

Curriculum vitae

Nicolae Bârsan

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Personal data

Date of birth	February 22, 1959
Place of birth	Petrosani, Romania
Citizenship	Romania and Germany
Family	Married to Luminita Barsan since May 1990, two children: <ul style="list-style-type: none">• Ilinca Valentina, born 1991• Catinca Cristiana, born 1996

Education

1977	School-leaving examination (Bacalaureat), Nicolae Balcescu High School, Bucharest, Romania
1982	Diploma in physics, University of Bucharest, Department of Physics, Romania
1993	PhD in Solid State Physics, Institute of Atomic Physics, Bucharest, Romania

Positions

1982-1983	High School teacher of Physics, Vulcan, Romania
1983-1984	Physicist, Geophysical and Geological Prospect Enterprise, Bucharest, Romania
1984 – to date	Institute of Physics and Technology of Materials, Bucharest, Romania <ul style="list-style-type: none">• physicist till 1989• researcher till 1993• senior researcher/research professor since 2005
Since November 1, 1995	Researcher at the Institute of Physical and Theoretical Chemistry, University of Tübingen, Germany <ul style="list-style-type: none">• Group Head since 1999• PhD Supervisor since 2011
March 2001	Co-founder of Advanced Sensing Devices (ASD) GmbH
May 2001-December 2006	Senior researcher at ASD GmbH and Applied Sensors GmbH

November 2006	Co-founder and Director of AO Action StW
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Publications (Web of Science H-index: 54. More than 11000 citations)

Papers in journals: 140
 Reviews: 9
 Book chapters: 9
 Books: 3
 Invited talks: 29
 Conference proceedings: 112
 Patents and patent applications: 14

Additional experience

1985-1990	Assistant professor, University of Bucharest, Department of Physics, Romania
Since 1996	Research in the frame of European projects Nanogas (BRE2CT940940), CIA (BRE2CT960194), Parfum (EP20848), CMOSSens (IST-1999-10579), GASMOH (ICA2-CT-2000-10041), ADA (), GOSPEL (IST-2002-507610),
February 1997- February 2000	Project Coordinator of the European Project EASTGAS (IC-15-CT-960803)
Since 1998	Reviewer for Sensors and Actuators B
1998	Member of the International Scientific Committee for the 7th International Meeting on Chemical sensors, Beijing, China (July 1998)
May-June 1998	Research stage at Illinois Institute of Technology (USA)
October 1998	Lecturer in the NEXUSPAN course "New Materials and Transducers for Chemical Sensors" Sinaia, Romania
1999	Member of the Organising Committee of the 6 th International Symposium Olfaction and Electronic Nose, Tübingen, Germany (September 1999)
1999 - 2000	Co-editor of the Proceedings of the 6 th International Symposium Olfaction and Electronic Nose in Sensors and Actuators B: Chemical, Volume 69, Issue 3, 25 October 2000
1999 - 2004	Member of the International Advisory Committee of the International Seminar on Semiconductor Gas Sensors, SGS, Ustron, Poland
Since 2001	Reviewer for Thin Solid Films, Journal of Electroceramics and IEEE Sensors Journal and for the publications of IoP
2001	Member of the Scientific Committee of the International School on Gas Sensors, S. Cesarea Terme (Lecce), Italy May 28 – June 2, 2001
2003	Organizer of the Symposium AH1 - Sensor, Actuators, and Microsystems (together with J.R. Stetter and U. Weimar) at the 203rd Meeting of Electrochemical Society, April 27-May 2, 2003 Paris, France
December 2005	Granting of the Research Professor title by the Romanian Ministry of Education and Research

2007	Organizer of the GOSPEL Workshop on Low Dimensional & Nanostructured Oxides: Bridging Surface Science and Sensor Science, Tübingen, Germany 15-16 June 2007 (with Prof. Udo Weimar, Uni Tübingen and Prof. Andrei Kolmakow, Southdale,USA)
2008	Organizer of the GOSPEL Workshop on Surface/adsorbed oxygen on metal oxides; role in gas sensing and catalysis, Tübingen, Germany 9-10 June 2008
Since November 2008	Supervisor for Doctoral Theses at the University of Bucharest, Romania
2009, 2011, 2013, 2015	Organizer of the GOSPEL/ISOCS Workshop on Gas sensors based on semiconducting metal oxides, Tübingen, Germany and Yufuin, Japan
2011-2014	Designated member of the Advisory Council for Research Development and Innovation to the Romanian Ministry of Education and Research
Since 2011	Supervisor for Doctoral Theses at the University of Tübingen, Germany

