

Prof. Dr. Stefan Ringe

Assistant Professor, Korea University

Research Fellow, IBS Center for Molecular Spectroscopy and Dynamics (CMSD)

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Curriculum Vitae

Education

- 06/2013– **Ph.D. in Computational Chemistry**, *Technical University Munich* (Germany)
05/2017 | Prof. Dr. Karsten Reuter, “*Summa Cum Laude*”
- 10/2010– **M.Sc. in Chemistry**, *Georg-August University Göttingen* (Germany)
03/2013 | Prof. Dr. Alec Wodtke, “*With Honors*”
- 10/2007– **B.Sc. in Chemistry**, *Georg-August University Göttingen* (Germany)
09/2010 | Prof. Dr. Philipp Vana,

Professional Experience

- 02/2022– **Assistant Professor**, *Korea University* (Rep. of Korea)
present | Department of Chemistry
- 02/2022– **Research Fellow**, *Institute for Basic Science (IBS)* (Rep. of Korea)
present | Center for Molecular Spectroscopy and Dynamics
- 02/2020– **Assistant Professor**, *DGIST* (Rep. of Korea)
02/2022 | Department of Energy Science & Engineering
- 02/2019– **Postdoctoral Research Scholar**, *KAIST* (Rep. of Korea)
02/2020 | Prof. Dr. Hyungjun Kim
- 07/2017– **Postdoctoral Research Scholar**, *Stanford University* (USA)
01/2019 | Prof. Dr. Jens Nørskov

Research Interests

- **Computational Design for Sustainable Energy Conversion:** CO₂ reduction, water oxidation (oxygen evolution reaction – OER) and reduction (hydrogen evolution reaction – HER), oxygen reduction reaction (fuel cell), NO reduction....

- **Electrified Solid-Liquid Interface Engineering:** Solid-liquid interface electrification and its influence on electrochemical reaction kinetics.
- **Machine Learning:** Development of *ab initio*-based machine learning techniques for modeling molecular dynamics at electrified solid-liquid interfaces and high-throughput screening of electrocatalysts.
- **Multi-scale Modeling of Electrochemical Systems:** Mass transport, buffer reactions, electrolyte design, porous electrodes.

Awards

- 2019 **Award for Outstanding Oral Presentation**, 130th Physical Chemistry Summer Symposium, Busan, Rep. of Korea
- 2016 **DAAD scholarship (Kongressreise)**, 67th Annual Meeting of the ISE, The Hague, Netherlands
- 2014 **Selection for Global Young Scientist Summit**, *National University of Singapore (Singapore)*
- 2013 **Award for Outstanding Graduation**, *Georg-August University Göttingen (Germany)*, awarded by chemistry department
- 2012 **Award for Outstanding Teaching**, *Georg-August University Göttingen (Germany)*, awarded by students

2010,2011,2012 Scholarship of Lower Saxony

- 2010 **Otto Wallach Award**, *Georg-August University Göttingen (Germany)*, best B.Sc. degree in chemistry
- 2007 **GDCh Award**, *Halepaghen-Gymnasium Buxtehude*, best graduation in chemistry (German Society of Chemistry)

Teaching and Mentoring Experience

- 2020– **Mentoring/Supervision**, *Technical University Munich (Germany)*, Master students (2), PhD student (1), Postdocs (2)
- 2014–2020 **Mentoring/Supervision**, *Technical University Munich (Germany)*, Master students (4), PhD students (2)
- 2020– **Lecturer**, *Technical University Munich (Germany)*, Thermodynamics, Advanced computational chemistry
- 10/2013– **Tutor**, *Technical University Munich (Germany)*,
09/2016 Mathematics, computational & theoretical chemistry, molecular simulations, thermodynamics, numerical methods, spectroscopy

Scientific Achievements

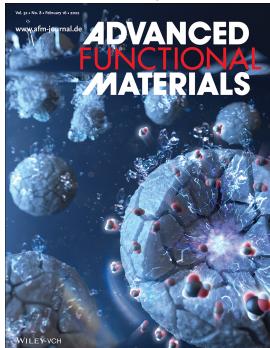
- Invited Talks
- 10/2022 IBS symposium at the 130th General Meeting of the Korea Chemical Society (KCS), Gyeongju HICO , Rep. of Korea
 - 08/2022 Theory seminar, Theory department, FHI Berlin, Germany

