

Dr. Christina Birkel

Associate Professor of Chemistry
and Biochemistry
Arizona State University

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Research Vision

Synthesis and structural science of new (layered) solids and two-dimensional materials for energy-relevant applications with a focus on transition metal-based carbides, nitrides and carbonitrides.

Teaching Vision

Enhancement of the students' intrinsic motivation and enthusiasm to learn and experience science by providing an open and transparent teaching environment, using activating teaching methods and hands-on training courses.

Positions

- 08/2023 – **Associate Professor**, School of Molecular Sciences, Arizona State University
- 10/2019 – **Kooperationsprofessorin "Joint professor"**, Eduard-Zintl-Institute of Inorganic and Physical Chemistry, Technische Universität (TU) Darmstadt, Germany
- 01/2019 – 07/2023 **Assistant Professor**, School of Molecular Sciences, Arizona State University
- 11/2018 – 12/2018 **Privatdozentin "Lecturer"**, Eduard-Zintl-Institute of Inorganic and Physical Chemistry, TU Darmstadt, Germany
- 03/2017 – 12/2018 **Athene Young Investigator**, Eduard-Zintl-Institute of Inorganic and Physical Chemistry, TU Darmstadt, Germany
- 08/2013 – 12/2018 **Junior Research Group Leader**, Eduard-Zintl-Institute of Inorganic and Physical Chemistry, TU Darmstadt, Germany
- 03/2011 – 07/2013 **Postdoctoral Researcher**
Dept. of Chemistry and Biochemistry, University of California, Santa Barbara
- 10/2007 – 02/2011 **Scientific Research Staff**
Institute of Inorganic Chemistry, Johannes Gutenberg - University, Mainz, Germany

Education

- 08/2013 – 11/2018 **Habilitation**, TU Darmstadt, Germany
"Synthesis and Structure of Inorganic Energy Materials: Non-conventional preparation and (micro)structure-properties relationships of thermoelectric, magnetic and catalytically active materials"
- 10/2007 – 11/2010 **Dr. rer. nat. summa cum laude**
Advisors: Prof. Wolfgang Tremel and Prof. Kookheon Char
Johannes Gutenberg-University, Mainz, Germany / Seoul National University, South Korea
Dissertation: *"Wet Chemistry Synthesis towards Nanostructures of Thermoelectric Antimonides"*
- 10/2002 – 09/2007 **Diploma**, Average Grade: 1.3
Advisors: Prof. Wolfgang Tremel and Prof. Ram Seshadri
Johannes Gutenberg-University, Mainz, Germany / University of California, Santa Barbara

Research Experience

- 08/2013 – 12/2018 **Junior Research Group Leader**, Group of Prof. Barbara Albert, Eduard-Zintl-Institute of Inorganic and Physical Chemistry, TU Darmstadt, Germany
- 03/2011 – 07/2013 **Postdoctoral Researcher**, Group of Prof. Galen Stucky
Dept. of Chemistry and Biochemistry, University of California, Santa Barbara

- 10/2007 – 02/2011 **Scientific Research Staff**, Group of Prof. Wolfgang Tremel
Institute of Inorganic Chemistry, Johannes Gutenberg - University, Mainz, Germany
- 03/2009 – 06/2009 **Two 3-month Research Visits**, Group of Prof. Kookheon Char
02/2010 – 05/2010 Seoul National University, South Korea – Project: *Template-assisted Synthesis of Zn-Sb Nanotubes*
- 01/2007 – 09/2007 **Diploma Thesis**, Group of Prof. Ram Seshadri
University of California, Santa Barbara
- 08/2005 – 04/2006 **6-month Exchange Semester**, Group of Prof. Ram Seshadri
University of California, Santa Barbara
Project: *Synthesis and Characterization of Intermetallic Nanoparticles*