Awards/grants

Annual conference of semiconductors 1985 (CAS) Poiana Brasov, Romania	Best paper award for: "Semiconductor SnO ₂ sensors for reducing gases", R. Ionescu, N. Bârsan, A. Vancu, E. Dimitriu
Annual conference of semiconductors 1986 (CAS) Poiana Brasov, Romania	Best paper award for: "The role of dopants on SnO ₂ sensors", N. Bârsan, E. Dimitriu, R. Ionescu, A. Vancu
May 1-July 1, 1994	DAAD research fellowship, University of Tübingen, Institute of Physical and Theoretical Chemistry, Germany
January 1 - July 31, 1997	Volkswagen Stiftung research fellowship, University of Tübingen, Institute of Physical and Theoretical Chemistry, Germany
2010	"Radu Grigorovici" Solid State Physics prize of the Romanian Academy

Memberships

Founding member (May 2008) and member of the Steering Committee of the International Society for Olfaction and Chemical Sensing (ISOCS)
Member of the American Chemical Society

Main Research Activities

- Physical chemistry and technology of chemical sensors
- Gas/chemical sensors applications
- Surface Physics and Chemistry
- Semiconductor Physics

Research Profile

Dr Barsan's research focuses on the understanding and application of surface interactions of materials with gases. Since 1984, when he started his scientific carrier at the Institute of Materials Physics and Technology in Bucharest, he was interested in the basic understanding of phenomena taking place at the surface of metal oxides operated in realistic conditions for gas sensing applications. Besides that, he also explored different technologies for devising better gas sensing materials and innovative sensors based on them. In Bucharest he also gained experience in applying gas sensors to practical applications and the design and fabrication of monitoring instrumentation such as leak detectors and alcoholmeters. Currently, he is still holding a CS I (since December 2005) position at the institute, which was renamed National Institute of Materials Physics and he is a Supervisor for Doctoral Theses at the University of Bucharest (since November 2008).

Since 1995 he is a senior researcher at the Institute of Physical Chemistry of the University of Tübingen where, since 1999, is leading together with Prof. Udo Weimar the Gas Sensor research group. Since 2010 he is allowed to supervise PhD research.

At the Institute of Physical Chemistry, he advanced his interest in the basic understanding of sensing with metal oxide pioneering the operando approach; the latter employs a host of spectroscopic and phenomenological characterization techniques, applied in sensor operation conditions, for a complete description of the gas sensing and transduction processes. Besides the obvious scientific value, the wealth of information gained by applying this approach has important practical applications. For example, it was proved that it is possible to monitor the influence of technology – thermal treatment, surface additives, synthesis processes - on sensors' performance.

On the technology side, he invented the hybrid microsensor production technology based on the combination of sensing layers based on pre-processed powders and micromachined Si transducers. In 2001, with funding from private investors, he co-founded Advanced Sensing Devices (ASD) with the intention to bring his developments in the field of metal oxide gas sensors to the market. ASD merged with Applied Sensors in 2003 and established itself as a leading European company in the field of gas sensor technology and application developments. During his working period at ASD and Applied Sensors, between May 2001 and December 2006, he was involved in the development and industrialization of micro gas sensors and in their application to the automotive field; to date, more than 30 million devices, of the type invented by Dr. Barsan, were commercialized by AppliedSensors.

In 2006 he co-founded AO Action, which is a Steinbeis Transfer Centre working in the exploitation of advanced sensing technologies. The Centre provides commercial services to private clients and works with consortia to exploit the results of publicly-funded research. Dr. Barsan is one of the two directors and currently runs 3 projects for industrial customers.