- 11/2021 Department seminar, Department of Biomolecular and Chemical Engineering, Sogang University (online)
- 07/2021 17th KIAS Electronic Structure Meeting, Online
- 04/2021 2021 Spring Meeting of the Korean Physical Society, Sono Moon Resort, Yangpyeong, (Rep. of Korea)
- 02/2021 BK21 Seminar of the Department of Chemical Engineering, University of Seoul, Online
- 11/2020 6th International Conference on Electronic Materials and Nanotechnology for Green Environment (ENGE), Jeju (Rep. of Korea)
- 10/2020 Annual Meeting of the Korean Chemical Society (KCS), Suwon (Rep. of Korea)
- 09/2020 2020 Pacific Rim Meeting of electrochemical and solid state science (PRIME), Online
- 09/2020 Department seminar, Department of Chemistry, KAIST (Rep. of Korea)
- 06/2020 2020 Spring Meeting of the Korean Electrochemical Society (KECS), ICE Jeju Island (Rep. of Korea)
- 03/2020 BK21 Creation of New Materials Section Seminar, Department of Material Science and Engineering, Korea University (Rep. of Korea)
- 01/2020 Material Science & Engineering (MSE) department seminar, KAIST (Rep. of Korea)
- 12/2018 DTU Physics Seminar, Denmark Technical University (DTU) (Denmark)
- 07/2018 FHI-aims Developer & User Meeting, Technical University Munich (Germany)
- 03/2018 Department seminar, Department of Chemistry, KAIST (Rep. of Korea)

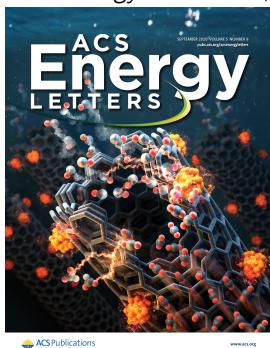
Paper reviews	Over 20 peer reviews for various SCI journals, such as <i>Nature Catal.</i> , <i>Nature Energy</i> , <i>Angew. Chem. Int. Ed.</i> , <i>Joule</i> , <i>Adv. Energy Mater.</i> , <i>Nature Comm.</i> , etc.
Research Stay	<ul style="list-style-type: none"> • 10/2011–02/2012, <i>Synthesis of Oxygen-Evolution Catalysts</i>, Prof. Dr. Åkermark, Stockholm University (Sweden)

Publications († = The authors contributed equally to this work; * = Corresponding author.)

- 1 S. Byun†, Z. Liu†, D. O. Shin†, K. Kim†, J. Choi, Y. Roh, D. Jin, S. Jung, K.-G. Kim, Y.-G. Lee*, S. Ringe*, Y. M. Lee*, *Alkali metal ion substituted carboxymethyl cellulose as anode polymeric binders for rapidly chargeable lithium-ion batteries*, *Energy Environ. Mater.* **2022**, DOI: 10.1002/eem2.12509.
- 2 K. K. Patra†, Z. Liu†, H. Lee†, S. Hong, H. Song, H. G. Abbas, Y. Kwon*, S. Ringe*, J. Oh*, *Boosting Electrochemical CO₂ Reduction to Methane via Tuning Oxygen Vacancy Concentration and Surface Termination on a Copper/Ceria Catalyst*, *ACS Catal.* **2022**, *12*, 10973–10983, DOI: 10.1021/acscatal.2c02669.
- 3 S.-J. Shin†, H. Choi†, S. Ringe, D. H. Won, H.-S. Oh, D. H. Kim, T. Lee, D.-H. Nam, H. Kim*, C. H. Choi*, *A unifying mechanism for cation effect modulating C1 and C2 productions from CO₂ electroreduction*, *Nat. Commun.* **2022**, *13*, 5482, DOI: 10.1038/s41467-022-33199-8.
- 4 S.-J. Kim, S. Lebègue, S. Ringe*, H. Kim*, *GW Quasiparticle Energies and Bandgaps of Two-Dimensional Materials Immersed in Water*, *J. Phys. Chem. Lett.* **2022**, *13*, 7574–7582, DOI: 10.1021/acs.jpclett.2c01808.
- 5 S. Ringe†*, N. G. Hörmann†, H. Oberhofer, K. Reuter*, *Implicit Solvation Methods for Catalysis at Electrified Interfaces*, *Chem. Rev.* **2022**, *122*, 10777–10820, DOI: 10.1021/acs.chemrev.1c00675.
- 6 E. B. Tetteh†, C. Gyan-Barimah†, H.-Y. Lee†, T.-H. Kang, S. Kang, S. Ringe*, J.-S. Yu*, *Strained Pt(221) Facet in a PtCo@Pt-Rich Catalyst Boosts Oxygen Reduction and Hydrogen Evolution Activity*, *ACS Appl. Mater. Interfaces* **2022**, *14*, 25246–25256, DOI: 10.1021/acsmami.2c00398.
- 7 G. Kastlunger*, L. Wang, N. Govindarajan, H. H. Heenen, S. Ringe, T. Jaramillo, C. Hahn*, K. Chan, *Using pH Dependence to Understand Mechanisms in Electrochemical CO Reduction*, *ACS Catal.* **2022**, *12*, 4344–4357, DOI: 10.1021/acscatal.1c05520.
- 8 S.-J. Shin†, D. H. Kim†, G. Bae†, S. Ringe, H. Choi, H.-K. Lim, C. H. Choi*, H. Kim*, *On the importance of the electric double layer structure in aqueous electrocatalysis*, *Nat. Commun.* **2022**, *13*, 174, DOI: 10.1038/s41467-021-27909-x.
- 9 S. Ringe*, *Approaching in-depth mechanistic understanding of electrochemical hydrogen conversion from computational simulations*, *Chem Catalysis* **2021**, *1*, 1160–1162, DOI: 10.1016/j.chechat.2021.10.019.
- 10 H. Song, Y. C. Tan, B. Kim, S. Ringe*, J. Oh*, *Tunable Product Selectivity in Electrochemical CO₂ Reduction on Well-Mixed Ni-Cu Alloys*, *ACS Appl. Mater. Interfaces* **2021**, *13*, 55272–55280, DOI: 10.1021/acsami.1c19224.
- 11 M. K. Kim, H. Lee, J. H. Won, W. Sim, S. J. Kang, H. Choi, M. Sharma, H. Oh, S. Ringe*, Y. Kwon*, H. M. Jeong*, *Design of less than 1 nm Scale Spaces on SnO₂ Nanoparticles for High-Performance Electrochemical CO₂ Reduction*, *Adv. Funct. Mater.* **2021**, *n/a*, 2107349,

