

Curriculum Vitae

Lorenz GUBLER

PD Dr.



Personal Information

Date of Birth Aug 14, 1971
Nationality Swiss
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Employment History

Current Position

since 01/2012

Research Group Leader

Paul Scherrer Institut, Villigen PSI (CH),
Head of Research Group 'Membranes & Electrochemical Cells' in the
Electrochemistry Laboratory / Energy & Environment Research Division
head count: 10 (PhD students, postdoctoral fellows, technicians, students)
<http://www.psi.ch/lec/mec>

Previous Positions

11/2002-12/2011

Research Associate & Project Leader

Paul Scherrer Institut, Villigen PSI (CH)
Electrochemistry Laboratory (Dr. G.G. Scherer)

02/2001-10/2002

Product Development Scientist

Johnson Matthey Fuel Cells, Reading (United Kingdom)
Development of electrochemical components and diagnostics for fuel cells,
responsible for design of fiber-reinforced composite membrane, coordination
and supervision of fabrication and testing on the lab scale, scale-up to pilot
line

06/1997 – 12/2000

Research & Teaching Assistant

Paul Scherrer Institut, Villigen PSI & ETH Zürich (CH)
PhD Researcher, Electrochemistry Laboratory of PSI (Dr. G.G. Scherer)

Academic Profile

2018

Habilitation & *Venia Legendi*

Title: "Radiation Grafted Membranes for Polymer Electrolyte Fuel Cells"
ETH Zürich, Laboratory for Physical Chemistry, degree: *PD Dr.* (PD =
Privatdozent)

1997 – 2000

PhD Thesis

Title: "Operating Polymer Electrolyte Fuel Cells with Reformed Fuel"
Paul Scherrer Institut, Electrochemistry Laboratory, & ETH Zürich (Prof. Dr.
A. Wokaun), degree: *Dr. sc. techn.*

1996 – 1997

Master Thesis

Title: "Elektrophoretische Abscheidung von ZrO₂-Schichten für
Festelektrolyt-Brennstoffzellen", ETH Zürich, Institute of Nonmetallic
Inorganic Materials (Prof. Dr. L.J. Gauckler), degree: *MSc*

1991 – 1996

Undergraduate & graduate studies in Materials Science

ETH Zürich, final degree: *Master of Science (MSc)* ("Dipl.-Ing. ETH")

Research Projects as Leading Investigator

Project Description	Funding		Duration
	Source	CHF ^a	
Radical Induced Damage and Mitigation of Anion Conducting Ionomers and their Constituents under Alkaline Conditions	SNF	965k	2023-2027
(Industry service contracts)	Industry	56.5k	2021-2022
New materials for electrolysis cells and next generation electrochemical water splitting devices	SFOE	287k	2021-2024
PEMFC membranes with enhanced interactions	BMW	54k	2019-2020
Functional composite separator-membrane materials for redox flow batteries	SNF	257k	2020-2023
Electrochemical separation and compression of CO ₂	Shell	400k	2019-2020
Determination of gas permeation properties of fuel cell membranes	Daimler-NuCellSys	45k	2018 (3M)
Functionalized Separators Enabling a Break-Through of Redox Flow Batteries for Stationary Energy Storage	Bridge Discovery ^b	648k	2018-2022
Polymer electrolyte water electrolysis at elevated temperature for reduced cost of hydrogen for energy applications	SFOE	286k	2017-2021
Radical Attack, Antioxidants and Polymer Repair Chemistry in Hydrocarbon based Fuel Cell Membranes	SNF	600k	2018-2021
Chemistry and Stability of Grafted Membranes for Redox Flow Batteries	SFOE	257k	2016-2019
Understanding of degradation signatures in water electrolyzers operated with variable input	SFOE	140k	2015-2018
Membranes for high-temperature polymer fuel cells	SNF	194k	2015-2017
HyForm: Formic acid - chemical storage of electrical energy and on-site hydrogen production for use in PEM fuel cells (Co-PI)	CCEM / CTI	57k / 20k	2014-2016
Sinergia 'REPCOOL' (Redox flow electrochemistry for power delivery and cooling) (Co-PI)	SNF	363k	2013-2016
Structure-property correlations of ion-containing polymers for fuel cells based on small-angle scattering techniques (Co-PI)	PSI	174k	2013-2016
Lithium conducting polymer electrolytes with polysulphide barrier properties	SNF	239k	2013-2016
Novel materials and system designs for low cost, efficient and durable polymer electrolyte water electrolyzers (NOVEL)	FCH-JU ^c	413k	2013-2016
S-Chain: Development of components for fuel cells (Co-PI)	Industry	(550k)	2008-2015
Antioxidant strategies for fuel cell membranes	SNF	203k	2010-2014
Radiation grafted fuel cell membranes with improved stability	PSI	225k	2009-2013
NanoTera 'Greenpower' (Connecting renewable energy to green mobility using hydrogen as energy carrier) (Co-PI)	SNF	638k	2009-2012
Understanding membrane degradation mechanisms under fuel cell operating conditions	SFOE	323k	2007-2014
Enhancing PEFC durability and reliability under application-relevant conditions (Co-PI)	SFOE	760k	2007-2010
Degradation Mechanisms and Rapid Aging Testing of Fuel Cell Membranes (Co-PI)	ETHZ	153k	2006-2009

