SYMPOSIUM

05 – 07 SEPTEMBER 2022

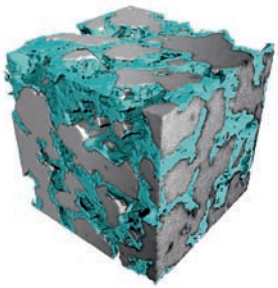
Magdeburg, Germany

MAX PLANCK INSTITUTE
FOR DYNAMICS OF COMPLEX
TECHNICAL SYSTEMS
MAGDEBURG

TU Clausthal

2nd Symposium on Insights into Gas Diffusion Electrodes

From Fundamentals to Industrial Applications



https://www.mpi-magdeburg.mpg.de/gde2022

Conference Venue

Johanniskirche
Johannisbergstraße 1
39104 Magdeburg

Internet Access

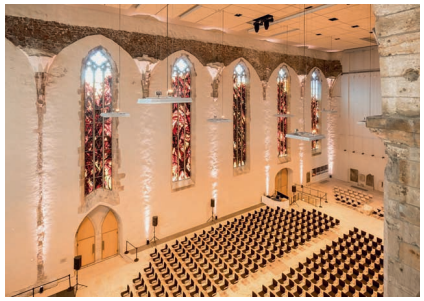
WiFi access is available for free throughout the conference venue. As WiFi can be used by all participants, a loss of efficiency is possible.

Book of Abstracts

Book of Abstracts (lectures and posters) is available online for participants of the meeting "Insights into Gas Diffusion Electrodes: From Fundamentals to Industrial Applications": https://www.mpi-magdeburg.mpg.de/gde2022

Social Programme

Tuesday, 06 September 2022, 19:00
Conference Dinner (Jahrtausendturm)



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General Information

Scientific Scope

The 2nd Symposium on **"Insights into Gas Diffusion Electrodes: From Fundamentals to Industrial Applications"** is an initiative of Research Unit 2397 approved by German Research Foundation (DFG) in July 2016. The main research focus of the project „Multiscale Analysis of Complex Three-Phase Systems: Oxygen and Carbon Dioxide Reduction" is devoted to the interaction of reaction and transport processes during oxygen and carbon dioxide reduction within silver-based gas diffusion electrodes (GDEs).

GDEs have broad applications in different electrochemical devices such as (bio)-fuel cells, (bio)-electrolyzers, and batteries for energy as well as inorganic and organic synthesis applications. Although very different chemistries and materials are involved, all of these examples share some similarities related to so-called "three phase boundaries" as well as pronounced mass transfer resistances related to slow diffusivity and/or low solubility of gases.

Plenary Lectures

Hierarchically Structured Electrodes: Their Design, Implementation and Characterization to Make Academic Developments Relevant
Prof. Doris Segets, University of Duisburg-Essen, Germany

Importance of Transport in Electrochemical Energy-Conversion Technologies
Dr. Adam Z. Weber, Lawrence Berkeley National Laboratory, USA

Gas Diffusion Electrodes for CO_2 Electrochemical Reduction
Prof. Eileen Yu, Newcastle University, UK

Scientific Committee

Ulrike Krewer	Karlsruhe Institute of Technology
Ingo Manke	Helmholtz Zentrum Berlin
Ulrich Nieken	University Stuttgart
Christina Roth	University Bayreuth
Wolfgang Schuhmann	Ruhr-Universität Bochum
Thomas Turek	TU Clausthal
Tanja Vidaković-Koch	MPI Magdeburg

Sponsors

German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) is the self-governing organisation for science and research in Germany. It serves all branches of science and the humanities. In organisational terms, the DFG is an association under private law. Its membership consists of German research universities, non-university research institutions, scientific associations and the Academies of Science and the Humanities. DFG supports this symposium within the framework of the research unit FOR 2397.
www.dfg.de
www.for2397.tu-clausthal.de

The International Society of Electrochemistry (ISE) was founded in 1949 by leading European and American Electrochemists to serve the growing needs of electrochemistry in becoming a modern scientific discipline. Since then the association has evolved and now comprises about 3000 individual members and more than 20 Corporate Members (teaching institutions, non-profit-making research organizations and learned societies) and Corporate Sustaining Members (industrial and commercial organizations). Its membership comes from more than 70 countries and is organized in over 40 regional sections. ISE is a non-profit-making organization with its seat in Lausanne, Switzerland.
www.ise-online.org