External and Internal Funding

Collectively roughly \$3 Million have been raised independently. *US grants

- 01/2024 – 12/2027 **Collaborative Research Center Transregio 270, DFG, Germany**
Hysteresis Design of Magnetic Materials for Efficient Energy Conversion (HoMMage), 2nd
- 01/2024 – 02/2024* **Crosscutting Activities in Materials Research, NSF (lead PI)**
Collaborative Research: Conference: MateriAlZ Winter School 2024
- 09/2022 – 08/2025* **Major Research Instrumentation Program, NSF (lead PI)**
MRI: Acquisition of a Dual Transmission X-Ray Diffractometer (DTXRD) for Studying the Local and Bulk Structure of Soft and Hard Materials under In Situ and Operando Conditions
- 07/2022 – 06/2025 **Research Grant (Collaborative), DFG, Germany**
Theory guided synthesis of MXenes with magnetic ordering
- 02/2022 – 01/2027* **Faculty Early Career Development (CAREER) Program, NSF**
CAREER: Fundamentals and synthesis of new compositions and shapes/microstructures of 3D and 2D carbides, nitrides and carbonitrides (MAX phases and MXenes)
- 01/2020 – 12/2023 **Collaborative Research Center Transregio 270, DFG, Germany**
Hysteresis Design of Magnetic Materials for Efficient Energy Conversion (HoMMage), 1st
- 09/2021 – 08/2024* **REU Site, NSF**
Research Experiences for Undergraduates in Sustainable Chemistry and Catalysis at Arizona State University
- 09/2019 – 08/2022* **Petroleum Research Fund, American Chemical Society**
Understanding and manipulating the surface chemistry of MXenes to enable their use as cracking catalysts
- 02/2018 – 02/2019 **Exploration Grant, Boehringer Ingelheim Foundation, Germany**
Wet chemical synthesis of nanoscale and magnetic ternary carbides
- 03/2017 – 02/2022 **Athene Young Investigator, TU Darmstadt, Germany**
Non-conventional synthesis of MAX phases for energy-relevant applications
- 03/2017 **Research Grant, Fonds der Chemischen Industrie, Germany**
Sol-gel synthesis of magnetic MAX phases
- 09/2016 – 12/2016 **Industry-funded project, Volkswagen AG**
Synthesis and characterization of intermetallic compounds for applications in the automotive industry
- 07/2016 – 06/2017 **Max Buchner Research Stipend, DECHEMA, Germany**
Synthesis of MAX phase carbides by mechanical alloying and optimization of their magnetic properties by doping with later transition metals

- 11/2015 – 10/2018 **Research Grant, DFG, Germany**
Going beyond conventional solid state methods: Microwave synthesis of transition metal carbides
- 08/2014 and 07/2016 **Conference Travel Grant, DAAD, Germany**
 Participation at the *Gordon Research Conference Solid State Chemistry*

Honors and Awards

- 10/2023 **"Women in Science"**, invited talk, Honorary Consul of Germany, Scottsdale, USA
- 08/2022 **"Emerging Areas in Inorganic Chemistry"**, invited talk, Fall ACS Meeting, Chicago
- 09/2020 **Women of Distinction in Materials Science**, invited talk (online)
- 09/2017 **Higher Education Teaching Certificate**, TU Darmstadt
- 04/2016 – 09/2017 **Mentoring program "ProProfessor"**, Mentoring Hessen
- 05/2011 – 07/2013 **Feodor Lynen Research Fellowship**, Alexander von Humboldt-Foundation
- 02/2012 **Best Poster Award**, Materials Research Outreach Program, Santa Barbara
- 09/2011 **MAINZ Award**, MAterials Science IN MainZ
 Granted for an outstanding Ph.D. thesis
- 02/2010 **Best Poster Award**, 451. Wilhelm-Else-Heraeus-Seminar, Bad Honnef, Germany
- 08/2008 – 11/2010 **PhD Fellowship**, Graduate School of Excellence - MAterials Science IN MainZ

Service Activities

Service to ASU/School of Molecular Sciences (SMS)