His research was funded by a host of German (BMBF and DFG) and European projects, e.g. Nanogas, CIA, Parfum, CMOSSens , GASMOH, ADA, GOSPEL, Clear-up, Netcarity, Orama, etc. He was the Project Coordinator of the European Project EASTGAS and part of the co-ordinating team for Gospel Network of Excellence and of the co-ordinating team of Clear-up European Integrated Project. He is a reviewer for many prestigious scientific journals such as: Sensors and Actuators B, Thin Solid Films, Journal of Electroceramics and IEEE Sensors Journal and for the publications of IoP. He was also involved in the organisation of a series of

International Conferences such as: the 7th International Meeting on Chemical sensors, Beijing, China (July 1998), the 6th International Symposium Olfaction and Electronic Nose, Tübingen, Germany (September 1999), the series of the International Seminars on Semiconductor Gas Sensors, SGS, taking place at Ustron, Poland, of the International School on Gas Sensors, S. Cesarea Terme (Lecce), Italy May 28 – June 2, 2001, the 203rd Meeting of Electrochemical Society, April 27-May 2, 2003 Paris, France. He is co-organizing the workshop on Gas Sensors based on Semiconducting Metal Oxides (starting 2007).

Current Research

The actual research interests of Dr. Barsan are still directed towards basic science, technology and application developments. He is currently developing novel metal oxide materials by taking advantage of all existing knowledge and infrastructure for the operando studies and he tries to extend the expertise of the group in the direction of oxide electronics and catalysis. He is also exploring biomimetic approaches for gas sensing and novel synthesis and deposition technologies for improved selectivity and sensitivity.

On the application side, he is targeting solutions for the fields of process control, health and environmental monitoring (both indoor and outdoor) and ambient assisted living.

He is currently coordinating two large research projects:

German Ministry of Education and Research (BMBF) – PraeBea: Interaktives Feedbacksystem zur Händedesinfektion in der stationären Intensivpflege (Teilvorhaben: Heuristische Integration von Sensorik und Erinnerungsmechanismen)

Common German Research Foundation (DFG)/Natural Science Foundation of China (NSFC) - Understanding chemical reception and electronic transduction mechanism in gas sensing with sulfide colloidal quantum dots

List of Publications (last five years)