Sponsors

The Gesellschaft Deutscher Chemiker (GDCh) represents a large, professionally and socially relevant community with around 30,000 members from science, business and the liberal professions.
The GDCh Division of Electrochemistry has been active since 1960 and has around 600 members from universities, research institutes and industry – around a third of them are students and young members. The Division aims to promote all areas of electrochemistry from the basics to application.
http://en.gdch.de

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www.covestro.com/en

Monday, 05 September 2022

12:00	Registration
Chair	**U. Nieken**
13:00	Welcome
13:10 PL	Hierarchically structured electrodes: Their design, implementation and characterization to make academic developments relevant **D. Segets, Institute for Particle Science and Technology, University of Duisburg-Essen**
14:00 IL	Chemical Design of Carbon-Based Materials for the Electrochemical Activation of Small Molecules **M. Oschatz, Center for Energy and Environmental Chemistry Jena**
14:30 O-01	The Interplay of Oxygen Reduction Reaction and Iron Dissolution from Fe-N-C in Alkaline Media **Y.-P. Ku, Forschungszentrum Jülich GmbH, Helmholtz-Institute Erlangen-Nürnberg for Renewable Energy**
14:45 O-02	Gas Diffusion Electrode Setup Beyond Room Temperature and Ambient Pressure **G. Wiberg, University of Bern**
15:05	**Coffee Break**
Chair	**C. Roth**
15:35 O-03	Bridging the gap between lab and application: A novel Porous Transport Electrode three-electrode set **P. Collantes Jiménez, INP Leibniz Institute for Plasma Science and Technology**
15:55 O-04	Best practice for determining oxygen reduction reaction catalyst activities in GDE half-cells **N. Schmitt, Department of Chemistry, Technical University of Darmstadt**

Monday, 05 September 2022

16:10 O-05	An alternative design for state-of-the-art GDEs: OER/ORR active, large macropore-sized, catalyst-coated substrates are competitive **A. Bekisch, Fraunhofer Institute IKTS; Friedrich-Schiller-University, Jena**
16:25 IL	From electrocatalyst powder to porous electrode layers: A journey with a lot of pitfalls **M. Oezaslan, Technical Electrocatalysis Laboratory, Institute of Technical Chemistry, TU Braunschweig**
16:55	Short Introduction of Poster Programm
17:05- 19:00	Poster Party (with snacks)

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Tuesday, 06 September 2022

Chair	**U. Krewer**
09:00 PL	Electrochemical Reduction of CO_2 using Gas Diffusion Electrodes **E. Yu, Department of Chemical Engineering, Loughborough University**
09:50 IL	Press it, Heat it, Twist it: A Series of Hidden Parameters for the Electrochemical CO_2 Reduction **U.-P. Apfel, Fraunhofer UMSICHT & Ruhr University Bochum**
10:20 O-06	Gaining Freedom of Scalable Gas Diffusion Electrode for the CO_2 Reduction Reaction **X. Wang, Ruhr-University Bochum**
10:35	**Coffee Break**
Chair	**I. Manke**
11:00 O-07	CO_2 electroreduction selectivity modulation by the gas diffusion electrode architecture **C. Andronescu, Chemical Technology III, University Duisburg-Essen**
11:20 IL	From oxygen reduction to CO_2 reduction in gas diffusion electrodes. Similarities and differences **W. Schuhmann, Analytical Chemistry - Center for Electrochemical Sciences (CES); Faculty of Chemistry and Biochemistry**
11:50 IL	Development and upscaling of gas diffusion electrodes for wastewater treatment and electrosynthesis of chemicals **D. Pant, Flemish Institute for Technological Research (VITO)**
12:20 O-08	Addressing the issue of carbon efficiency in CO_2 electroreduction at silver gas diffusion electrodes using acidic electrolytes **J. Osiewacz, Clausthal University of Technology - ICVT**
12:35	**Lunch -Break**

