



Scientific career

University	Study of Physics and Diploma Thesis performed at Freie Universität Berlin, Institute of Solid State Physics, D, Dep. Prof. G. Kaindl	1981-1987
Ph.D.	Dr. rer. nat. at Technische Universität Berlin, "Untersuchung der elektronischen Struktur und Morphologie dünner, geordneter Polyimidschichten (work performed at Fritz-Haber-Institut der Max-Planck-Gesellschaft, Dept. Prof. A.M. Bradshaw)	21.2.1992
Positions	Scientist at Fritz-Haber-Institut der Max-Planck-Gesellschaft, D Scientist at Universität Frankfurt/Main, D Senior Scientist and Group Leader at Fritz-Haber-Institut, D, Dep. Prof. R. Schlögl Research fellowship at National Synchrotron Light Source Laboratory, Brookhaven, USA Research fellowship at University of Basel, Prof. P. Oelhafen, CH Senior Scientist at ETH Zürich, Technisch-Chemisches Labor, Dep. Prof. A. Baiker, CH and MPG-Research Fellowship	1992 – 1993 1993 1993 – 1998 1993 1994 1998 - 2000
Associate Prof. (Privatdozent) "Venia legendi"	Technische Universität Berlin, Institute of Chemistry, D Habilitation: " <i>Application of Copper Suboxide for the Partial Oxidation: In situ and ex situ Characterization</i> "	1999
Senior Scientist	Helmholtz-Zentrum Berlin GmbH (former Hahn-Meitner-Institut) Division of Solar Energy Research, Institute Heterogeneous Material Systems Deputy Head of Institute Heterogeneous Material Systems	since 01/2000 2003 – 2012
Current Position	Project/Group leader, Institute Solar Fuels/Nanospectroscopy, Helmholtz-Zentrum Berlin GmbH Project leader/Coordinator, Institute Applied Energy Research, Helmholtz-Zentrum Berlin GmbH	2013 - 2018 since 2019

Scientific interests

The main focus is set on (i) new thin film deposition techniques for semiconductors used for photovoltaic applications and based on chemical vapour transport, (ii) preparation and characterization of novel photocatalysts and photoelectrode materials, and (iii) the surface and interface analysis. Special attention is paid to electronic and structural properties. A long-term experience exists in the field of synchrotron radiation-related spectroscopic techniques in particular in-situ (operando) methods like X-ray absorption and photoelectron spectroscopy. He was the responsible scientist of the BMWi-project "Entwicklung einer neuen Dünnschichttechnologie für die Photovoltaik: Technische Umsetzung des CCSVT-Verfahrens am Beispiel von Cu(In,Ga)Se₂-Solarzellenbasis-Materials" combine-project with AIXTRON AG. He was a project partner of the BMBF-Excellence cluster „Light2Hydrogen“-<http://light2hydrogen.de/> (2009 - 2014) and currently he is the initiator and project head of a consortium with 4 partners embedded in the DFG-priority program SPP1613 "SolarH₂". Additionally, he is coordinating a project for the realization of a novel Scanning Transmission X-Ray Microscope designed especially for in-situ Studies in the soft-X-ray range (100 eV – 1200 eV) at the Synchrotron radiation source BESSY-II.

Relevant publications

Th. Schedel-Niedrig, W. Weiss, R. Schlögl, **Electronic Structure of Ultrathin Ordered Iron Oxide Films Grown on Pt(111)**
Physical Review B **52** (1995) 17449.

X. Bao, M. Muhler, Th. Schedel-Niedrig, R. Schlögl, **The Interaction of Oxygen with Silver at High Temperature and Atmospheric Pressure: A Spectroscopic and Structural Analysis of a Strongly Bound Surface Species**, Physical Review B **54** (1996) 2249.

A.Knop-Gericke, M. Hävecker, Th. Schedel-Niedrig, R. Schlögl
Hochdruck-Niederenergie Röntgenabsorptionsspektroskopie: Ein Beitrag zur Überwindung des „Pressure Gaps“ in der Untersuchung heterogen-katalytischer Prozesse, Angewandte Chemie Internat. Edition **37** (1998) 1939.