- 2023 – today **Search Committee**, Assistant/Associate Professor "Quantum Molecular Science"
- 2023 – today **Committee Member (elected)**, Personnel and Budget Committee
- 2023 **Panel Member**, Research in Germany
- 2023 **Panel Member**, iSTEM SOLUR - Undergraduate Research
- 2022 – 2023 **Search Committee**, Assistant/Associate Professor "Materials Chemistry"
- 2021 – today **Advisor and Mentor**, NSF REU Program "Sustainable Chemistry and Catalysis"
- 2022 – 2023 **Committee member**, "SMS Seminars"
- 2021 – 2022 **Search Committee**, Two open-rank positions "Materials Chemistry"
- 2020 – 2022 **Committee member**, "Graduate Programs"
- 2020 – today **Committee member**, Master and Ph.D. Thesis Committees
- 2020 – today **Covernance Board (elected)**, Eyring Materials Center, ASU
- 2019 **Selection Committee**, Limited Proposal Submission, ASU
- 2019 – 2020 **Search Committee**, "Associate/Assistant Professor, Materials Chemistry/Thermochemistry"

Service to TU Darmstadt

- 2020 – today **Committee member**, Master and Ph.D. Thesis Committees, Dr. Sabine Kanbach (2024, Chemistry), Dr. Harish Kumar Singh (2023, Materials Science) Dr. Jutta Kilschautzky (2023, Chemistry), Dr. Lukas Schäfer (2023, Materials Science), Judith Anna Czernek (2022, Staatsexamen, Chemie Lehramt) Dr. Fernando Maccari (2022, Materials Science)

- 2020 – 2023 **Steering committee (elected)**, Collaborative Research Center Transregio 270
"Hysteresis Design of Magnetic Materials for Efficient Energy Conversion (HoMMage)"
- 2020 – 2022 **Committee member**, "Internationalization Strategy"
- 2017 – 2018 **Search committee**, W2 Assistant Professorship "Theoretical Chemistry" (tenure-track)
- 2014 – 2018 **Steering committee**, LOEWE-Research cluster
"RESsourcenschonende Permanentmagnete durch Optimierte Nutzung Seltener Erden (RESPONSE)"
- 2011 – 2018 **Active member of interdisciplinary research groups and research profiles**
"From Material to Product Innovation"
- Service to the scientific community**
- 2024 – 2028 **Editorial Advisory Board Member**, ChemPlusChem
- 2023 – today **Lead Organizer**, MateriAlZ Winter School
- 2023 – today **Editorial Board Member**, Data In Brief
- 2021 – today **Proposal panel activities**, National Science Foundation (NSF)
- 2021 – today **Editorial Advisory Board**, ACS Organic and Inorganic Au
- 2021 – today **Symposium Organization Team**, 2022 MRS Spring Meeting and Exhibit "2D MXenes: Synthesis, Properties, and Applications", Honolulu, Hawai'i
- 2020 – today **Seminar Series Organization Team**, MateriAlZ Seminar Series
- 2018 – today **Proposal review processes**, Deutsche Forschungsgemeinschaft (DFG), National Science Foundation (NSF), American Chemical Society (ACS) - Petroleum Research Fund (PRF)
- 2011 – today **Peer review processes**
Multiple journals, such as *Nature Chemistry*, *Angewandte Chemie*, *Journal of the American Chemical Society*, *Nano Energy*, *Chemistry of Materials*, *Nanoscale*, *Journal of Applied Physics*, *Journal of Magnetism and Magnetic Materials*, *Materials and Design*, *Solid State Sciences*
- 2017 – 2018 **Scientific organization committee**, 680th Wilhelm-Else-Heraeus-Seminar "Materials for Automotive Propulsion", Physikzentrum Bad Honnef, Germany
- 2015 and 2016 **Mentoring**
CyberMentor: Online mentoring program for girls interested in STEM fields

