Prof. Dr. Stefan Ringe
Assistant Professor, Korea University
Research Fellow, IBS Center for Molecular Spectroscopy and Dynamics (CMSD)
Asan Science Building, office 610
Seoul, Seongbuk-gu, Anam-dong 3-ga 137-11, 02841, Rep. of Korea
sringe@korea.ac.kr

Curriculum Vitae

Education

06/2013–05/2017 **Ph.D. in Computational Chemistry**, *Technical University Munich* *(Germany)*.
Prof. Dr. Karsten Reuter, *"Summa Cum Laude"*

10/2010–03/2013 **M.Sc. in Chemistry**, *Georg-August University Göttingen* *(Germany)*.
"With Honors"

10/2007–09/2010 **B.Sc. in Chemistry**, *Georg-August University Göttingen* *(Germany)*.
"With Honors"

Professional Experience

02/2022–present **Assistant Professor**, *Korea University* *(Rep. of Korea)*.
Department of Chemistry

02/2022–present **Research Fellow**, *Institute for Basic Science (IBS)* *(Rep. of Korea)*.
Center for Molecular Spectroscopy and Dynamics

02/2020–02/2022 **Assistant Professor**, *DGIST* *(Rep. of Korea)*.
Department of Energy Science & Engineering

02/2019–02/2020 **Postdoctoral Research Scholar**, *KAIST* *(Rep. of Korea)*.
Prof. Dr. Hyungjun Kim

07/2017–01/2019 **Postdoctoral Research Scholar**, *Stanford University* *(USA)*.
Prof. Dr. Jens Nørskov

Research Interests

- **Computational Design for Sustainable Energy Conversion**: CO_2 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

2023-2024 **Fellowship of the Cluster of Excellence Sustainable and Energy-Efficient Aviation (SE2A)**, SE2A/TU Braunschweig, Braunschweig (Germany).

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**, *Singapore 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).

Scientific Achievements

Invited Talks to International Conferences

- 06/2024 USTC School on Electrochemistry (online)Lecture 1, Lecture 2, Lecture 3
- 04/2024 87th Annual Conference of the DPG and DPG Spring Meeting, Berlin (Germany)
- 03/2024 Data-driven materials modeling, Ewha University, Seoul (Rep. of Korea)
- 01/2024 Lorentz Center Workshop on Atomistic Modelling of Solid-Liquid Interfaces in Electrocatalysis
- 06/2023 Canadian Chemistry Conference and Exhibition, Vancouver (Canada)
- 03/2023 1st Y-KAST International Conference, Jeju Shinhwa World, Jeju (Rep. of Korea)
- 02/2023 SIAM Conference on Computational Science and Engineering (CSE23), RAI Congress Centre, Amsterdam (Netherlands)
- 02/2023 Virtual Winterschool on Computational Chemistry (online)

- 11/2020 6th International Conference on Electronic Materials and Nanotechnology for Green Environment (ENGE), Jeju (Rep. of Korea)
- 09/2020 2020 Pacific Rim Meeting of electrochemical and solid state science (PRIME), Online
- 07/2018 FHI-aims Developer & User Meeting, Technical University Munich (Germany)

Paper reviews Over 30 peer reviews/year for various SCI journals, such as *Nature Catal.*, *Nature Energy*, *Angew. Chem. Int. Ed.*, *Joule*, *Adv. Energy Mater.*, *Nature Comm.*, etc..

Research Stay
- 10/2011–02/2012, *Synthesis of Oxygen-Evolution Catalysts*, Prof. Dr. Åkermark, Stockholm University (Sweden)

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

1 S. Ringe, *Deciphering electrochemical methanol production*, *Nature Catalysis* **2024**, *7*, 955–956.

2 C. Won†, S. Kim†, D. Kwak†, T. Kim, J. Kim, E. Lee, S. Kim, R. V. Adith, S. Ringe*, H. I. Kim*, K. Jin*, *Spatiotemporal Nitric Oxide Modulation via Electrochemical Platform to Profile Tumor Cell Response*, *Angewandte Chemie International Edition* **2024**, e202411260.