^a research funds to own group / laboratory

^b joint program by SNF and Innosuisse

^c Fuel Cells & Hydrogen – Joint Undertaking (EU-Project)

Awards

2001 ETH Medal for outstanding PhD thesis

Awards and grants to team / group members

2022	Tym de Wild	<i>Poster award</i> Polymers for Fuel Cells, Energy Storage and Conversion, Napa (CA), USA, May 15-18, 2022
2022	Jamie Duburg	<i>Mobility grant</i> Swiss National Science Foundation CHF 14k, 6 month for research stay at the Simon Fraser University, Vancouver, Canada (Prof. S. Holdcroft), May-Oct 2022
2021	Alexander P. Muroyama	<i>SNF Ambizione Grant</i> CHF 405k, 24 months 'A novel process for electrochemical direct-air capture of CO ₂ '
2021	Tym de Wild	<i>Poster award</i> Workshop on Ion Exchange Membranes for Energy Applications (online conference), Jun 22-24, 2021
2020	Tym de Wild	<i>Research fellowship</i> Japan Society for the Promotion of Science (JSPS) for research stay at the University of Yamanshi, Japan (Prof. K. Miyatake), Jun-Aug 2022
2019	Fabio J. Oldenburg	<i>PSI Founder Fellowship</i> CHF 150k, 12 month Support for creating the PSI spin-off 'Gaia Membranes' (membranes for redox flow batteries)
2017	Fabio J. Oldenburg	<i>Poster award</i> The 6 th International Seminar on Green Energy Conversion, Summer School for Young Scientists, Koumi, Nagano, Japan, Sep 13-15, 2017
2015	Albert Albert	<i>Poster award</i> SCS (Swiss Chemical Society) Fall Meeting, Lausanne, Switzerland, Sep 4, 2015
2015	Maria Geormezi	<i>Poster award</i> 6 th International Conference on Fundamentals and Development of Fuel Cells, Toulouse, France, Feb 3-5, 2015
2014	Albert Albert	<i>Poster award</i> 65 th Annual Meeting of the International Society of Electrochemistry, Lausanne, Switzerland, Aug 31 - Sep 5, 2014
2014	Tom Engl	<i>Poster award</i> 3 rd International Seminar on Green Energy Conversion, Yamanashi, Japan, Aug 25-27, 2014
2012	Kaewta Jetsrisuparb	<i>Graduate student award</i> in recognition of the outstanding paper contributed to Symposium F, Solid Proton Conductors (in honour of Professor G. Alberti), E-MRS 2012 Spring Meeting, Strasbourg, France, May 14-18, 2012
2011	Yves Buchmüller	<i>Top 5 Poster</i> 12 th Tihany Symposium on Radiation Chemistry, Zalakaros, Hungary, Aug 27 - Sep 1, 2011

Governing Activities

Supervisor of PhD Theses at ETH Zürich (in parenthesis: principal investigator)

(2023)	Cesar Weber	(Salvatore De Angelis, Felix Büchi)
(2023)	Kinanti Aliyah	(Jens Eller, Felix Büchi)
(2023)	Ricardo Carreon	(Pierre Boillat)