Teaching Activities

- 2019 – today **Lecturer**, Arizona State University
CHM 453 Inorganic Chemistry (online), *CHM 598/494 Nanomaterials*, *CHM 501 Inorganic Seminar*.
- 2019 – today **Lecturer**, TU Darmstadt, Germany
Non-conventional synthesis in materials chemistry.
- 2013 – today **Thesis Supervisor**
of doctoral, master and bachelor theses.
- 2007 – today **Supervisor and Mentor**
of numerous students and interns in Germany and in the US, among them international participants of exchange programs, such as **RISE** and **CISEI**.
- 2013 – 2018 **Lecturer**
Inorganic Chemistry 1 - Nonmetals, *Chemistry for Energy Scientists and Engineers*, *Special Instrument-based Analytics*.

- 2006 – 2010 **Teaching Assistant**
Various lab courses, such as preparative inorganic and physical chemistry.

Students Graduated and Mentored

- 2019 – today **Graduate Students (7), ASU**
current: John Jamboretz, Rose Snyder, Jordan Sinclair, Suneet Kale, Arya Loloee, Vaibhav Joshi,
past: Dr. Jan Paul Siebert (graduated in Spring 2022, won the George U. Yuen Memorial Award)
- 2019 – today **Undergraduate Researchers (11), ASU**
current: Lin-Lin Elliott (REU program), past: Rylee James, Lauren Driggers (REU program),
Matthew Flores, Jordan Hill (REU program), Zainab Goawala (visiting student from USD, Luce
Foundation), John Kim, Andrew Wasserbeck, Shayna Mallett, Alexa Sanchez, Langston Tillman,
Andrew Harris, Keene Patarakun
- 2013 – today **Graduate Students (4), TU Darmstadt**
current: Isabel Huck, past: Dr. Niels Kubitzka (graduated in 2023) Dr. Minh Hai Tran (graduated
in 2021), Dr. Christin Hamm (graduated in 2017)
- 2019 – today **Master Students (1), ASU**
current: Michael Bedner
- 2013 – today **Master Students (3), TU Darmstadt**
past: Isabel Huck, Jan Paul Siebert, Niels Kubitzka
- 2013 – today **Bachelor Students (6), TU Darmstadt**
past: Sanja Jankovich, Leonhard Iser, Viktor Klippenstein, Timo Schäfer, Jan Paul Siebert, Niels
Kubitzka
- 2013 – 2018 **Undergraduate Researchers (12), TU Darmstadt**
current: Sanja Jankovich, past: Manh Dang Nguyen, Jan Paul Siebert, Corinna Müller, Franziska
Heck, Timo Schäfer, Viktor Klippenstein, Thomas Schedlbauer, Patrick Schmatz, Max Gatter-
dam, Jurek Schneider, Nicole Herzog
- 2011 – 2013 **Undergraduate Researchers (2), UC Santa Barbara**
Carolyn Mills, Bethany Lettiere
- 2007 – 2011 **Undergraduate Researchers (>10), JGU Mainz**
multiple students, e.g. Dr. Gregor Kieslich, Dr. Mark Steinmann

Postdoctoral Fellows Mentored

- 2019 – today **PostDocs (3), ASU**
past: *Dr. Carina Büchner*, Dr. Andreas Reitz (supported through a Walter Benjamin Fellowship,
DFG, Germany), Dr. Christin Hamm
- 2019 – today **PostDocs (1), TU Darmstadt**
past: Dr. Carina Büchner (joint with ASU), Dr. Lothar Bischoff (supported through Boehringer
Ingelheim Foundation)

Professional Development

- since 2019 **(Online) Teaching Workshops, ASU**
- 2019 – 2020 **New Assistant Professor Workshop Series, ASU**
- 2013 – 2018 **Didactic workshops and seminars, Teaching Certificate "Zertifikat Hochschullehre",
TU Darmstadt**