R. Würz, A. Meeder, D. Fuentès Marrón, Th. Schedel-Niedrig, A. Knop-Gericke, K. Lips
Native Oxidation of CuGaSe₂ Crystals and Thin Films Studied by Electron Paramagnetic Resonance and Photoelectron Spectroscopy, Physical Review B **70** (2004) 205321.

R. Nürnberg, N. Allsop, M. Ch. Lux-Steiner, and Th. Schedel-Niedrig
Three-dimensional Simulations of a Thin Film Heterojunction Solar Cell with a Point Contact/Defect Passivation Structure at the Heterointerface, Applied Physics Letters **95** (2009) 122108.

V. Koteski, S. Doka-Yamigno, J. Hofstetter, M. Rusu, E. Arushanov, H.-E. Mahnke, M.Ch. Lux-Steiner, and Th. Schedel-Niedrig
Germanium doping of wider-band-gap CuGaSe₂Chalcopyrites: Local and electronic structure, Physical Review B **81** (2010) 245213.

Survey article

M. Rusu, S. Wiesner, R. Würz, S. Lehmann, S. Doka-Yamigno, A. Meeder, M. Bär, V. Koteski, H.-E. Mahnke, J. Beckmann, K. Höhn, W. Frisch, W. Bohne, P. Schubert-Bischoff, M. Heuken, A. Jäger-Waldau, A. Rumberg and Th. Schedel-Niedrig

CuGa_xSe_y chalcopyrite-related thin films grown by chemical close-spaced vapour transport (CCSVT) for photovoltaic application: Surface- and bulk material properties, oxidation and surface Ge-doping *Solar Energy Materials and Solar Cells* **95** (2011) 1555-1581.

F. Yang, M. Lublow, S. Orthmann, C. Merschjann, T. Tyborski, M. Rusu, S. Kuballa, A. Thomas, R. Arrigo, M. Hävecker, Th. Schedel-Niedrig, ***Metal-Free Photocatalytic Graphitic Carbon Nitride on p-Type Chalcopyrite as a Composite Photocathode for Light-Induced Hydrogen Evolution***, *ChemSusChem* **5** (2012) 1227.

C. Merschjann, T. Tyborski, S. Orthmann, F. Yang, K. Schwarzburg, M. Lublow, M.Ch. Lux-Steiner, Th. Schedel-Niedrig ***Insight into the Photophysics of Polymeric Carbon Nitride: An Optical Quasi-Monomer***, *Physical Review B* **87** (2013) 205204-1.

J. Pfrommer, M. Lublow, A. Azarpira, C. Goebel, M. Lücke, A. Steigert, M. Pogrzeba, P. W. Menezes, A. Fischer, T. Schedel-Niedrig, M. Driess, ***Bottom-up Fabrication of a New Stable Water Oxidation Catalyst from a Heterobimetallic Single Source Precursor*** *Angewandte Chemie Int. Ed.* **53** (2014)5183.

A. Azarpira, M. Lublow, A. Steigert, P. Bogdanoff, D. Greiner, Ch. A. Kaufmann, M. Krüger, U. Gernert, R. van de Krol, A. Fischer, Th. Schedel-Niedrig ***Efficient and Stable TiO₂:Pt-Cu(In,Ga)Se₂ Composite Photoelectrodes for Visible –LightDrivenHydrogen Evolution*** *Advanced Energy Materials* **2015**, 1402148-1402157.

C. Merschjann, S. Tschierlei, T. Tyborski, K. Kailasam, S. Orthmann, D. Hollmann, Th. Schedel-Niedrig, A. Thomas, and S. Lochbrunner ***Complementing graphenes:One-dimensionalinterplanar charge transport in polymeric graphitic carbon nitrides*** *Advanced Materials* **27**: 7993–7999 (doi:10.1002/adma.201503448).