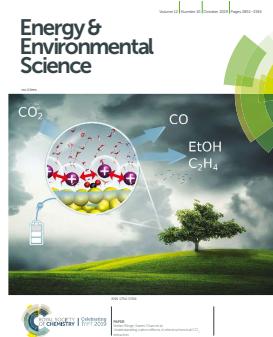


- 12 D. H. Kim†, S. Ringe†, H. Kim, S. Kim, B. Kim, G. Bae, H.-S. Oh, F. Jaouen, W. Kim*, H. Kim*, C. H. Choi*, Selective electrochemical reduction of nitric oxide to hydroxylamine by atomically dispersed iron catalyst, *Nat. Commun.* **2021**, *12*, 1–11, DOI: 10.1038/s41467-021-22147-7.
- 13 T. Ludwig, J. A. Gauthier, C. F. Dickens, K. S. Brown, S. Ringe, K. Chan, J. K. Nørskov*, Atomistic Insight into Cation Effects on Binding Energies in Cu-Catalyzed Carbon Dioxide Reduction, *The Journal of Physical Chemistry C* **2020**, *124*, 24765–24775, DOI: 10.1021/acs.jpcc.0c07004.
- 14 Y. J. Sa†, H. Jung†, D. Shin†, H. Y. Jeong, S. Ringe, H. Kim*, Y. J. Hwang*, S. H. Joo*, Thermal Transformation of Molecular Ni^{2+} – N_4 Sites for Enhanced CO_2 Electroreduction Activity, *ACS Catalysis* **2020**, *10*, 10920–10931, DOI: 10.1021/acscatal.0c02325.
- 15 M.-Y. Lee†, S. Ringe†, H. Kim*, S. Kang*, Y. Kwon*, Electric field mediated selectivity switching of electrochemical CO_2 reduction from formate to CO on carbon supported Sn, *ACS Energy Lett* **2020**, *5*, 2987–2994, DOI: 10.1021/acsenergylett.0c01387.

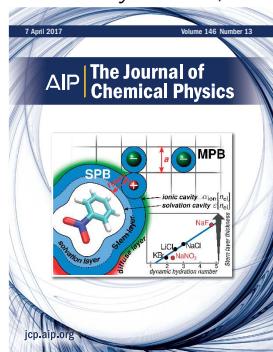


- 16 S. Ringe†*, C. G. Morales-Guio†, L. D. Chen, M. Fields, T. F. Jaramillo, C. Hahn, K. Chan*, Double layer charging driven carbon dioxide adsorption limits the rate of electrochemical carbon dioxide reduction on Gold, *Nat. Commun.* **2020**, *11*, 1–11, DOI: 10.1038/s41467-019-13777-z.
- 17 C. Xia†, S. Back†, S. Ringe†, K. Jiang, F. Chen, X. Sun, S. Siahrostami*, K. Chan*, H. Wang*, Confined local oxygen gas promotes electrochemical water oxidation to hydrogen peroxide, *Nature Catalysis* **2020**, DOI: 10.1038/s41929-019-0402-8.
- 18 J. A. Gauthier, C. F. Dickens, H. H. Heenen, S. Vijay, S. Ringe, K. Chan, Unified Approach to Implicit and Explicit Solvent Simulations of Electrochemical Reaction Energetics, *J. Chem. Theory Comput.* **2019**, *15*, 6895–6906, DOI: 10.1021/acs.jctc.9b00717.