- 2016 – 2017 **Workshops and trainings**, "Analysis of Potential", "Appointment Procedures for Professorships", "Acquisition of Third-party Funding", "Work Life Balance and Gender Competence", "Leadership Requirements in Academia", "University Management"
Mentoring Hessen
- 2013 – 2014 **Libra-peer coaching for young researchers**, "Basics of Peer Coaching", "Coping with Crises", "Self-management and Self-coaching", "Potential and Personal Development"
TU Darmstadt
- 2007 – 2011 **Workshops and seminars**, "Time- and Self-Management", "Effective Scientific Presentations", "Inter-Cultural Communications", "Ethics in Research and Science", "Reviewing Scientific Papers", "Writing for Scientists", JGU Mainz

Presentations (selection)

Collectively more than 50 talks and an additional 15 poster contributions at national and international conferences, seminars and symposia.

- 08/2024 **14th International Conference on Ceramic Materials and Components for Energy and Environmental Systems, (invited)**, Budapest, Hungary
- 07/2024 **Gordon Research Conference on Solid State Chemistry, poster**, New London, USA
- 07/2024 **International Conference on Magnetism 2024**, Bologna, Italy
- 04/2024 **MRS Spring Meeting, (invited)**, Seattle, USA
- 02/2024 **University of California, Davis, Chemistry Seminar (invited)**, Davis, USA
- 01/2024 **International Conference and Expo on Advanced Ceramics and Composites (2 invited talks)**, Daytona Beach, USA
- 11/2023 **MRS Fall Meeting, (invited)**, Boston, USA
- 11/2023 **Colorado School of Mines, Chemistry Seminar, (invited)**, Golden, USA
- 08/2023 **36th European Conference on Surface Science, MXene Symposium, (invited)**, Lodz, Poland
- 07/2023 **Nanoscience Colloquium, (invited)**, University of Hamburg, Germany
- 05/2023 **Gesellschaft Deutscher Chemiker GDCh talk, (invited)**, Justus-Liebig-University Giessen, Germany
- 02/2023 **Department of Chemistry, (invited)**, University of Maryland, USA
- 11/2022 **MRS Fall Meeting, (invited)**, Boston, USA
- 08/2022 **Fall ACS Meeting, Symposium *Emerging Areas in Inorganic Chemistry* (invited)**, Chicago, USA
- 07/2022 **Gordon Research Conference on Solid State Chemistry (invited)**, New London, USA
- 06/2022 **15th International Ceramics Congress (invited)**, Perugia, Italy
initially scheduled for 06/2020, postponed because of the global COVID-19 pandemic
- 11/2021 **Department of Materials Science and Engineering (invited)**, University of Utah, USA
- 11/2021 **PRISM/PCCM Seminar Series Fall 2021 (invited)**, Princeton University, USA
- 11/2021 **Deutsche Physikerinnentagung/German Female Physicist Conference (invited)**, on-line
- 09/2021 **MSE - Fall Colloquium Series (invited)**, Northwestern University, USA

- 09/2021 **2nd International workshop on functional MAX-materials "FunMAX" (invited)**, Krasnoyarsk, Russia/online
- 08/2021 **ACS Meeting (invited)**, Atlanta, USA/online
- 04/2021 **MRS Spring Meeting (invited)**, online
- 09/2020 **Women of Distinction in Materials Science (invited)**, online
- 09/2020 **MSE 2020 Materials Science and Engineering Congress (invited)**, online
- 08/2020 **1st International workshop on functional MAX-materials "FunMAX" (invited)**, online
- 03/2020 **ACS Spring Meeting (invited)**, Philadelphia, USA
canceled because of the global COVID-19 pandemic
- 01/2020 **44th International Conference and Expo on Advanced Ceramics and Composites**, Daytona Beach, USA
- 08/2019 **North American Solid State Chemistry Conference**, Golden, USA

List of Scientific Products

Book Chapters

2. C.M. Hamm, and C.S. Birkel. MAX Phases and MXenes, in *Inorganic Chemistry; Seshadri, R.; Cussen, S.; in Comprehensive Inorganic Chemistry III; Reedijk, J., Poepelmeier, K. R., Eds.*; Vol. 5, pp 278â289. Oxford: Elsevier **2023** [B978-0-12-823144-9.00076-5]
1. C.S. Birkel. Synthesis of inorganic energy materials, in *Frontiers of Science and Technology*, De Gruyter **2021** [10.1515/9783110584455-010]