A. Azarpira, J. Pfrommer, K. Olech, Ch. Höhn, M. Driess, B. Stannowski, Th.Schedel-Niedrig, M. Lublow, ***Optimized Immobilization of ZnO:CoElectrocatalysts Realizes 5% Efficiency in Photo-assisted Splitting of Water*** *J. Mater. Chem. A*, **2016**, 4, 3082 (DOI: 10.1039/C5TA07329D).

A. Azarpira, Th. Schedel-Niedrig, H.-J. Lewerenz, M. Lublow ***Sustained Water Oxidation by Direct Electrosynthesis of Ultrathin Organic Protection Films on Silicon*** *Advanced Energy Materials* **2016**, 1502314 (DOI: 10.1002/aenm.201502314).

Liste der Publikationen

1. *Orientation of Tetracene as a Large Hydrocarbon on Si(111)-(7x7) and Oxidised Si(111)*
Th. Schedel-Niedrig, K.-H. Frank, U. Karlsson, E.E. Koch,
Vacuum **41** (1990) 652.
2. *Investigations of the Electronic Structure of Ordered Polyimide Monolayers on Graphite*
Th. Schedel-Niedrig, H. Sotobayashi, A. Ortega-Villamil, A.M. Bradshaw,
Surface Science **247** (1991) 83.
3. *Compressed Benzene on Ni (110)*
M.G. Ramsey, D. Steinmüller, F.P. Netzer, Th. Schedel-Niedrig, A. Santianello, D.R. Llyod
Surface Science **251/252** (1991) 979.
4. *The Morphology and Electronic Structure of Ordered Polyimide Monolayers*
Th. Schedel-Niedrig, M. Keil, H. Sotobayashi, T. Schilling, B. Tesche, A.M. Bradshaw,
Journal of Physics: Condensed Matter **3** (1991) S23.
5. *The Adsorption of Ordered Polyimide Monolayers*
Th. Schedel-Niedrig, M. Keil, H. Sotobayashi, T. Schilling, B. Tesche, A.M. Bradshaw,
Berichte der Bunsengesellschaft, Physik. Chemie **95** (1991) 1385.
6. *Morphology and Electronic Structure of Thin, Ordered Polyimid Monolayers Prepared by the Langmuir-Blodgett Technique*
H. Sotobayashi, Th. Schedel-Niedrig, M. Keil, T. Schilling, B. Tesche, A.M. Bradshaw,
in: Polymer-Solid Interfaces, Eds. J.J. Pireaux, P. Bertrand, J.L. Brédas (Institute of Physics Publishing), Bristol, Philadelphia (1992), p.81.
7. *The Reaction of Oxygen with Graphite: X-Ray Absorption Spectroscopy of Carbonaceous Materials*
F. Atamny, J. Blöcker, B. Henschke, R. Schlögl, Th. Schedel-Niedrig, M. Keil,
A.M. Bradshaw,
Journal of Physical Chemistry **96** (1992) 4522.
8. *XANES Investigations of Stage 1 and Stage 2 Donor GIC with K and Cs at the Carbon K Edge*
J. Blöcker, H. Werner, D. Herein, R. Schlögl, Th. Schedel-Niedrig, M.Keil, A.M. Bradshaw,
Material Research Forum **91** (1992) 337.
9. *Spectroscopic and Chemical Characterisation of "Fullerene Black"*
H. Werner, D. Herein, J. Blöcker, B. Henschke, U. Tegtmeier, Th. Schedel-Niedrig, M. Keil,
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10. *Application of X-Ray Absorption Spectroscopy to Carbon Materials*
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11. *Reaction of Molecular Oxygen with C₆₀: Spectroscopic Studies*
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A. M. Bradshaw, J. Kirschner,
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12. *An X-Ray Absorption Study of Highly Oriented Poly (tetrafluoroethylene) Thin Films*
Ch. Ziegler, Th. Schedel-Niedrig, G. Beamson, D.T. Clark, W.R. Salaneck, A.M. Bradshaw,
Langmuir **10** (1994) 4439.
13. *Time Resolved Photoemission from Excitons in C₆₀ Films*
B.S. Itchkawitz, J.P. Long, Th. Schedel-Niedrig, W.R. Hunter, R. Schlögl, A.M. Bradshaw,
M.N. Kabler,
Proc. Int. Conf. on Physics of Semiconductors (ICPS22), Vancouver, Canada, Ed(s). D. J. Lockwood,
World Scientific, Singapore 1995, 2057.
14. *The Structure of PMDA-PDA Polyimide Monolayer Adsorbed on Gold*
M. Keil, J. J. Paggel, Th. Schedel-Niedrig, H. Sotobayashi, A. M. Bradshaw,
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15. *Reaction of C₇₀ with Molecular Oxygen*
M. Wohlers, H. Werner, D. Herein, Th. Schedel-Niedrig, R. Schlögl,
In: Electronic Properties of Novel Materials: Physics and Chemistry of Fullerenes and Derivatives, Ed(s).
H. Kuzmany, J. Fink, M. Mehring, S. Roth.
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16. *Photoemission and C1s Near-Edge Absorption from Photopolymerized C₆₀ Films*
