

# Oliver Bünermann

## PERSONAL INFORMATION

Name: Bünermann, Oliver  
Nationality: German  
Date of birth: 14 June 1978  
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Family status: married  
Children: 3



## CURRENT POSITION

2010– Group Leader, Atom-Surface Scattering Dynamics, Institute for Physical Chemistry, Georg-August-Universität Göttingen, Germany  
Web site: <http://uni-goettingen.de/en/atom-surface+scattering+dynamics/212020.html>

## EDUCATION AND PROFESSIONAL PREPARATION

2021 Habilitation in Physical Chemistry, Georg-August Universität Göttingen, Germany  
2009-2010 Post-doctoral researcher, Department of Chemistry, University of California, Berkeley, USA  
2006-2009 Post-doctoral researcher, Faculty of Physics, University of Freiburg, Germany  
2006 Ph.D. Faculty of Physics, University of Bielefeld, Germany  
2003 Diploma, Faculty of Physics, University of Bielefeld, Germany

## FELLOWSHIPS AND AWARDS

2009 Forschungsstipendium, DFG  
2008 Dissertationspreis 2007 der Westfälisch Lippischen Universitätsgesellschaft (Ph.D. thesis award)

## TEACHING ACTIVITIES

2010– Lectures in physical chemistry, Institute for Physical Chemistry, Georg-August-Universität Göttingen, Germany

## INSTITUTIONAL RESPONSIBILITIES

2015- Executive Director of the International Center for Advanced Studies of Energy Conversion (ICASEC), Georg-August-Universität Göttingen, Germany  
2021- Local chairman OV GDCh Göttingen

## MEMBERSHIPS OF SCIENTIFIC SOCIETIES

Member of Deutsche Bunsen-Gesellschaft für physikalische Chemie  
Member of Deutsche Physikalische Gesellschaft  
Member of Gesellschaft Deutscher Chemiker

## RESEARCH MENTORS

- Prof. Dr. Frank Stienkemeier, Bielefeld and Freiburg, Germany
- Prof. Dr. Daniel M. Neumark, Berkeley, USA
- Prof. Dr. Alec M. Wodtke, Göttingen, Germany

## INVITED AND PEER-REVIEWED SCIENTIFIC PRESENTATIONS

1. 2nd International Workshop on Scattering of Atoms and Molecules from Surfaces, 2013, *Inelastic Hydrogen Atom Scattering: A new tool to investigate energy conversion processes at surfaces.*
2. XIXth Symposium on Atomic, Cluster and Surface Physics, 2014, *Inelastic Hydrogen Atom Scattering: A new tool to investigate energy conversion processes at surfaces.*
3. Gordon Research Conference on Dynamics at Surfaces, 2015, *Inelastic Hydrogen Atom Scattering from Metals: Importance of Electron-Hole-Pair Excitations.*

4. 20<sup>th</sup> Symposium on Atomic, Cluster and Surface Physics, 2016, *Inelastic Hydrogen Atom Scattering: Role of Electron-Hole Pair Excitations*.
5. Bunsen Tagung 2016, *Inelastic Hydrogen Atom Scattering: Role of Electron-Hole Pair Excitations*.
6. 3<sup>rd</sup> International Conference on Scattering of Atoms and Molecules from Surfaces, 2016, *Inelasticity in H atom scattering from surfaces*.
7. International Conference on Molecular Energy transfer in Complex Systems, 2017, *H atom scattering from surfaces*.
8. DPG Frühjahrstagung der Sektion Kondensierte Materie, 2018, *Hydrogen Atom Adsorption on Surfaces studied in Scattering Experiments*.
9. Symposio Max Planck / Colombia Fronteras de la Ciencia, 2019, *Dynamics and Surfaces - Hydrogen Atom Adsorption on Surfaces Studied in Scattering Experiments*.
10. Bunsen Tagung 2023, *Surface electronic structure of semiconductors probed by H atom scattering*.
11. 2024 WPI Symposium: Energy Research for a Carbon Neutral Future, *Inelastic H-atom scattering as a probe for energy conversion on surfaces*.
12. Sandia National Laboratories PI Meeting, 2024, *Inelastic hydrogen atom scattering as probe for surface dynamics*.