Patents and Invention Disclosures

3. J.P. Siebert, and C.S. Birkel. Sol-gel synthesis of MAX phase functional materials, 22193-0287001/M21-290P-US1-d, *Patent application filed*
2. J. Jamboretz, A. Reitz, and C.S. Birkel. Raman Spectroscopy System for Extreme Conditions, 22193-0329P01/M23-014P-PR1-d, *Patent application filed*
1. J. Sinclair, J.P. Siebert, and C.S. Birkel. Sol-gel synthesis of phosphorous-containing MAX phases, 22193-0338P01/M23-119P-PR1-d, *Patent application filed*

Journal Publications

Graduate student, *Undergraduate student, **corresponding author

Since joining ASU (including Birkel contribution to papers)

53. *J. Sinclair, J.P. Siebert*, M. Flores*, *D. Ciota*, D.-K. Seo, and **C.S. Birkel****. High surface area of carbonaceous Cr₂GaC composite microspheres synthesized by sol-gel chemistry, *New J. Chem.*, **2024**, accepted [doi.org/10.1039/D4NJ02038C]. **Contribution:** Designed research, interpreted most of the results, wrote and edited majority of the manuscript, all syntheses, structural characterizations (XRD) performed in the Birkel lab.
52. *J. Sinclair*, M. Flores, A.M. Brugh, M. Juelsolt, A.A. Riaz, C. Schlueter, A. Regoutz, and **C.S. Birkel****. In-Depth Analysis of the Species and Transformations during Sol Gel-Assisted V₂PC Synthesis, *Inorg. Chem.*, **2024**, 63, 23,