Papers in Journals

1. “Pd@SnO₂ and SnO₂@Pd Core@Shell Nanocomposite Sensors”, F. Gyger, A. Sackmann, M. Hubner, P. Bockstaller, D. Gerthsen, H. Lichtenberg, J-D. Grunwaldt, N. Barsan, U. Weimar, C. Feldmann, *Particle & Particle Systems Characterization* 31, 5 (2014) 591-596 DOI: 10.1002/ppsc.201300241
2. “Grain shape influence on semiconducting metal oxide based gas sensor performance: modeling versus experiment”, J. Rebholz, P. Bonanati, U. Weimar, N. Barsan, *Analytical and Bioanalytical Chemistry* 406, 16 (2014) 3977-3983 DOI: 10.1007/s00216-013-7502-0
3. “Synthesis of poly-[2,5-di(thiophen-2-yl)-1H-pyrrole] derivatives and the effects of the substituents on their properties”, S. Pandule, A. Oprea, N. Barsan, U. Weimar, K. Persaud, *Synthetic Metals* 196 (2014) 158-165 DOI: 10.1016/j.synthmet.2014.07.012
4. “Conduction mechanism switch for SnO₂ based sensors during operation in application relevant conditions; implications for modeling of sensing”, N. Barsan, J. Rebholz, U. Weimar, *Sensors and Actuators B* 207 (2015) 455– 459 DOI: 10.1016/j.snb.2014.10.016
5. “Identifying the Active Oxygen Species in SnO₂ Based Gas Sensing Materials: An Operando IR Spectroscopy Study”, D. Degler, S. Wicker, U. Weimar, N. Barsan, *Journal of Physical Chemistry C* (2015) 119, 21, 11792-11799 DOI: 10.1021/acs.jpcc.5b04082
6. “Structure-function relationships of conventionally and flame made Pd-doped sensors studied by X-ray absorption spectroscopy and DC-resistance”, D. Degler, H.W.P. de Carvalho, U. Weimar, N. Barsan, D. Pham, L. Maedler, J.D. Grunwaldt, *Sensors and Actuators B* 219 (2015) 315– 323 DOI: 10.1016/j.snb.2015.05.012
7. “Extending the toolbox for gas sensor research: Operando UV/vis diffuse reflectance spectroscopy on SnO₂-based gas sensors”, D. Degler, N. Barz, U. Dettinger, H. Peisert, T. Chasse, U. Weimar, N. Barsan, *Sensors and Actuators B* 224 (2016) 256– 259 DOI:10.1016/j.snb.2015.10.040
8. “Structure and chemistry of surface-doped Pt:SnO₂ gas sensing materials”, D. Degler, H.W.P. de Carvalho, K. Kvashinina, J.D. Grunwaldt, U. Weimar, N. Barsan, *RSC Advances* (2016) 6, 34, 28149-28155 DOI: 10.1039/c5ra26302f
9. “Smart RFID label with a printed multisensor platform for environmental monitoring”, A. V. Quintero, F. Molina-Lopez, E. C. P. Smits, E. Danesh, J. van den Brand, K. Persaud, A. Oprea, N. Barsan, U. Weimar, N.F. de Rooij, D. Briand, *Flexible and Printed Electronics* 1, 2 (2016) Article Number: 025003, DOI: 10.1088/2058-8585/1/2/025003
10. “Design of Core Shell Heterostructure Nanofibers with Different Work Function and Their Sensing Properties to Trimethylamine”, F. Li, X. Gao, R. Wang, T. Zhang, G. Y. Lu, N. Barsan, *ACS Applied Materials and Interfaces* 8 (2016) 30, 19799-19806
11. “Selectivity Enhancement by Using Double-Layer MOX-Based Gas Sensors Prepared by Flame Spray Pyrolysis (FSP)”, J. Rebholz, K. Grossmann, D. Pham, S. Pokhrel, L. Maedler, U. Weimar, N. Barsan, *Sensors* (2016) 16, DOI: 10.3390/s16091437
12. “Gold-Loaded Tin Dioxide Gas Sensing Materials: Mechanistic Insights and the Role of Gold Dispersion”, D. Degler, S. Rank, S. Mueller, H. W. P. de Carvalho, J.D. Grunwaldt, U. Weimar, N. Barsan, *ACS Sensors* (2016) 1, 11 1322-1329
13. “Understanding the Potential of WO₃ Based Sensors for Breath Analysis”, A. Staerz, U. Weimar, N. Barsan, *Sensors* (2016) 16, DOI: 10.3390/s16111815

