Prof. Dr. Peter Wasserscheid

(*23.10.1970, married, three children: 2000, 2002, 2005)
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Working group vision and contribution to catalaix

The Wasserscheid group conducts catalyst research and process development for a more sustainable chemical industry and an emission-free energy system of the future. The group is one of the leading teams in the development of catalytic processes for chemical hydrogen storage, especially using liquid organic hydrogen carrier systems. Innovative solvent systems, mainly based on liquid salts, so-called ionic liquids, are another research focus. The group also deals with system design and with the realization of larger demonstrators. Therefore, there is also extensive experience in the field of technology transfer (several company foundations with today > 300 employees, > 100 patent applications; several processes realized on a large scale).

The Wasserscheid group contributes to the catalaix project with innovative technologies for the supply of hydrogen for the multidimensional circular economy using CO_2, polymer waste and biomass. The focus is on catalyst development for hydrogenation/dehydrogenation and on reactor development for hydrogenation/dehydrogenation. Further focal points are the direct use of chemically bound hydrogen in recycling processes and the production of hydrogen carrier molecules from biomass or polymer waste. Through the Wasserscheid group, catalaix has excellent connections to the hydrogen-based structural change projects of Forschungszentrum Jülich.

Current & Previous Positions

Since 2003	**Full Professor of Chemical Reaction Engineering**, Department of Chemical and Biological Engineering, Friedrich-Alexander-Universität Erlangen-Nürnberg – currently 51% of Peter's working time
Since 2014	**Founding director** (4/2014 – 11/2015) and **director** (since 12/2015) of the Helmholtz-Institute Erlangen-Nürnberg for Renewable Energy (HI ERN); HI ERN is part of Forschungszentrum Jülich but located in Erlangen and Nuremberg.
since 2021	**Founding director** of the Institute for a Sustainable Hydrogen Economy (INW) of Forschungszentrum Jülich and head of INW-D (demonstrator projects) - both positions at the Forschungszentrum Jülich add to 49 % of Peter's working time

Education

1998 – 2003	**Habilitation**, Technical Chemistry, RWTH Aachen, Germany
1995 – 1998	**PhD** with Prof. Keim, Institute for Technical and Macromolecular Chemistry, RWTH Aachen, Germany
1991 – 1995	**Diploma in Chemistry,** RWTH Aachen, Germany

Fellowships and Awards

2000 Haltermann Innovation Award
2000 Karl-Zerbe-Award of DGMK
2001 Max-Buchner-Award of DECHEMA
2003 German Industry Innovation Award (cat. “start-up”) with Solvent Innovation GmbH, Cologne
2006 **Leibniz Award of the German Science Foundation (DFG)**
2010 **ERC Advanced Investigator Grant**
2013 Honorary Professorship, Chinese Academy of Science, Beijing
2016 CATSA Eminent Visitor Award of the South African Catalysis Society
2016 German Industry Innovation Award (category “start-up”) with Hydrogenious Technologies GmbH
2018 **ERC Advanced Investigator Grant**
2018 ‚Deutscher Zukunftspreis des Bundespräsidenten 2018‘ – top 3 selection
2019 **Siemens „Inventor of the Year 2019 – Open Innovation”**; with Drs. Katharina Meltzer, Dr. Alexander Tremel, Dr. Manfred Baldauf (all Siemens AG).

Contributions to the science system

2008 – 2016 Fachkollegiat for the German Science Foundation (DFG)
2013 – 2014 Panel Chair (PE 8) for the ERC Synergy Grant
Since 2019 Director of the Hydrogen Center Bavaria
Since 2019 Member of the Bavarian Academy of Sciences

Selected projects

2006 – 2012 Initiator and coordinator of SPP 1191 “Ionic Liquids”, Priority Programme of DFG
2007 – 2019 Deputy spokesperson of the Cluster of Excellence „Engineering of Advanced Materials“ at FAU
2019 – 2022 Coordination Committee of *Kopernikus Project P2X* (BMBF)
2022 - 2025 Spokesperson of CRC 1452 „Catalysis at Liquid Interfaces”
2019 – 2025 Erforschung und Entwicklung eines emissionsfreien und stark emissionsreduzierten Antriebssystems am Beispiel des Schienenverkehrs (Durchführung: HI ERN; Fördermittelgeber: Bayerisches Staatsministerium für Wirtschaft, Landesentwicklung und Energie; Rolle: Projektleiter; eigene Fördersumme: 28,697,000 €)
2018 – 2024 **ERC Advanced Investigator Grant**: “Supported Catalytically Active Liquid Metal Solutions”, SCALMS, Grant agreement No.: 786475, (Durchführung: FAU; Fördermittergeber: European Research Council; Rolle: Geförderter im Einzelprojekt; Fördersumme: 2.493.000 €).
2000 – 2024 300 kW oneReactor using LOHC technologies for the Forschungszentrum Jülich Living lab energy campus (Durchführung: HI ERN; Fördermittelgeber: BMBF; Rolle: Teilprojektleitung; eigene Fördersumme: 798,000 €)
2021 – 2024 HECTOR-Projekt – Einspeicherung von grünem Wasserstoff in LOHC im Tonnenmaßstab am Standort Dormagen (Durchführung: HI ERN; Fördermittelgeber: NRW: Progres-Programm; Rolle: Teilprojektleitung; eigene Fördersumme: 2,072,917€.