- 10682-10690 [doi.org/10.1021/acs.inorgchem.4c01160]. **Contribution:** Designed research, interpreted most of the results, wrote and edited majority of the manuscript, managed communication with European collaborators, all syntheses, structural characterizations (XRD) performed in the Birkel lab.
51. N. Kubitza, I. Huck, H. Pazniak, C. Kalha, D. Koch, B. Zhao, P.K. Thakur, T.-L. Lee, A.A. Riaz, W. Donner, H. Zhang, B. Moss, U. Wiedwald, A. Regoutz, and C.S. Birkel**. Between carbide and nitride MAX phases: sol-gel assisted synthesis and characterization of the carbonitride phase $\text{Cr}_2\text{GaC}_{1-x}\text{N}_x$, *J. Mater. Chem. C*, **2024**, 12, 7552-7561 [doi.org/10.1039/D4TC00067F]. **Contribution:** Designed research, interpreted most of the results, wrote and edited majority of the manuscript, managed communication with European collaborators, all syntheses, structural characterizations (XRD) performed in the Birkel lab.
50. C. Büchner, N. Kubitza, A.M. Malik, J. Jamboretz, A.A. Riaz, Y. Zhu, C. Schlueter, M.R. McCartney, D.J. Smith, A. Regoutz, J. Rohrer, and C.S. Birkel**. Chemical Conversions within the Mo-Ga-C System: Layered Solids with Variable Ga Content, *Inorg. Chem.* **2024** 63, 17, 7725-7734 [doi.org/10.1021/acs.inorgchem.4c00107]. **Contribution:** Designed research, interpreted most of the results, wrote and edited majority of the manuscript, managed communication with European collaborators, all syntheses, structural characterizations (XRD) and Raman spectroscopy performed in the Birkel lab.
49. N. Kubitza, B. Beckmann, S. Jankovic*, K. Skokov, A.A. Riaz, C. Schlueter, A. Regoutz, O. Gutfleisch, and C.S. Birkel**. Exploring the Potential of Nitride and Carbonitride MAX Phases: Synthesis, Magnetic and Electrical Transport Properties of V_2GeC , $\text{V}_2\text{GeC}_{0.5}\text{N}_{0.5}$, and V_2GeN , *Chem. Mater.* **2024** 36, 3, 1375-1384 [doi.org/10.1021/acs.chemmater.3c02510]. **Contribution:** Designed research, interpreted most of the results, wrote and edited majority of the manuscript, managed communication with European collaborators, all syntheses, structural characterizations (XRD) performed in the Birkel lab.
48. N. Kubitza, P. Babaei*, U. Wiedwald, and C.S. Birkel**. Rapid Sol Gel Synthesis Approach for the Preparation of the Magnetocaloric Antiperovskite Mn_3GaC , *Chem. Mater.* **2023** 35, 21, 9175-9181, [doi.org/10.1021/acs.chemmater.3c01905]. **Contribution:** Designed research, interpreted most of the results, wrote and edited majority of the manuscript, all syntheses, structural characterizations (XRD) performed in the Birkel lab.
47. N. Kubitza, C. Büchner, J. Sinclair, R. Snyder, and C.S. Birkel**. Extending the Chemistry of Layered Solids and Nanosheets: Chemistry and Structure of MAX Phases, MAB Phases and MXenes (invited review), *ChemPlusChem* **2023**, 88, e202300214, [doi.org/10.1002/cplu.202300214]. **Contribution:** Review planned and written by the Birkel team.
46. R. Snyder, M. Juelsholt, C. Kalha, J. Holm, E. Mansfield, T.L. Lee, P.K. Thakur, A.A. Riaz, B. Moss, A. Regoutz, and C.S. Birkel**. Detailed analysis of the synthesis and structure of MAX phase $(\text{Mo}_{0.75}\text{V}_{0.25})_5\text{AlC}_4$ and its MXene sibling $(\text{Mo}_{0.75}\text{V}_{0.25})_5\text{C}_4$, *ACS Nano* **2023** 17, 12693 - 12705, [doi.org/10.1021/acs.nano.3c03395]. **Contribution:** Designed research, interpreted most of the results, wrote and edited majority of the manuscript, managed communication with European collaborators, all syntheses, structural characterizations (XRD) and electrochemical measurements performed in the Birkel lab.
45. N. Kubitza, R. Xie, I. Tarasov, C. Shen, H. Zhang, U. Wiedwald, and C.S. Birkel**. Microwave-assisted synthesis of the new solid-solution $(\text{V}_{1-x}\text{Cr}_x)_2\text{GaC}$ ($0 < x < 1$), a Pauli paramagnet almost matching the Stoner criterion for $x = 0.80$, *Chem. Mater.* **2023** 61, 10634 - 10641, [doi.org/10.1021/acs.inorgchem.2c00200]. **Contribution:** Designed research, interpreted results, wrote and edited majority of the manuscript, managed communication with European collaborators, all syntheses and structural characterizations (XRD) performed in the Birkel lab.
44. A. Reitz, H. Pazniak, C. Shen, H.K. Singh, J. Kumar, N. Kubitza, A. Navrotsky, H. Zhang, U. Wiedwald, and C.S. Birkel**. Cr_3GeN : A Nitride with Orthorhombic Antiperovskite Structure *Chem. Mater.* **2022** 34, 10304 - 10310, [doi.org/10.1021/acs.chemmater.2c01524]. **Contribution:** Designed research, interpreted results, wrote and edited