## RESEARCH PUBLICATIONS [1-39] ORCID: 0000-0001-9837-6548

1. Zhu, L., Q. Zheng, Y. Wang, K. Krüger, A. Wodtke, O. Bünermann, J. Zhao, H. Guo, and B. Jiang, *Mechanistic Insights into Non-Adiabatic Interband Transitions on a Semiconductor Surface Induced by Hydrogen Atom Collisions*. JACS Au **4**, 4518-4526 (2024), DOI: 10.1021/jacsau.4c00909.
2. Krüger, K., N. Hertl, A.M. Wodtke, and O. Bünermann, *Temperature dependence of the Ge(111) surface electronic structure probed by inelastic H atom scattering*. Physical Review Materials **8**, 034603 (2024), DOI: 10.1103/PhysRevMaterials.8.034603.
3. Liebetrau, M., Y. Dorenkamp, O. Bünermann, and J. Behler, *Hydrogen Atom Scattering at the Al<sub>2</sub>O<sub>3</sub> (0001) Surface: A Combined Experimental and Theoretical Study*. Physical Chemistry Chemical Physics **26**, 1696-1708 (2024), DOI: 10.1039/d3cp04729f.
4. Krüger, K., Y. Wang, L. Zhu, B. Jiang, H. Guo, A.M. Wodtke, and O. Bünermann, *Isotope effect suggests site-specific nonadiabaticity on Ge(111)c(2x8)*. Natural Sciences **4**, e20230019 (2024), DOI: 10.1002/ntls.20230019.
5. Bünermann, O., *Surface electronic Structure of Semiconductors Probed by H Atom Scattering*. Bunsen-Magazin **4/2023**, 122-124 (2023).
6. Krüger, K., Y. Wang, S. Tödter, F. Debbeler, A. Matveenko, N. Hertl, X. Zhou, B. Jiang, H. Guo, A.M. Wodtke, and O. Bünermann, *Hydrogen atom collisions with a semiconductor efficiently promote electrons to the conduction band*. Nature Chemistry **15**, 326-331 (2022), DOI: 10.1038/s41557-022-01085-x.
7. Hertl, N., K. Krüger, and O. Bünermann, *Electronically Nonadiabatic H Atom Scattering from Low Miller Index Surfaces of Silver*. Langmuir **38**, 14162-14171 (2022), DOI: 10.1021/acs.langmuir.2c02140.
8. Lecroart, L., N. Hertl, Y. Dorenkamp, H. Jiang, T.N. Kitsopoulos, A. Kandratsenka, O. Bünermann, and A.M. Wodtke, *Adsorbate modification of electronic nonadiabaticity: H atom scattering from p(2 × 2) O on Pt(111)*. Journal of Chemical Physics **155**, 034702 (2021), DOI: 10.1063/5.0058789.
9. Hertl, N., A. Kandratsenka, O. Bünermann, and A.M. Wodtke, *Multibounce and Subsurface Scattering of H Atoms Colliding with a van der Waals Solid*. Journal of Physical Chemistry A **125**, 5745-5752 (2021), DOI: 10.1021/acs.jpca.1c03433.
10. Bünermann, O., A. Kandratsenka, and A.M. Wodtke, *Inelastic Scattering of H Atoms from Surfaces*. Journal of Physical Chemistry A **125**, 3059-3076 (2021), DOI: 10.1021/acs.jpca.1c00361.