Co-examiner of PhD Theses at ETH Zürich

2023	Tym de Wild
2021	Steffen Garbe
2019	Fabio Oldenburg
2019	Ugljesa Babic
2017	Olga Nibel
2016	Véronique Sproll
2016	Albert Albert
2016	Joanna Conder
2015	Tom Engl
2014	Zhuoxiang Zhang
2014	Yves Buchmüller
2013	Kaewta Jetsrisuparb
2011	Nicolas Linse
2010	Frank Wallasch

External PhD Committees

2023	Xiangyu Wu, EPF Lausanne, (invited by Prof. X. Hu)
2021	Danick Reynard, EPF Lausanne, (invited by Prof. H. Girault)
2021	Christian Hänsel, ETH Zürich, D-MATL (invited by Prof. M. Niederberger)
2014	Luis Felipe Rodrigues Castanheira, Université de Grenoble (invited by Dr. F. Maillard)
2014	Assma El Kaddouri, Université de Grenoble (invited by Prof. C. Bas)
2013	Étienne Labalme, Université de Montpellier II, France (invited by Dr. G. David)
2009	Feifei Ng, Université de Montpellier II, France (invited by Dr. D. Jones)

Hosting of Visiting Researchers / Scholars

2019/2020	Albert Albert, BMW, Germany
2018	Ayoub Ouarga, Université Mohammed VI Polytechnique, Morocco
2015	Prof. Dr. Mohamed M. Nasef, Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia
2013	Dr. Davide De Focatiis, University of Nottingham, UK
2008	Dr. Tetsuya Yamaki, Japan Atomic Energy Agency (JAEA), Takasaki, Japan
2007	Antonio Jose Martín Fernandez, Autonomy University of Madrid, Spain

Selection Committees

2015	for the position of Research Scientist in the Section for Proton Conductors at DTU Energy, Denmark (invited by Prof. Jens Oluf Jensen)
2023	for the position of Research Group Leader in the Electrochemistry Laboratory at Paul Scherrer Institut, Switzerland (invited by Prof. Thomas J. Schmidt)

Work as Reviewer

- 2021 European Commission, Horizon Europe programme: EIC Transition Challenges 2021 (HORIZON-EIC-2021-TRANSITION-CHALLENGES-01-02): Energy Harvesting and Storage Technologies (RIA)
- 2020 Dutch Research Council, Theme: Storage and Conversion, The Netherlands; Fonds National de la Recherche (FNR), Luxembourg; Czech Science Foundation, Czech Republic
- 2018 Italian Ministry for Education, University and Research (MIUR), Italy
- 2017 Fonds National de la Recherche (FNR), Luxembourg
- 2017 Volkswagenstiftung, Germany
- 2014, 2018, 2023 Agence Nationale de Recherche (ANR), France
- 2014 National Science Foundation (NSF), USA
- Numerous journals, including Chem. Rev., J. Phys. Chem., Energy Environ. Sci., ChemSusChem, Adv. Mater, Adv. Funct. Mater., Adv. Energy Mater., Nature Energy