B. S. Itchkawitz, J. P. Long, Th. Schedel-Niedrig, M. N. Kabler, A. M. Bradshaw,
R. Schlögl, W. R. Hunter,
Chemical Physics Letters **243** (1995) 211.
17. *X-Ray Absorption Study of (100) Textured CVD Diamond*
Th. Schedel-Niedrig, D. Herein, H. Werner, M. Wohlers, R. Schlögl, G. Franz, P. Kania,
P. Oelhafen, C. Wild,
Europhysics Letters **31** (1995) 461.
18. *Electronic Structure of the Oxidized Ag(111) Surface: High Temperature and High Pressure*
Th. Schedel-Niedrig, X. Bao, M. Muhler, R. Schlögl,
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D. Briggs, John Wiley & Son, New York 1995, p 89.
19. *Electronic Structure of Ultrathin Ordered Iron Oxide Films Grown on Pt(111)*
Th. Schedel-Niedrig, W. Weiss, R. Schlögl,
Physical Review B **52** (1995) 17449.
20. *New Developments in the Characterisation of Heterogeneous Catalysis*
H. Werner, D. Herein, Th. Schedel-Niedrig, R. Schlögl,
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21. A. M. Bradshaw, R. Hemmen, Th. Schedel-Niedrig, D. Ricken:
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in: Landolt Börnstein Group III Condensed Matter, Vol. 24: The Physics of Solid Surfaces, Subvolume
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22. *Reaction of C₆₀ and C₇₀ with Molecular Oxygen*
M. Wohlers, H. Werner, D. Herein, Th. Schedel-Niedrig, A. Bauer, R. Schlögl,
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23. *Valence-Band Photoemission of the H-Plasma Annealed (100) textured CVD Diamond Surface*
G. Franz, P. Kania, P. Oelhafen, Th. Schedel-Niedrig, R. Schlögl, R. Locher,
Surface Science **365** (1996) 825.
24. *The Interaction of Oxygen with Silver at High Temperature and Atmospheric Pressure: A Spectroscopic and Structural Analysis of a Strongly Bound Surface Species*
X. Bao, M. Muhler, Th. Schedel-Niedrig, R. Schlögl,
Physical Review B **54** (1996) 2249.
25. *The Mechanism of Oxidation of Fullerenes with Molecular Oxygen*
M. Wohlers, A. Bauer, Th. Belz, Th. Rühle, Th. Schedel-Niedrig, R. Schlögl,
in: *Surface Chemistry and Structure of Carbon* **41**, Ed. L.J. Radovic (ACS Symposium Series)
Philadelphia 1996, 108.
26. *Solid State Electronic Structure of Ba₃C₆₀ - A Model Approach*
M.C. Böhm, Th. Schedel-Niedrig, H. Werner, R. Schlögl, J. Schulte,
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27. *The Solid State Electronic Structure of Ba₅C₆₀*
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28. *Electronic Structure of C₆₀ Fragments in Alkali and Alkaline-Earth-Doped Fullerides*
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29. *X-Ray Absorption Spectroscopy of Small Chromium Oxide Particles (Cr₂O₃, CrO₂) Supported on Titanium Oxide*
Th. Schedel-Niedrig, Th. Neisius, C.T. Simmons, K. Köhler,
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30. *Surface Embedded Oxygen: Electronic Structure of Ag(111) and Cu(poly) Oxidised at Atmospheric Pressure*
Th. Schedel-Niedrig, X. Bao, M. Muhler, R. Schlögl,
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31. *The Electronic Structure of Barium Doped C₆₀*
Th. Schedel-Niedrig, M.C. Böhm, H. Werner, R. Schlögl,
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32. *Ba_xC₆₀ fullerides: π-Electronic Peculiarities of the C₆₀ Molecule and their Consequences for the Solid State*
M.C. Böhm, J. Schulte, J. Schütt, Th. Schedel-Niedrig, H. Werner, R. Schlögl,
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33. *Electronic Structure of Polymerized C₆₀ Phases*
J. Schulte, M.C. Böhm, Th. Schedel-Niedrig, R. Schlögl,
Berichte Bunsenges. Phys. Chem., **101** (1997) 1531.
34. *The Selective Oxidation of Methanol: A Comparison of the Mode of Action of Metal and Oxide Catalysts*
D. Herein, H. Werner, Th. Schedel-Niedrig, Th. Neisius, A. Nagy, S. Berndt, R. Schlögl,
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Elsevier, Amsterdam, **1997**, 103.