3 S.-J. Kim, S. Lebègue*, S. Ringe*, H. Kim*, *Elucidating Solvatochromic Shifts in Two-Dimensional Photocatalysts by Solving the Bethe–Salpeter Equation Coupled with Implicit Solvation Method*, *The Journal of Physical Chemistry Letters* **2024**, *15*, 4575–4580.

4 S. M. R. Islam, F. Khezeli, S. Ringe, C. Plaisance, *An implicit electrolyte model for plane wave density functional theory exhibiting nonlinear response and a nonlocal cavity definition*, *J. Chem. Phys.* **2023**, *159*, DOI: 10.1063/5.0176308.

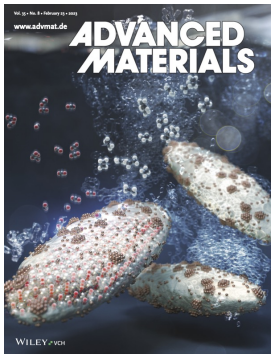
5 B. Kim†, Y. C. Tan†, Y. Ryu†, K. Jang, H. G. Abbas, T. Kang, H. Choi, K.-S. Lee, S. Park, W. Kim, P.-P. Choi, S. Ringe*, J. Oh*, *Trace-Level Cobalt Dopants Enhance CO2 Electroreduction and Ethylene Formation on Copper*, *ACS Energy Lett.* **2023**, *8*, 3356–3364, DOI: 10.1021/acsenergylett.3c00418.

6 M. Park, S. Cho, J. Yang, V. W.-H. Lau, K. H. Kim, J. H. Park*, S. Ringe*, Y.-M. Kang*, *Heterogeneous Catalyst as a Functional Substrate Governing the Shape of Electrochemical Precipitates in Oxygen-Fueled Rechargeable Batteries*, *J. Am. Chem. Soc.* **2023**, *145*, 15425–15434, DOI: 10.1021/jacs.3c03619.

7 S. Ringe, *The importance of a charge transfer descriptor for screening potential CO2 reduction electrocatalysts*, *Nat. Commun.* **2023**, *14*, 2598, DOI: 10.1038/s41467-023-37929-4.

8 S. Ringe, *Cation effects on electrocatalytic reduction processes at the example of the hydrogen evolution reaction*, *Current Opinion in Electrochemistry* **2023**, 101268, DOI: 10.1016/j.coelec.2023.101268.

9 S. Hong†, H. G. Abbas†, K. Jang†, K. K. Patra, B. Kim, B.-U. Choi, H. Song, K.-S. Lee, P.-P. Choi, S. Ringe*, J. Oh*, *Tuning the C1 /C2 Selectivity of Electrochemical CO2 Reduction on Cu-CeO2 Nanorods by Oxidation State Control*, *Adv. Mater.* **2023**, *35*, e2208996, DOI: 10.1002/adma.202208996.



10 J.-H. Yu, K. P. Singh, S.-J. Kim, T.-H. Kang, K.-S. Lee, H. Kim, S. Ringe*, J.-S. Yu*, *Active and stable PtP2-based electrocatalysts solve the phosphate poisoning issue of high temperature fuel cells*, *J. Mater. Chem. A Mater. Energy Sustain.* **2023**, DOI: 10.1039/D2TA09110K.

11 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.

12 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.

13 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.

14 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.

15 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.

16 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/acsami.2c00398.

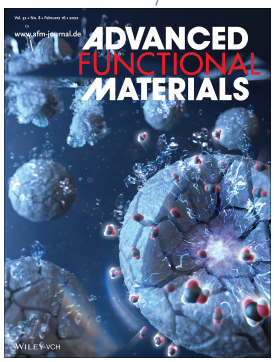
17 G. Kastlunger*, L. Wang, N. Govindarajan, H. H. Heenen, S. Ringe, T. Jaramillo, C. Hahn*, K. Chan, *Using pH Dependence to Understand Mechanisms in Electrochemical CO Reduction*, *ACS Catal.* **2022**, *12*, 4344–4357, DOI: 10.1021/acscatal.1c05520.

