, M. V. Kovalenko, C. J. Brabec, M. A. Loi, Opto-electronics of PbS quantum dot and narrow bandgap polymer blends, *J. Mater. Chem. C* 3, 5499 (2015)
47. B. Beyer, D. Griese, C. Schirrmann, R. Pfeifer, S. Kahmann, O. R. Hild, K. Leo, Small molecule bulk heterojunction organic solar cells with coumarin-6 as donor material, *Thin Solid Films* 536, 206 (2013)