35. *X-Ray Absorption Spectroscopy: Sensitive Characterization of (Model-) Catalysts in the Electron-Yield Mode*
Thomas Schedel-Niedrig,
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36. *New Experimental Technique: X-Ray Absorption Spectroscopy Detector for in situ Studies in the Soft X-Ray Range ($250 \text{ eV} < h\nu < 1000 \text{ eV}$) under Reaction Conditions*
A. Knop-Gericke, M. Hävecker, Th. Schedel-Niedrig,
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37. *Hochdruck-Niederenergie Röntgenabsorptionsspektroskopie: Ein Beitrag zur Überwindung des „Pressure Gaps“ in der Untersuchung heterogen-katalytischer Prozesse*
A. Knop-Gericke, M. Hävecker, Th. Schedel-Niedrig, R. Schlögl,
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39. *High-Pressure Soft X-Ray Absorption Spectroscopy: Application of a New in situ Spectroscopic Method in Catalysis Research*
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41. *Ex situ XPS Study of the Interface between Ag(111) Electrode and Alkaline Electrolyte*
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R. Schlögl
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50. *In situ X-Ray Absorption Spectroscopy in the Soft Energy Range: Novel Prospects for the Chemical Characterization of Solid State Surfaces at High Pressure and High Temperature*
Th. Schedel-Niedrig, M. Hävecker, A. Knop-Gericke, R. Schlögl, P. Reinke, M.Ch. Lux-Steiner
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52. *CuGaSe₂ Solar Cell Cross Section Studied by Kelvin Probe Force Microscopy in Ultra-high Vacuum*
Th. Glatzel, D. Fuertes Marrón, Th. Schedel-Niedrig, S. Sadewasser, M.Ch. Lux-Steiner
Applied Physics Letters **81** (2002) 2017-2019.
53. *Microstructural Properties CVD-Grown CuGaSe₂- Based Thin Film Solar Cells*
D. Fuertes Marrón, A. Meeder, U. Bloeck, P. Schubert-Bischoff, N. Pfänder, R. Würz,
S.M. Babu, Th. Schedel-Niedrig, M. Ch. Lux-Steiner
Thin Solid Films **431-432** (2003) 237-241.
54. *Formation of an Interfacial MoSe₂ Layer in CVD-grown CuGaSe₂-Based Thin Film Solar Cells*
R. Würz, D. Fuertes Marrón, A. Meeder, A. Rumberg, S.M. Babu, Th. Schedel-Niedrig,
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55. *Radiative Recombination in CVT-Grown CuGaSe₂ Single Crystals and Thin Films*
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56. *Surface and Bulk Properties of CuGaSe₂Thin Films*
A. Meeder, L. Weinhardt, R. Stresing, D. Fuertes Marrón, R. Würz, S.M. Babu,
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57. *Temperature dependence of exciton gap in monocrystalline CuGaSe₂*
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59. *Deposition and Characterization of Semiconducting Ga₂Se₃ Thin Films Prepared by Chemical Close-Spaced Vapor Transport*
M. Rusu, S. Wiesner, S. Lindner, R. Würz, W. Fritsch, S.M. Babu, A. Rumberg,
Th. Schedel-Niedrig, M. Ch. Lux-Steiner, C. Giesen
Journal of Physics: Condensed Matter **15** (2003) 8185-8193.
60. *Monitoring Chemical Reactions at a Liquid-Solid Interface: Water on CuIn(S,Se)₂ Thin Films Solar Cell Absorber*
C. Heske, U. Groh, O. Fuchs, L. Weinhardt, E. Umbach, Th. Schedel-Niedrig, Ch.-H. Fischer, M. Ch. Lux-Steiner, S. Zweigart, T.P. Niesen, F. Karg, J.D. Denlinger, B. Rude, C. Andrus, F. Powell,
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62. *Native Oxidation of CuGaSe₂ Crystals and Thin Films Studied by Electron Paramagnetic Resonance and Photoelectron Spectroscopy*
R. Würz, A. Meeder, D. Fuertes Marrón, Th. Schedel-Niedrig, A. Knop-Gericke, K. Lips
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63. *Electronic Structure of Secondary Phases in Cu-rich CuGaSe₂ Solar Cell Devices*
D. Fuertes Marrón, Th. Glatzel, A. Meeder, Th. Schedel-Niedrig, S. Sadewasser,
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Applied Physics Letters **85** (2004) 3755.
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Liste der Patente, Patent- und Erfindungsmeldungen