- majority of the manuscript, led communication with collaboration partners (Germany), all syntheses and structural characterizations (XRD) performed in the Birkel lab.
43. *J. Jamboretz, A. Reitz, and C.S. Birkel***. Development of a Raman spectroscopy system for in situ monitoring of microwave-assisted inorganic transformations *J. Raman Spectr.* **2022** 1 - 9, [doi.org/10.1002/jrs.6478]. **Contribution:** Designed research, interpreted results, wrote and edited majority of the manuscript, all syntheses and structural characterizations (XRD) performed in the Birkel lab.
 42. *J. Sinclair, J.P. Siebert, M. Juelscholt, S. Chen, H. Zhang, and C.S. Birkel***. Sol Gel-Based Synthesis of the Phosphorus-Containing MAX Phase V_2PC *Inorg. Chem.* **2022** 61, 16976 - 16980, [doi.org/10.1021/acs.inorgchem.2c02880]. **Contribution:** Designed research, interpreted results, wrote and edited majority of the manuscript, led communication with collaboration partners (Germany), all syntheses and structural characterizations (XRD) performed in the Birkel lab.
 41. *N. Kubitza, A. Reitz, A. Zieschang, H. Pazniak, B. Albert, C. Kalha, C. Schlueter, A. Regoutz, U. Wiedwald, and C.S. Birkel***. From MAX phase carbides to nitrides: Synthesis of V_2GaC , V_2GaN and the carbonitride $V_2GaC_{1-x}N_x$, *Inorg. Chem.* **2022** 61, 10634 - 10641, [doi.org/10.1021/acs.inorgchem.2c00200]. **Contribution:** Designed research, interpreted results, wrote and edited majority of the manuscript, all syntheses and structural characterizations (XRD) performed in the Birkel lab.
 40. *J.P. Siebert, M. Juelscholt, D. Guenzing, H. Wende, K. Ollefs, and C.S. Birkel***. Towards a mechanistic understanding of the sol-gel syntheses of ternary carbides, *Inorg. Chem. Front* **2022** 9, 1565 - 1574, [doi.org/10.1039/D2QI00053A]. **Contribution:** Designed research, edited the manuscript, all syntheses and structural characterizations (XRD) performed in the Birkel lab, applied for beamtime, led communication with collaboration partners (Germany).
 39. *J.P. Siebert, K. Patakarun*, and C.S. Birkel***. Mechanistic Insights into the Nonconventional Sol-Gel Synthesis of MAX Phase M_2GeC ($M = V, Cr$), *Inorg. Chem.* **2022** 61, 3, 1603 - 1610, [[acs.inorgchem.1c03415](https://doi.org/10.1021/acs.inorgchem.1c03415)]. **Contribution:** Designed research, made figures, edited the manuscript, all parts of the work performed in the Birkel lab.
 38. *J.P. Siebert, D. Hajra, S. Tongay, and C.S. Birkel***. The synthesis and electrical transport properties of carbon/ Cr_2GaC MAX phase composite microwires, *Nanoscale* **2022** 14, 744-751, [[10.1039/D1NR06780J](https://doi.org/10.1039/D1NR06780J)]. **Contribution:** Designed the scope of the work, interpreted results, made figures, wrote and edited the majority of the manuscript, all syntheses and structural characterizations (XRD) performed in the Birkel lab.
 37. *J.P. Siebert, M. Flores*, and C.S. Birkel***. Shape Control of MAX Phases by Biopolymer Sol Gel Synthesis: Cr_2GaC Thick Films, Microspheres, and Hollow Microspheres, *ACS Org. Inorg. Au (invited)* **2021** 2, 59 - 65, [[10.1021/acsorginorgau.1c00022](https://doi.org/10.1021/acsorginorgau.1c00022)]. **Contribution:** Designed research, interpreted results, made figures, edited the manuscript, all parts of the work performed in the Birkel lab.
 36. *J.P. Siebert, S. Mallett*, M. Juelscholt, H. Pazniak, U. Wiedwald, K. Page, and C.S. Birkel***. Local structure determination and magnetic properties of the Mn-doped MAX phase Cr_2GaC , *Mater. Chem. Front.* **2021** 5, 6082-6091, [[10.1039/D1QM00454A](https://doi.org/10.1039/D1QM00454A)]. **Contribution:** Designed the scope of the work, interpreted results, made figures, wrote and edited majority of the manuscript, all syntheses and structural characterizations (XRD) performed in the Birkel lab, applied for beamtime, led communication with collaboration partners (Oak Ridge National lab and Germany).
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