Invited Conference Contributions

- 2022 “Tethered Antioxidant for Improved Chemical Stability of Sulfonated Hydrocarbon-based Fuel Cell Membranes”, Workshop on Ion Exchange Membranes for Energy Applications (EMEA) 2022, Bad Zwischenahn, Germany, June 10-22
- 2022 “Functionalized PBI Membranes for High-Performance Vanadium Redox Flow Batteries”, Polymers for Fuel Cells, Energy Storage and Conversion, Napa (CA), USA, May 15-18
- 2021 “Membrane Design & Engineering Principles for Next-Generation Water Electrolysers”, 2nd Edition Next Generation Electrolysers, online conference, Dec 7-8
- 2021 “Membrane Requirements and Opportunities for Next-Generation Water Electrolysers”, 3rd International Conference on Electrolysis (ICE), webinar, June 18
- 2019 “Amphoteric and Bilayer Membranes for Vanadium Redox Flow Batteries”, Asilomar Conference on Polymers for Fuel Cells, Energy Storage, and Conversion, Pacific Grove CA, USA, Feb 24-27
- 2018 “Antioxidant Strategies for Hydrocarbon-based Membranes”, Americas International Meeting on Electrochemistry and Solid State Science (AiMES), Joint International Meeting between the Electrochemical Society (ECS) and the Sociedad Mexicana de Electroquímica (SMEQ), I01 - Fuel Cells, Electrolysers, and Energy Conversion, Abstract #I01C-1454, Cancun, Mexico, Sept 30 – Oct 4
- 2018 “Membranes for All-Vanadium Redox Flow Batteries – Current Development Trends”, 1st Swiss & Surrounding Battery Days (SSBD), Baden, Switzerland, May 23-25
- 2017 “Addressing Transport Selectivity and Cycling Stability in Vanadium Redox-Flow Batteries using an Amphoteric Membrane”, Asilomar Conference on Polymers for Fuel Cells, Energy Storage, and Conversion, Pacific Grove CA, USA, Feb 26 – March 1
- 2016 “Membranes for Water Electrolysis - Target-Oriented Choice and Design of Materials”, Second International Workshop on Durability and Degradation Issues in PEM Electrolysis Cells and its Components, Fraunhofer ISE, Freiburg, Germany, February 16-17
- 2015 “Radiation Grafting: Tailored Ion-conducting Membranes for Electrochemical Applications”, Asilomar Conference on Advances in Polymers for Fuel Cells and Energy Devices, Pacific Grove CA, USA, Feb 8-11
- 2014 “Radiation Grafted Fuel Cell Membranes: Radical Attack and Mitigation Using Polymer-Bound Antioxidants”, 11th Meeting of the Ionizing Radiation and Polymers Symposium (IRaP 2014), Jeju Island, Korea, October 5- 9
- 2014 “Membrane Degradation, Radical Attack and Mitigation via Regenerative Radical Scavengers”, 11th Symposium on Fuel Cell and Battery Modeling and Experimental Validation (ModVal 11), Winterthur, Switzerland, March 17-19 (plenary talk)
- 2013 “Radiation Grafted Membranes for Fuel Cells: Strategies to Compete with PFSA Membranes”, 224th Meeting of the Electrochemical Society, B11 -Polymer Electrolyte Fuel Cells 13, Abstract #1271, San Francisco, USA, Oct 26 – Nov 1 (plenary talk)

- 2013 “Radiation Grafted Membranes: Strategies to Outperform and Outlast State-of-the-Art PFSA Materials”, Asilomar Conference on Advances in Materials for Proton Exchange Membrane Fuel Cell Systems, Pacific Grove CA, USA, Feb 17-20
- 2011 “Polymerelektrolyt Brennstoffzellen: Entwicklungsstand und materialwissenschaftliche Herausforderungen”, 9. Riesaer Brennstoffzellen – Workshop, Riesa, Germany, June 22
- 2009 “New Trends in Hydrocarbon Membrane Development”, Gordon Research Conference – Fuel Cells, Bryant University, Smithfield RI, USA, July 26-31
- 2008 “Trends for Fuel Cell Membrane Development”, 12th Aachener Membran Kolloquium, Aachen, Germany, Oct 29-30, proceedings pp. 281-288
- 2007 “Strategy for Aging Tests of Fuel Cell Membranes”, US DOE High Temperature Membrane Working Group Meeting (joint session with CARISMA), Washington DC, USA, Oct 10
- 2005 “Trends in Membrane Electrode Development for PEFC”, European Materials Research Society (E-MRS) 2005 Spring Meeting, Symposium L: Hydrogen and Fuel Cells, May 31 – June 3, L-V.01

Organization of Conferences

- 2022 Scientific Committee, *International Flow Battery Forum (IFBF)*, Brussels (Belgium), June 28-29
- 2021 Scientific Organizing Committee, *European Fuel Cell Forum (EFCF)*, held online June 29 – July 2
- 2017- Organizing Committee, *Swiss Electrochemistry Symposium*
2021 Scientific Committee, *International Flow Battery Forum (IFBF)*, held online Jan 19-21
- 2019 Organizing and Advisory Committee, *International Flow Battery Forum (IFBF)*, Lyon (France), July 9-11
- 2018 Co-organizer of the 15th *Symposium on Modeling and Validation of Electrochemical Energy Devices (ModVal 2018)*, Aarau (CH), April 12-13
- 2015 Co-coordinator of Symposium 4 (‘Advances in Fuel Cells from Materials to Systems’) of the 66th *Annual Meeting of the International Society of Electrochemistry*, Taipei, Taiwan, Oct 4-9
- 2012 Co-organizer of the 9th *Symposium on Fuel Cell and Battery Modeling and Experimental Validation (ModVal 9)*, Sursee (CH), April 2-4