18 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.

19 S. Ringe*, *Approaching in-depth mechanistic understanding of electrochemical hydrogen conversion from computational simulations*, *Chem Catalysis* **2021**, *1*, 1160–1162, DOI: 10.1016/j.checat.2021.10.019.

20 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.

21 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 SnO_2 Nanoparticles for High-Performance Electrochemical CO_2 Reduction*, *Adv. Funct. Mater.* **2021**, *n/a*, 2107349, DOI: 10.1002/adfm.202107349.



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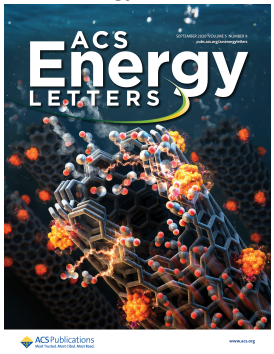
24 Y. J. Sa†, H. Jung†, D. Shin†, H. Y. Jeong, S. Ringe, H. Kim*, Y. J. Hwang*, S. H. Joo*, *Thermal Transformation of Molecular Ni^2+–N_4 Sites for Enhanced CO_2 Electroreduction Activity*, *ACS Catalysis* **2020**, *10*, 10920–10931, DOI: 10.1021/acscatal.0c02325.

25 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.



26 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.

27 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.

28 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.

29 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.

30 S. Ringe†*, E. L. Clark†, J. Resasco, A. Walton, B. Seger, A. T. Bell, K. Chan*, *Understanding cation effects in electrochemical CO_2 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,

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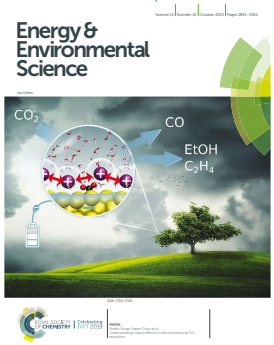


31 Y. Wu†, S. Ringe†, C.-L. Wu, W. Chen, A. Yang, H. Chen, M. Tang, G. Zhou, H. Y. Hwang, K. Chan*, Y. Cui*, *A Two-Dimensional MoS_2 Catalysis Transistor by Solid-State Ion Gating Manipulation and Adjustment (SIGMA)*, *Nano Lett.* **2019**, *19*, 7293–7300, DOI: 10.1021/acs.nanolett.9b02888.

32 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 CO_2 to CO*, *ACS Catal.* **2019**, 4006–4014, DOI: 10.1021/acscatal.9b00260.

33 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.

34 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.

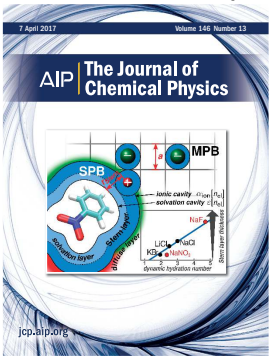
35 C. Hille†, S. Ringe†*, M. Deimel, C. Kunkel, W. E. Acree, K. Reuter, H. Oberhofer, *Generalized molecular solvation in non-aqueous solutions by a single parameter implicit solvation scheme*, *J. Chem. Phys.* **2019**, *150*, 041710, DOI: 10.1063/1.5050938.

36 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 CO_2 towards C_2 products on stepped copper*, *Nat. Commun.* **2019**, *10*, 32, DOI: 10.1038/s41467-018-07970-9.

37 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.

38 S. Ringe*, H. Oberhofer, K. Reuter, *Transferable ionic parameters for first-principles Poisson-Boltzmann solvation calculations: Neutral solutes in aqueous monovalent salt so-*

lutions, *J. Chem. Phys.* **2017**, *146*, 134103, front cover, DOI: 10.1063/1.4978850.



39 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.