- 19 J. A. Gauthier†, C. F. Dickens†, S. Ringe, K. Chan, *Practical Considerations for Continuum Models Applied to Surface Electrochemistry*, *Chemphyschem* **2019**, *20*, 3074–3080, DOI: 10.1002/cphc.201900536.
- 20 S. Ringe†*, E. L. Clark†, J. Resasco, A. Walton, B. Seger, A. T. Bell, K. Chan*, *Understanding cation effects in electrochemical CO₂ reduction*, *Energy Environ. Sci.* **2019**, *12*, 3001–3014, inside front cover, Research Highlight in *Nature Catal.*, (DOI: 10.1038/s41929-019-0335-2) and part of the 2019 *Energy Environ. Sci.* HOT Articles, DOI: 10.1039/C9EE01341E.



- 21 Y. Wu†, S. Ringe†, C.-L. Wu, W. Chen, A. Yang, H. Chen, M. Tang, G. Zhou, H. Y. Hwang, K. Chan*, Y. Cui*, *A Two-Dimensional MoS₂ Catalysis Transistor by Solid-State Ion Gating Manipulation and Adjustment (SIGMA)*, *Nano Lett.* **2019**, *19*, 7293–7300, DOI: 10.1021/acs.nanolett.9b02888.
- 22 E. L. Clark†, S. Ringe†, M. Tang, A. Walton, C. Hahn, T. F. Jaramillo, K. Chan, A. T. Bell*, *Influence of Atomic Surface Structure on the Activity of Ag for the Electrochemical Reduction of CO₂ to CO*, *ACS Catal.* **2019**, 4006–4014, DOI: 10.1021/acscatal.9b00260.
- 23 T. Ludwig, J. A. Gauthier, K. S. Brown, S. Ringe, J. K. Nørskov, K. Chan*, *Solvent-Adsorbate Interactions and Adsorbate-Specific Solvent Structure in Carbon Dioxide Reduction on a Stepped Cu Surface*, *J. Phys. Chem. C* **2019**, *123*, 5999–6009, DOI: 10.1021/acs.jpcc.8b11571.
- 24 J. A. Gauthier, S. Ringe, C. F. Dickens, A. J. Garza, A. T. Bell, M. Head-Gordon, J. K. Nørskov, K. Chan*, *Challenges in Modeling Electrochemical Reaction Energetics with Polarizable Continuum Models*, *ACS Catal.* **2019**, *9*, 920–931, DOI: 10.1021/acscatal.8b02793.
- 25 C. Hille†, S. Ringe†*, M. Deimel, C. Kunkel, W. E. Acree, K. Reuter, H. Oberhofer, *Generalized molecular solvation in non-aqueous solutions by a single parameter implicit solvation scheme*, *J. Chem. Phys.* **2019**, *150*, 041710, DOI: 10.1063/1.5050938.
- 26 X. Liu, P. Schlexer, J. Xiao, Y. Ji, L. Wang, R. B. Sandberg, M. Tang, K. S. Brown, H. Peng, S. Ringe, C. Hahn, T. F. Jaramillo, J. K. Nørskov, K. Chan*, *pH effects on the electrochemical reduction of CO₂ towards C₂ products on stepped copper*, *Nat. Commun.* **2019**, *10*, 32, DOI: 10.1038/s41467-018-07970-9.
- 27 A. M. Patel, S. Ringe, S. Siahrostami, M. Bajdich, J. K. Nørskov, A. R. Kulkarni*, *Theoretical Approaches to Describing the Oxygen Reduction Reaction Activity of Single-Atom Catalysts*, *J. Phys. Chem. C* **2018**, *122*, 29307–29318, DOI: 10.1021/acs.jpcc.8b09430.
- 28 S. Ringe*, H. Oberhofer, K. Reuter, *Transferable ionic parameters for first-principles Poisson-Boltzmann solvation calculations: Neutral solutes in aqueous monovalent salt solutions*, *J.*



- 29 S. Ringe, H. Oberhofer*, C. Hille, S. Matera, K. Reuter, *Function-Space-Based Solution Scheme for the Size-Modified Poisson-Boltzmann Equation in Full-Potential DFT*, *J. Chem. Theory Comput.* **2016**, *12*, 4052–4066, DOI: 10.1021/acs.jctc.6b00435.