11. Jiang, H.Y., X. Tao, M. Kammler, F. Ding, A.M. Wodtke, A. Kandratsenka, T.F. Miller, and O. Bünermann, *Small nuclear quantum effects in scattering of H and D from graphene*. Journal of Physical Chemistry Letters **12**, 1991-1996 (2021), DOI: 10.1021/acs.jpcclett.0c02933.
12. Wille, S., H. Jiang, O. Bünermann, A.M. Wodtke, J. Behler, and A. Kandratsenka, *An experimentally validated neural-network potential energy surface for H-atom on free-standing graphene in full dimensionality*. Physical Chemistry Chemical Physics **22**, 26113-26120 (2020), DOI: 10.1039/d0cp03462b
13. Jiang, H.Y., M. Kammler, F. Ding, Y. Dorenkamp, F.R. Manby, A.M. Wodtke, T.F. Miller, A. Kandratsenka, and O. Bünermann, *Imaging covalent bond formation by H atom scattering from graphene*. Science **364**, 379-382 (2019), DOI: 10.1126/science.aaw6378.
14. Jiang, H.Y., Y. Dorenkamp, K. Krüger, and O. Bünermann, *Inelastic H and D atom scattering from Au(111) as benchmark for theory*. Journal of Chemical Physics **150**, 184704 (2019), DOI: 10.1063/1.5094693.
15. Dorenkamp, Y., C. Volkmann, V. Roddatis, S. Schneider, A.M. Wodtke, and O. Bünermann, *Inelastic H Atom Scattering from Ultrathin Aluminum Oxide Films Grown by Atomic Layer Deposition on Pt(111)*. Journal of Physical Chemistry C **122**, 10096-10102 (2018), DOI: 10.1021/acs.jpcc.8b02692.
16. Kandratsenka, A., H.Y. Jiang, Y. Dorenkamp, S.M. Janke, M. Kammler, A.M. Wodtke, and O. Bünermann, *Unified description of H-atom-induced chemicurrents and inelastic scattering*. Proceedings of the National Academy of Sciences of the United States of America **115**, 680-684 (2018), DOI: 10.1073/pnas.1710587115.
17. Dorenkamp, Y., H.Y. Jiang, H. Köckert, N. Hertl, M. Kammler, S.M. Janke, A. Kandratsenka, A.M. Wodtke, and O. Bünermann, *Hydrogen collisions with transition metal surfaces: Universal electronically nonadiabatic adsorption*. Journal of Chemical Physics **148**, 034706 (2018), DOI: 10.1063/1.5008982.
18. Bünermann, O., H.Y. Jiang, Y. Dorenkamp, D.J. Auerbach, and A.M. Wodtke, *An ultrahigh vacuum apparatus for H atom scattering from surfaces*. Review of Scientific Instruments **89**, 094101 (2018), DOI: 10.1063/1.5047674.
19. Bünermann, O., H.Y. Jiang, Y. Dorenkamp, A. Kandratsenka, S.M. Janke, D.J. Auerbach, and A.M. Wodtke, *Electron-hole pair excitation determines the mechanism of hydrogen atom adsorption*. Science **350**, 1346-1349 (2015), DOI: 10.1126/science.aad4972.
20. Dvorak, M., M. Mueller, O. Bünermann, and F. Stienkemeier, *Size dependent transition to solid hydrogen and argon clusters probed via spectroscopy of PTCDA embedded in helium nanodroplets*. Journal of Chemical Physics **140**, 144301 (2014), DOI: 10.1063/1.4870395.
21. Kaufmann, S., D. Schwarzer, C. Reichardt, A.M. Wodtke, and O. Bünermann, *Generation of ultra-short hydrogen atom pulses by bunch-compression photolysis*. Nature Communications **5**, 5373 (2014), DOI: 10.1038/ncomms6373.
22. Dvorak, M., M. Müller, T. Knoblauch, O. Bünermann, A. Rydlo, S. Minniberger, W. Harbich, and F. Stienkemeier, *Spectroscopy of 3, 4, 9, 10-perylenetetracarboxylic dianhydride (PTCDA) attached to rare gas samples: Clusters vs. bulk matrices. I. Absorption spectroscopy*. Journal of Chemical Physics **137**, 164301 (2012), DOI: 10.1063/1.4759443.
23. Dvorak, M., M. Müller, T. Knoblauch, O. Bünermann, A. Rydlo, S. Minniberger, W. Harbich, and F. Stienkemeier, *Spectroscopy of 3, 4, 9, 10-perylenetetracarboxylic dianhydride (PTCDA) attached to rare gas samples: Clusters vs. bulk matrices. II. Fluorescence emission spectroscopy*. Journal of Chemical Physics **137**, 164302 (2012), DOI: 10.1063/1.4759445.
24. Bünermann, O., O. Kornilov, S.R. Leone, D.M. Neumark, and O. Gessner, *Femtosecond Extreme Ultraviolet Ion Imaging of Ultrafast Dynamics in Electronically Excited Helium Nanodroplets*. IEEE

Journal of Selected Topics in Quantum Electronics **18**, 308-317 (2012), DOI: 10.1109/Jstqe.2011.2109054.