Most important scientific contributions

[1] Wasserscheid, P., Keim, W.: Ionic liquids - New 'solutions' for transition metal catalysis, Angewandte Chemie - International Edition, (2000). DOI: 10.1002/1521-3773(20001103)39:21. (cited 6218 times, SCOPUS 10.10.2023) – *review and concept paper about the use of ionic liquids in chemistry and chemical engineering.*

[2] Preuster, P., Papp, C., Wasserscheid, P.: Liquid Organic Hydrogen Carriers (LOHCs): Toward a Hydrogen-free Hydrogen Economy, Accounts of Chemical Research (2017). DOI: 10.1021/acs.accounts.6b00474. (cited 555 times) – *review and concept paper about the use of LOHC systems in hydrogen storage and transport.*

[3] Jorschick, H., Preuster, P., Dürr, S., Seidel, A., Müller, K., Bösmann, A., Wasserscheid, P.: Hydrogen Storage Using a Hot Pressure Swing Reactor, Energy & Environmental Science (2017). DOI: 10.1039/C7EE00476A. (cited 118 times) – *research paper on the pressure-driven hydrogenation/dehydrogenation of LOHC system using the same catalyst and reactor.*

[4] Taccardi, N., Grabau, M., Debuschewitz, J., Distaso, M., Brandl, M., Hock, R., Maier, F., Papp, C., Erhard, J., Neiss, C., Peukert, W., Görling, A., Steinrück, H.-P., Wasserscheid, P.: Gallium-rich Pd-Ga phases as supported liquid metal catalysts, Nature Chemistry, (2017). DOI: 10.1038/nchem.2822. (cited 186 times) – *research paper on alloy materials providing access to single atom catalysis.*

[5] Sievi, G., Geburtig, D., Skeledzic, T., Bösmann, A., Preuster, P., Brummel, O., Waidhas, F., Montero, M.A., Khanipour, P., Katsounaros, I., Libuda, J., Mayrhofer, K.J.J., Wasserscheid, P.: Towards an efficient liquid organic hydrogen carrier fuel cell concept, Energy & Environmental Science (2019). DOI: 10.1039/C9EE01324E. (cited 59 times) – *research paper on the direct electrochemical use of hydrogen-rich LOHC compounds.*

[6] Geisselbrecht, M., Mrusek, S., Müller, K., Preuster, P., Bösmann, A., Wasserscheid, P.: Highly Efficient, Low-Temperature Hydrogen Release from Perhydro-Benzyl Toluene Using Reactive Distillation, Energy & Environmental Science (2020). DOI: 10.1039/D0EE01155J. (cited 37 times) – *research paper on the facilitated hydrogen release from LOHC systems in a RD column.*

[7] Bulgarin, A., Jorschick, H., Preuster, P., Bösmann, A., Wasserscheid, P.: Purity of hydrogen released from the Liquid Organic Hydrogen Carrier compound perhydro dibenzyltoluene by catalytic dehydrogenation. DOI: 10.1016/j.ijhydene.2019.10.067 (cited 58 times) – *research paper on hydrogen purity and hydrogen purification from LOHC dehydrogenation processes.*

[8] Rüde, T., Dürr, S., Preuster, P., Wolf, M., Wasserscheid, P.: Benzyltoluene/perhydro benzyltoluene - pushing the performance limits of pure hydrocarbon liquid organic hydrogen carrier (LOHC) systems, Sustainable Energy & Fuels (2022). DOI: 10.1039/D1SE01767E. (cited 22 times) – *research paper on hydrogen storage using benzyltoluene-based LOHC systems.*

[9] Solymosi, T., Geißelbrecht, M., Mayer, S., Auer, M., Leicht, P., Terlinden, M., Malgaretti, P., Bösmann, A., Preuster, P., Harting, J., Thommes, M., Vogel, N., Wasserscheid, P.: Nucleation as a rate-determining step in catalytic gas generation reactions from liquid phase systems, Science Advances (2022). DOI: 10.1126/sciadv.ade3262. (cited 6 times) – *research paper on the role of nucleation-inhibition in hydrogen release reactions.*

[10] Schühle, P., Stöber, R., Semmel, M., Schaadt, A., Szolak, R., Thill, S., Alders, M., Hebling, C., Wasserscheid, P., Salem, O.: Dimethyl ether/CO_2 – a hitherto underestimated H_2 storage cycle, Energy & Environmental Science (2023). DOI: 10.1039/d3ee00228d. (cited 3 times) – *research paper on DME steam reforming and CO_2 back transportation for highly efficient hydrogen transportation.*

Patents (3 examples out of 119 filed or granted patent families)

[1] Albert, J., Baldauf, M., Reichert, J., Stark, K., Tremel, A., Wasserscheid, P.: Reactor for carrying out equilibrium-limited reactions. DE 102016210224, to Siemens AG, Germany, 2017 – *methanol reactor with in situ product absorption to shift the reaction equilibrium.*

[2] Bösmann, A., Preuster, P., Wasserscheid, P., Mrusek, S.: Method and system for release of gas from a liquid medium. DE 102018221447, to Hydrogenious LOHC Technologies GmbH, Germany – *H_2 release from LOHC systems at very mild conditions using subatmospheric reaction pressure.*

[3] Weiss, A, Paetz, C., Büch, H., Seidel, A., Hestermann, I., Bösmann, A., Wasserscheid, P., Preuster, P., Grauert, M., Kadar, J.: Process and device to catalytic gas release from a substrate. Patent number: WO2022223443A1, to Hydrogenious LOHC Technologies GmbH, Germany – *autothermal hydrogen release from LOHC systems through partial and reversible oxidation of the organic carrier compound.*