Tuesday, 06 September 2022

Chair	**W. Schuhmann**
14:00 O-09	On the fate of selectivity in zero-gap CO_2 to CO electrolysis using Ni anodes **S. K. Chandrasekar, PhotoCatalytic Synthesis, University of Twente**
14:15 O-10	Diagnosis of in-plane and though-plane mass transfer in zero-gap MEA electrolyzer for CO_2 reduction **W. Ju, Department of Chemistry, Chemical Engineering Division, Technical University Berlin**
14:35 O-11	Impacts of Unintended Cation Crossover through Anion Exchange Membranes on the Operation of Zero-gap Cu-based CO_2 Electrolysers **G. El-Nagar, Helmholtz-Zentrum Berlin für Materialen und Energie GmbH**
14:55 O-12	Computational modelling and optimisation of long-channel CO_2 electroreduction flow cells **J. Blake, TU Delft**
15:10	**Coffee Break and Poster Discussions**
Chair	**M. Paulisch-Rinke**
16:15 IL	Advanced 2D and 3D Microscopic and Spectroscopic Characterization of Gas Diffusion Electrodes for Fuel Cells **J. Jankovic, University of Connecticut**
16:45 IL	Industrial GDE: Current Applications and Perspectives from De Nora **P. Narangoda, De Nora Deutschland GmbH**
17:15	**Break**
19:00	**Conference Dinner (Jahrtausendturm)**

Conference Program

Wednesday, 07 September 2022

Chair	**T. Turek**
09:00 PL	Importance of Transport in Electrochemical Energy-Conversion Technologies: The Case For Gas-Diffusion Electrodes **A. Weber, LBNL, Berkeley, CA, USA**
09:50 O-13	Micromodel of a gas diffusion electrode tracks in-operando pore-scale wetting phenomena **S. Brosch, RWTH Aachen University Chemical Process Engineering**
10:05 O-14	A novel pore network model for electrolyte imbibition in gas diffusion electrodes **T. Mager, Institute of Chemical Process Engineering, University of Stuttgart**
10:20	**Coffee Break**
Chair	**T. Vidaković-Koch**
10:50 O-15	Operando Synchrotron Imaging of Electrolyte Distribution in Silver Based Gas Diffusion Electrodes During Oxygen Reduction Reaction **M. C. Paulisch-Rinke, Helmholtz-Zentrum Berlin, Institute of Applied Materials**
11:10 O-16	Investigating the Mass Transport in Porous Transport Layers of PEMWE using Neutron Imaging **H. Atlaf, Otto-von-Guericke University, Magdeburg**
11:25 IL	Operation of PEM Fuel Cells Exposed to Harsh Environments **T. Reshetenko, Hawaii Natural Energy Institute, University of Hawaii**
11:55 O-17	Influence of the Porous Transport Layer Structure on Proton Exchange Membrane Water Electrolyzer Performance **T. Miličić, Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg**
12:10 O-18	Transient hydrogen crossover in dynamically operated polymer electrolyte membrane electrolysis cells - a model-based analysis **T. Franz, Otto-von-Guericke University, Process Systems Engineering**
12:25	**Closing**

Poster Program

	CO_2 Reduction
P-01	Modeling the Influence of CO_2 Concentration on Electrochemical CO_2 Reduction at Silver Gas Diffusion Electrodes, **M. Löffelholz, TU Clausthal**
P-02	Electrochemical CO_2 Reduction: Steady-state vs. Dynamic Investigation **I. Dorner, Institute for Applied Materials – Electrochemical Technologies, Karlsruhe Institute of Technology**
P-03	Development of gas diffusion electrodes for applications in electrochemical CO_2 reduction, **S. Molodtsov, Avantium**
P-04	The application of a MOF-derived FeNC catalyst on commercial GDEs for the CO_2RR, **J. Shi, Ruhr University Bochum**
P-05	Fabrication of a CuBZnO Modified GDEs for Back-Pressure Modulated Electrochemical CO_2 Reduction, **J. Weidner, Ruhr University Bochum**
P-06	Impact of Catalyst Ink Dispersion Method on Gas Diffusion Electrode Performance for CO_2 Reduction, **K. Lawrence, TU Delft**
P-07	Model-based Analysis of CO_2 Reduction Reaction Kinetics on Planar Silver Electrodes, **M. Sivasankaran, Max Planck Institute for Dynamics of Complex Technical Systems**
P-08	Combined modelling and experimental evaluation of advanced catholyte compartment designs for improved CO_2 reduction towards hydrocarbons in flow cell electrolyzers, **M. Filippi, TU Berlin**
P-09	Exploring the Effects of Mass Transport on the Efficiency of CO_2 Electrolysis Using a Flow Cell Setup, **C. Blümner, Otto von Guericke University Magdeburg**
P-10	Tailored gas diffusion electrodes for electrochemical CO_2 reduction, **S. Chandrasekar, PhotoCatalytic Synthesis, University of Twente**
P-11	Optimization of the zero-gap half-cell for electroreduction of CO_2 to multicarbon (C2+) products, **V. Chanda, Faculty of Chemistry and CENIDE, Center for Nano-integration, University Duisburg Essen**
P-12	Tuning pH profiles in Gas Diffusion Electrodes for Formic Acid Production, **R. Taghanaki, Institute of Technical Chemistry, University of Stuttgart**