Outreach

- 2021 Swiss Association of Energy Economics (SAEE) Webinar: Grüner Wasserstoff in der Schweiz: Chancen und Herausforderungen, “Technische Optionen der Produktion von grünem Wasserstoff in der Schweiz”, July 1
- 2018 Evening Lecture to Naturwissenschaftliche Gesellschaft Winterthur (NGW), “Brennstoffzellen: Eine Technologie vor dem Durchbruch?”, Winterthur, Nov 9
- 2017 Summer Student Lecture, “Electrochemical Devices for Energy Conversion and Storage”, Paul Scherrer Institut, July 12
- 2014 Summer Student Lecture, “Fuel Cells in the Context of the Energy Transition”, Paul Scherrer Institut, Aug 20
- 2013 Hochrhein-Seminar für Mathematik und Naturwissenschaften, “Die Brennstoffzelle: was ist der Stand der Technologie, wo drückt der Schuh?“, education program for interested and capable pupils (www.hochrhein-seminar.de), Waldshut, Germany, Oct 11
- 2005 Evening Lecture to Technische Gesellschaft Zürich (TGZ), “Die Brennstoffzelle – was trägt sie bei zur Lösung der Energieproblematik?”, Zürich, Sept 26
- 2003 – Overview lectures and guided tours at PSI related to energy challenges and energy research topics at PSI to a very diverse general audience (e.g., high-school students, academic delegations, company excursionists, retirees, etc.)

- 1999, 2000, PSI Autumn School: co-organization of tutorials on energy topics and fuel cell experiments in the lab (1 full day) for high-school students
- 2000 Tutorial (1 h) on 'Hydrogen' at the Academic High School (Kantonsschule / Gymnasium) Wetzikon, Switzerland

Scientific Track Record

Google Scholar: scholar.google.ch/citations?user=i9w3tkYAAAAJ

Co-author of 93 peer-reviewed journal articles and 7 peer-reviewed book chapters

Co-inventor of 15 patents/patent applications

28 invited talks

Total no. of citations: 3'890; h-index: 34 (Scopus) (status 30-May-2023)

Professional affiliations: Materials Research Society (MRS), The Electrochemical Society (ECS), ETH (Materials) Alumni, Studiengruppe Energieperspektiven

Teaching

- 2020 – “Electrochemistry: Fundamentals, Cells & Applications“ (529-0659-00), 100 % (39 lessons), ETH Zürich
- 2020 – “Electrochemical Energy Conversion and Storage Technologies“ (529-0191-01), 40 % (15 lessons), ETH Zürich
- 2019 – “Hands-on Electrochemistry for Energy Storage and Conversion Applications“ (529-0507-00), 25 %, 10 days block course, PSI and ETH Zürich
- 2018 Introductory lecture, “Anti-Aging and Detox for Fuel Cell Membranes“, Laboratory of Physical Chemistry, Department of Chemistry and Applied Biosciences, ETH Zürich, March 20
- 2018 – ‘19 “Renewable Energy Technologies II“ (529-0191-01), 50 % (15 lessons), ETH Zürich
- 2015 – Contributions (2 lessons per year on ‘Power-to-Gas’ / ‘Power-to-X’) to Lecture “Energy Storage Systems“, Prof. Dr. J. Worlitschek, Lucerne School of Engineering and Architecture
- 2012 – ‘17 Contributions (4-10 lessons per year) to Lecture “Renewable Energy Technologies II“, Prof. Dr. T.J. Schmidt, ETH Zürich
- 1998 Teaching assistant in the lecture ‘Phyikalisch-chemische Aspekte der Energienutzung’ (A. Wokaun) at ETH Zürich
- 1995, 1996 Teaching assistant (3 semesters) in the lecture ‘Mechanics’ at ETH Zürich for 1st and 2nd semester engineering students