14. "The oxidizing effect of humidity on WO₃ based sensors", A. Staerz, C. Berthold, T. Russ, S. Wicker, U. Weimar, N. Barsan, *Sensors and Actuators B* 237 (2016) 54– 58 DOI: 10.1016/j.snb.2016.06.072
15. "Nanocrystalline cobalt-oxide powders by solution-combustion synthesis and their application in chemical sensors", K. Vojisavljevic, S. Wicker, I. Can, A. Bencan, N. Barsan, B. Malic, *Advanced Powder Technology* 28, 4 (2017) 1118-1128 DOI: 10.1016/j.appt.2016.10.029
16. "Response of Gallium Nitride Chemiresistors to Carbon Monoxide is Due to Oxygen Contamination", R. M. Prasad, S. Lauterbach, H. J. Klebee, O. Medrignac-Conanec, N. Barsan, U. Weimar, A. Gurlo, *ACS Sensors* 6, 2 (2017) 713-717 DOI: 10.1021/acssensors.7b00064
17. "Characterization of WO₃ thin films prepared by picosecond laser deposition for gas sensing", E. M. Preiss, A. Krauss, V. Kekkonen, N. Barsan, H. Seidel, *Sensors and Actuators B* 248 (2017) 153– 159 DOI: 10.1016/j.snb.2017.03.096
18. "Soot oxidation performance with a HZSM-5 supported Ag nanoparticles catalyst and the characterization of Ag species" H. Ruan, M. Nishibori, T. Uchiyama, K. Ninomiya, K. Kamitani, K. Kato, Y. Konishi, A. Haensch, N. Barsan, U. Weimar, K. Shimanoe, *RSC Advances* 7, 69 (2017) 43789-43797
19. "Temperature-Dependent NO₂ Sensing Mechanisms over Indium Oxide", S. Roso, D. Degler, E. Llobet, N. Barsan, A. Urakawa, *ACS Sensors* 2, 9 (2017) 1272-1277
20. "Nanolevel Control of Gas Sensing Characteristics via p-n Heterojunction between Rh₂O₃ Clusters and WO₃ Crystallites", A. Staerz, T. H. Kim, J. J. Lee, U. Weimar, N. Barsan, *Journal of Physical Chemistry C* 121, 44 (2017) 24701-24706 DOI: 10.1021/acs.jpcc.7b09316
21. "Ambient Humidity Influence on CO Detection with SnO₂ Gas Sensing Materials. A Combined DRIFTS/DFT Investigation", S. Wicker, M. Guiltat, U. Weimar, A. Hemeryck, N. Barsan, *Journal of Physical Chemistry C* 121, 45 (2017) 25064-25073 DOI: 10.1021/acs.jpcc.7b06253
22. "Platinum loaded tin dioxide: a model system for unravelling the interplay between heterogeneous catalysis and gas sensing", D. Degler, S. A. Mueller, D. E. Doronkin, Di Wang, J. D. Grunwaldt, U. Weimar, N. Barsan, *J. Mater. Chem. A* 6 (2018) 2034-2046 DOI: 10.1039/c7ta08781k
23. "Pt-In₂O₃ mesoporous nanofibers with enhanced gas sensing performance towards ppb-level NO₂ at room temperature", YunshiLiu, Xing Gao, Feng Li, Geyu Lu, Tong Zhang, N. Barsan, *Sensors and Actuators B* 260 (2018) 927– 936 DOI: 10.1016/j.snb.2018.01.114
24. "Exploiting Synergies in Catalysis and Gas Sensing using Noble Metal-Loaded Oxide Composites", S. A. Müller, D. Degler, C. Feldmann, M. Türk, R. Moos, K. Fink, F. Studt, D. Gerthsen, N. Barsan, and J. D. Grunwaldt, *ChemCatChem* 10 (2018) 1 – 18 DOI: 10.1002/cctc.201701545
25. "Structural, optical, and electrical properties of unintentionally doped NiO layers grown on MgO by plasma-assisted molecular beam epitaxy", M. Budde, C. Tschammer, P. Franz, J. Feldl, M. Ramsteiner, R. Goldhahn, M. Feneberg, N. Barsan, A. Oprea, O. Bierwagen, *Journal of Applied Physics* 123, 19 (2018) Article Number: 195301
26. "Rhodium Oxide Surface-Loaded Gas Sensors", A. Staerz, I. Boehme, D. Degler, M. Bahri, D. Doronkin, A. Zimina, H. Brinkmann, S. Herrmann, B. Junker, O. Ersen, J. D. Grunwaldt, U. Weimar, N. Barsan, *Nanomaterials* 8 , 11 (2018) Article Number: 892 DOI: 10.3390/nano8110892

Books and books chapters

1. "Sensors", Hudson W. P. Carvalho, David Degler, Nicolae Barsan, Jan-Dierk Grunwaldt, in: XAFS Techniques for Catalysts, Nanomaterials, and Surfaces, eds Yasuhiro Iwasawa, Kiyotaka Asakura, Mizuki Tada, Springer International Publishing 2017, ISBN: 978-3-319-43864-1 (Print) 978-3-319-43866-5 (Online) pp. 383-396
2. "Chemical and Biochemical Sensors, 1. Fundamentals" N. Barsan, G. Gauglitz, A. Oprea, E. Ostertag, G. Proll, K. Rebner, K. Schierbaum, F. Schleifenbaum, and U. Weimar in Book Series Ullmann's Encyclopedia of Industrial Chemistry (2016) Wiley-VCH Verlag GmbH & Co. 1–81 DOI: 10.1002/14356007.b06_121.pub2
3. "Chemical and Biochemical Sensors, 2. Applications" N. Barsan, G. Gauglitz, A. Oprea, E. Ostertag, G. Proll, K. Rebner, K. Schierbaum, F. Schleifenbaum, and U. Weimar in Book Series Ullmann's Encyclopedia of Industrial Chemistry (2016) Wiley-VCH Verlag GmbH & Co. 1–46 DOI: 10.1002/14356007.u06_u01