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Bezeichnung:

Vorrichtung und Verfahren zur Röntgenabsorptionsspektroskopie

Tag der Anmeldung: 11.03.1998

Erfinder: Th. Schedel-Niedrig, A. Knop-Gericke, M. Hävecker

2. United States Patent No.6,212,253 B1, April 3, 2001

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Drittmittel-Projekte (seit 2009)

- **Light2Hydrogen-BMBF-Exzellenz-Cluster Initiative (11/2009 – 10/2015)**
Projektleiter am Helmholtz-Zentrum Berlin GmbH
Koordinatoren: Prof. Beller (LIKAT, Rostock), Prof. Driess (TU Berlin), Prof. Antonietti (MPI Golm)
- **DFG-Schwerpunkt-Programm „Solar-H₂“ (seit 07/2012 bis 06/2019): 2 Projekte**
Initiator und Koordinator: Th. Schedel-Niedrig
Konsortium: Prof. Fischer/Uni Freiburg, Prof. Behrens/Uni Duisburg/Essen, Prof. Lerch/TU Berlin
- **HZB-Technologie-Transfer-Projekt (akzeptiert 07/2015)**
Robuste, hoch-skalierbare Polymer-basierte Passivierungsschichten für Halbleiter hergestellt mittels Elektropolymerisation bei Raumtemperatur Bearbeiter: A. Azarpira, M. Lublow, Th. Schedel-Niedrig
- „CO₂ als nachhaltige Kohlenstoffquelle – Wege zur industriellen Nutzung (CO₂-WIN)“
Thema:
PRODIGY - PROzessentwicklung in Der Gas-Feststoff Photokatalyse für die Reduktion von CO₂
(Engl.: PRODIGY – PROcess Development In Gas-solid photocatalytic CO₂ reduction)
(eingereicht 08/2019)
Th. Schedel-Niedrig (Teilprojektleiter)
Koordination: Prof. J. Strunk (LIKAT, Rostock)