	GDE Characterization
P-13	PTFE degradation and morphology investigation in Gas Diffusion Electrodes after electrochemical performance, **R. de Oliveira Silva, Institute of Applied Materials, Helmholtz-Zentrum Berlin**
P-14	Determining the electrochemical active surface area of fuel cell catalyst layers in a gas diffusion electrode half-cell setup, **N. Röttcher, Forschungszentrum Jülich, Helmholtz-Institute Erlangen-Nürnberg for Renewable Energy**
P-15	Efficient Methods to Characterize the Morphology of Highly Porous 3D Metallic Foam Electrodes, **H. Hoffmann, University of Bayreuth**
P-16	Predictive, Multiphysics simulation of effective electrical conductivity, permeability, porosity, and specific active area of Gas Diffusion Electrodes (GDE), **S. Atyabi, Flemish Institute for Technological Research, Mol, Belgium**
P-17	Probing the activity and stability of oxygen evolution electrocatalysts using a modified GDE setup, **M. Geuß, Helmholtz-Institute Erlangen-Nürnberg**
P-18	Electrochemical characterisation of the ORR in realistic catalyst layers with a GDE, **P. Lauf, Helmholtz-Institute Erlangen-Nürnberg**

	Fuel Cells and Water Electrolysis
P-19	Optimisation of Gas Diffusion Electrode for Alkaline Fuel Cell with Liquid Electrolyte, **J. Hnát, University of Chemistry and Technology Prague, Department of Inorganic Technology**
P-20	Investigation of PEMFC Multiphase Transport in Cathodic Gas Diffusion Layers Using a Co-Simulation Concept, **L. Hüfner, Ernst-Berl-Institute, Technische Universität Darmstadt**
P-21	Microfluidic PEM Water Electrolyzer Cell to Investigate the Two-Phase Flow in the Anodic Pore-Network Structure, **S. Bhaskaran, Otto von Guericke University Magdeburg**
P-22	Distribution of Relaxation Times as a Diagnosis Tool for Polymer Electrolyte Membrane Electrolysers, **D. Brinker, Institute for Applied Materials – Electrochemical Technologies, Karlsruhe Institute of Technology**

P-23	The performance of different iron compounds in gas diffusion electrodes for a novel alkaline water electrolysis process, **M. Kaiser, Institute of Chemical and Electrochemical Process Engineering, TU Clausthal**
P-24	Scale-up of microbial fuel cells using large-area gas diffusion electrodes, **L. Landwehr, Institute of Chemical and Electrochemical Process Engineering, TU Clausthal**

	Other Electrochemical Processes
P-25	Carbon monoxide electroreduction in catholyte-free gas diffusion electrolysers, **S. Gupta, Helmholtz Zentrum Berlin für Materialien und Energie**
P-26	Wetting behavior of electrolyte in a silver GDE and how it affects performance in metal-air batteries, **A. Kube, German Aerospace Center**
P-27	Switchable Oxygen Depolarized Cathodes for flexible Chlor-Alkali Electrolysis, **K. Baitalow, Chemical Process Engineering, RWTH Aachen University**
P-28	Preparation of an air-diffusion cathode based on Printex L6 carbon supported on carbon cloth for H_2O_2 electrogeneration in water treatment: Catalysis and viability, **M. Kronka, University of Sao Paulo / Universitat de Barcelona**
P-29	Bifunctional silver-based gas diffusion electrodes for electrically rechargeable zinc-air flow batteries: Challenges and perspectives, **S. Genthe, Technical University of Clausthal**
P-30	Gold Recovery and Nanoparticle Synthesis by Gas-Diffusion Electrocrystallization (GDEx), **L. León Fernández, VITO (Flemish Institute for Technological Research)**
P-31	Gas Diffusion Electrodes for Electrochemical NAD(P)H Regeneration, **M. Al-Shaibani, Max Planck Institute, Magdeburg**
P-32	Rational design of 3-D porous enzymatic electrodes for the production of gluconic acid in bioelectrochemical system, **M. Varnicic, Institute of Chemistry, Technology and Metallurgy, Belgrade**

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