25. Bünermann, O., O. Kornilov, D.J. Haxton, S.R. Leone, D.M. Neumark, and O. Gessner, *Ultrafast probing of ejection dynamics of Rydberg atoms and molecular fragments from electronically excited helium nanodroplets*. Journal of Chemical Physics **137**, 214302 (2012), DOI: 10.1063/1.4768422.
26. Kornilov, O., O. Bünermann, D.J. Haxton, S.R. Leone, D.M. Neumark, and O. Gessner, *Femtosecond Photoelectron Imaging of Transient Electronic States and Rydberg Atom Emission from Electronically Excited He Droplets*. Journal of Physical Chemistry A **115**, 7891-7900 (2011), DOI: 10.1021/Jp2004216.
27. Roden, J., A. Eisfeld, M. Dvorak, O. Bünermann, and F. Stienkemeier, *Vibronic line shapes of PTCDA oligomers in helium nanodroplets*. Journal of Chemical Physics **134**, 054907 (2011), DOI: 10.1063/1.3526749.
28. Bünermann, O. and F. Stienkemeier, *Modeling the formation of alkali clusters attached to helium nanodroplets and the abundance of high-spin states*. European Physical Journal D **61**, 645-655 (2011), DOI: 10.1140/epjd/e2011-10466-0.
29. Kornilov, O., C.C. Wang, O. Bünermann, A.T. Healy, M. Leonard, C. Peng, S.R. Leone, D.M. Neumark, and O. Gessner, *Ultrafast Dynamics in Helium Nanodroplets Probed by Femtosecond Time-Resolved EUV Photoelectron Imaging*. Journal of Physical Chemistry A **114**, 1437-1445 (2010), DOI: 10.1021/Jp907312t.
30. Hernando, A., M. Barranco, R. Mayol, M. Pi, F. Ancilotto, O. Bünermann, and F. Stienkemeier, *Absorption Spectrum of Na Atoms Attached to Helium Nanodroplets*. Journal of Low Temperature Physics **158**, 105-111 (2010), DOI: 10.1007/s10909-009-9934-7.
31. Bünermann, O., M. Dvorak, F. Stienkemeier, A. Hernando, R. Mayol, M. Pi, M. Barranco, and F. Ancilotto, *Calcium atoms attached to mixed helium droplets: A probe for the He-3-He-4 interface*. Physical Review B **79**, 214511 (2009), DOI: 10.1103/Physrevb.79.214511.
32. Bünermann, O., G. Droppelmann, A. Hernando, R. Mayol, and F. Stienkemeier, *Unraveling the absorption spectra of alkali metal atoms attached to helium nanodroplets*. Journal of Physical Chemistry A **111**, 12684-12694 (2007), DOI: 10.1021/Jp0760760.
33. Mudrich, M., B. Forkl, S. Mueller, M. Dvorak, O. Bünermann, and F. Stienkemeier, *Kilohertz laser ablation for doping helium nanodroplets*. Review of Scientific Instruments **78**, 103106 (2007), DOI: 10.1063/1.2796849.
34. Hernando, A., R. Mayol, M. Pi, M. Barranco, F. Ancilotto, O. Bünermann, and F. Stienkemeier, *The structure and energetics of He-3 and He-4 nanodroplets doped with alkaline earth atoms*. Journal of Physical Chemistry A **111**, 7303-7308 (2007), DOI: 10.1021/Jp0701385.
35. Mayol, R., F. Ancilotto, M. Barranco, O. Bünermann, M. Pi, and F. Stienkemeier, *Alkali atoms attached to He-3 nanodroplets*. Journal of Low Temperature Physics **138**, 229-234 (2005), DOI: 10.1007/s10909-005-1555-1.
36. Stienkemeier, F., O. Bünermann, R. Mayol, F. Ancilotto, M. Barranco, and M. Pi, *Surface location of sodium atoms attached to He-3 nanodroplets*. Physical Review B **70**, 214508 (2004), DOI: 10.1103/Physrevb.70.214509.
37. Bünermann, O., M. Mudrich, M. Weidemuller, and F. Stienkemeier, *Spectroscopy of Cs attached to helium nanodroplets*. Journal of Chemical Physics **121**, 8880-8886 (2004), DOI: 10.1063/1.1805508.
38. Mudrich, M., O. Bünermann, F. Stienkemeier, O. Dulieu, and M. Weidemuller, *Formation of cold bialkali dimers on helium nanodroplets*. European Physical Journal D **31**, 291-299 (2004), DOI: 10.1140/epjd/e2004-00139-6.

39. Droppelmann, G., O. Bünermann, C.P. Schulz, and F. Stienkemeier, *Formation times of RbHe exciplexes on the surface of superfluid versus normal fluid helium nanodroplets*. *Physical Review Letters* **93**, 023402 (2004), DOI: 10.1103/Physrevlett.93.023402.