Invited Seminars & Colloquia

- 2023 Beyond-PFSA project meeting, Zentrum für Sonnenenergie- und Wasserstoff-Forschung (ZSW), Ulm, “Degradation Studies of Hydrocarbon Fuel Cell Membranes“, March 3 (invited by Dr. Klaus-Dieter Kreuer)
- 2021 University of Science and Technology (UST), Korea, Global Mentoring Conference, “Electrochemical Technologies in the Context of the Energy Transition“, Online lecture, October 1, 2021 (invited by Dr. Dirk Henkensmeier, KIST)
- 2021 ETH Materials Colloquium, “Fuel Cells, Batteries, Electrolyzers, etc.: Some Insights from a Materials Science Point of View“, Sept 1 (invited by the Scientific Staff Association at the Department of Materials, SAM)
- 2019 Seminar at the Shell Technology Centre Amsterdam (together with A. Pătru, B. Pribyl-Kranewitter, A. Muroyama), “CO₂ as Feedstock for Value-Added Products: the Potential

- Role of Electrochemistry”, Amsterdam, The Netherlands, October 3 (invited by Dr. Emanuela Negro)
- 2017 Physical Chemistry Colloquium, “Energy Storage using Power-to-Gas “, ETH Zürich (trial lecture for obtaining *venia legendi*), June 20 (invited by Prof. Karl-Heinz Altmann)
- 2015 Seminar at the Max Planck Institute (MPI) for Solid State Research, Department of Physical Chemistry of Solids, “Radiation Grafting: Tailoring of Ion-conducting Membranes for Electrochemical Applications”, Stuttgart, Germany, May 11 (invited by Dr. Klaus-Dieter Kreuer)
- 2015 Seminar at University of Nottingham, Faculty of Engineering, “Ion-conducting Membranes for Energy Devices prepared by Radiation Grafting”, Nottingham, UK, Feb 26 (invited by Prof. Davide De Focatis)
- 2015 Seminar at University of Surrey, Department of Chemistry, “Radiation Grafting: Tailoring of Ion-conducting Membranes for Electrochemical Applications”, Guildford, UK, Feb 23 (invited by Prof. John Varcoe)
- 2014 Seminar at Donghua University, College of Environmental Science and Engineering, “Radiation Grafting: Tailoring of Ion-conducting Membranes for Electrochemical Applications”, Shanghai, China, Oct 13 (invited by Prof. Qinli Qiao)
- 2013 Physical Chemistry Colloquium, “Radiation Grafting: Tailoring of Ion-Conducting Membranes for Electrochemical Applications“, ETH Zürich, Dec 3 (invited by Prof. T.J. Schmidt)
- 2012 Seminar at the Adolphe Merkle Institute University of Fribourg, “Ion-containing Membranes for Fuel Cells”, Marly, Sept 18 (invited by Dr. Sandor Balog)
- 2012 Seminar at Université de Savoie, “Radiation Grafted Membranes for Polymer Electrolyte Fuel Cells”, Le Bourget-du-Lac, France, July 2 (invited by Prof. Corine Bas)
- 2010 UK Nanomat, “Nanoscale Aspects of Materials Research and Development in Polymer Electrolyte Fuel Cells”, Paul Scherrer Institut, March 18 (invited by Prof. A. Wokaun)
- 2010 IEA Advanced Fuel Cells Annex 25 Stationary Fuel Cells Meeting No. 2, “Polymer Electrolyte Fuel Cell Activities at PSI and in CH”, Winterthur, Switzerland, April 27 (invited by Stephan Renz)
- 2006 RCECS-PSI Joint Seminar, “Characterization of Fuel Cell Performance and Durability using MEAs with Radiation Grafted Membranes”, Paul Scherrer Institut, Aug 23/24 (invited by Prof. Alexander Wokaun)
- 2006 Seminar at EMPA Thun, “PSI Electrochemistry Laboratory: Contributions to Efficient Energy Storage and Conversion”, Nov 16 (invited by Dr. Philippe Kern)
- 2005 Seminar at the National Research Council Canada, Institute for Fuel Cell Innovation, “Radiation Grafted Membranes for Low Temperature Fuel Cells”, Vancouver, Canada, Sept (invited by Prof. Michael Eikerling)
- 2000 Seminar at Imperial College, London, UK, on reformate operation of fuel cells