

John Rozen

Birth Date : May 3rd, 1980 **Citizenship** : Belgium **Immigration Status** : Non-Resident Alien (F-1 Visa OPT)

Profile J. Rozen, Ph.D., is a Research Associate at Vanderbilt University, located in Nashville, TN. His undergraduate curriculum led to degrees in both engineering and physics. His choice to join a program in materials science was therefore logical, as it is where the fields intersect. His current research is centered on the understanding and the optimization of silicon carbide devices and interfaces. In particular, he has been dedicated to implementing thermal oxidation and device testing setups in an effort to study the impact of processing parameters on the properties and the reliability of SiC structures exposed to high gate oxide fields and high temperatures. His previous experiences have proven that he is a fast and versatile learner, a patient and effective teacher, and that he is dedicated to the quality of his work. He aspires to further strengthen his knowledge not only in science but also in management and social communication.

Current

<i>Position</i>	Research Associate, Department of Physics and Astronomy, and Institute of Nanoscale Science and Engineering, Vanderbilt University, Nashville TN, USA.
<i>Fields</i>	Materials Science, Physics, Engineering
<i>Project</i>	Silicon Carbide, Semiconductor Devices and Interface Physics - Fabrication and Characterization.

Education

2005 – 2008	Ph.D. in Materials Science Program, Vanderbilt University, Nashville TN, USA. Thesis Title: <i>Electronic Properties and Reliability of the SiO₂/SiC Interface</i> . Graduation Date: May 2008
2003 – 2005	M.S. in Materials Science Program, Vanderbilt University, Nashville TN, USA. Thesis Title: <i>Properties of Nanocrystalline Vanadium Dioxide</i> . Graduation Date: December 2005
2002 – 2003	D.E.A. (M.S. equivalent) in Physics Program, Université Libre de Bruxelles, Brussels, Belgium. Graduation Date: June 2003
2000 – 2002	B.S. in Physics Program, Université Libre de Bruxelles, Brussels, Belgium. Thesis Title: <i>NMR Studies of Molecular Dynamics in Fullerene Crystals</i> . Graduation Date: June 2002 - Grande Distinction
1998 – 2000	Civil Engineer Candidate Program, Université Libre de Bruxelles, Belgium. Graduation Date: September 2000

Research Experience

2005 – 2008	Position: Research Assistant Employer: Vanderbilt University, Nashville TN, USA.
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Advisor: L. C. Feldman

Ph.D. Thesis Title: *Electronic Properties and Reliability of the SiO₂/SiC Interface*

Responsibilities

- Conduct experimental research
- Implement experimental setups
- Link findings to interface and device physics
- Write journal articles and technical reports
- Participate to the implementation of proposals
- Present work at conferences and meetings
- Guide and assist junior researchers
- Participate to the management of research facilities

Research Areas

- Oxide growth on SiC and Si (High temperature and high pressure)
- MOS fabrication on SiC
- Interface characterization (CV, D_{it})
- Device testing: TDDB and charge injection –study of impact of processing parameters on reliability, threshold voltage instability and channel mobility degradation.

Implemented Setups (*entirely designed and built*)

- **Oxidation station:** 3-zone furnace, quartz tube, corrosive gas feeding lines, gas flow control, cooling system, purging system, dangerous gas containment, vacuum monitoring...
- **High pressure oxidation:** thick quartz tube for oxidation at pressures up to 4 atm, vacuum and flow control at low and high pressures, shielding for failure prevention...
- **Photo-injection setup:** mercury lamp light source, UV mirrors, semi-transparent gate metals, voltage and current source, GPIB interface...
- **TDDB setup:** probe station, probe cards, switch matrix, hot chuck (thermally and electrically insulated), alignment optics, voltage source, voltmeter, GPIB interface, custom **LabView program** to remotely control and monitor testing of 36 devices in parallel...
- **Automated CV:** switch matrix, electrically insulated connector box, GPIB interface, custom **LabView program** to remotely control and monitor testing of three devices in parallel during charge injection experiments...

2003 – 2005 Position: Research Assistant

Employer: Vanderbilt University, Nashville TN, USA.

Advisors: L. C. Feldman and R. F. Haglund, Jr.

M.S. Thesis Title: *Properties of Nanocrystalline Vanadium Dioxide*.

Responsibilities

- Conduct experimental research
- Implement experimental setups
- Link findings to solid state physics
- Write journal articles and technical reports
- Participate to the implementation of proposals
- Present work at conferences and meetings

Research Areas

- Synthesis of VO₂ nanoparticles on various substrates using pulsed laser deposition
- Study of the electrical and optical properties of VO₂ thin films
- Percolation effects in VO₂ structures
- VO₂ based devices (FETs, ROMs...)

Implemented Setup (*entirely designed and built*)

- **Simultaneous optical and electrical probe:** infrared laser, optical detector, voltmeter, local heating, temperature control, alignment optics, probe system, sample design, GPIB interface, **LabView program** to monitor optical and electrical properties of a thin film as a function of substrate temperature...

2001 – 2003 B.S. / M.S. Student

School: Université Libre de Bruxelles, Solid State Physics, Brussels, Belgium

Advisor: F. Masin

B.S. Thesis Title: *NMR Studies of Molecular Dynamics in Fullerene Crystals.*

Responsibilities

- Conduct experimental research
- Implement experimental setups
- Link findings to solid state physics
- Write journal articles
- Present work at conferences and meetings

Research Areas

- Solid State NMR
- Study of the symmetry of molecular dynamics in solids by NMR
- Computer simulation of van der Waals solids dynamics

Implemented Code

- **Molecular dynamics simulations:** complex custom **C++** code to calculate activation energies and rotation barriers in a C_{60} molecular solid, usage of X-ray data for atomic coordinates, usage of theoretical data for inter-atomic and inter-molecular interactions...

Teaching Experience

2006 – 2007 **Mentoring** of Senior Undergraduate Student in Physics, Pursuing Honor Thesis, Vanderbilt University, Nashville TN, USA. (Resulted in High Honors and a Publication)

2002 – 2003 **High School Physics Teacher**, Institut Universalis, Brussels, Belgium.

2001 – 2002 **Teaching Assistant**, Physics Laboratories, Université Libre de Bruxelles, Brussels, Belgium.

Professional Activities

Current **Reviewer** for the American Institute of Physics (Applied Physics Letters, Journal of Applied Physics), for the American Physical Society (Physical Review B) and for the Materials Research Society.

Summer 1996 **Network Technician**, Queen's University, Belfast, Northern Ireland, UK.

Technical Skills

Device Fabrication

- High temperature oxidation
- Chemical etching
- Chemical conditioning
- Thermal evaporation
- DC/RF sputtering
- Photolithography
- Pulsed Laser Deposition
- Chemical Vapor Deposition

Characterization

- Capacitance-Voltage
- Current-Voltage
- Charge Injection (optical & electrical)
- TDDB (dielectric time to breakdown)
- Ellipsometry
- Rutherford backscattering
- X-ray diffraction
- Electron Microscopy
- AFM (atomic force microscopy)
- Hall effect
- NMR (nuclear magnetic resonance)

Computing Skills

Programming

- C++
- MPI (parallel programming)
- Taurus (Synopsis, device modeling)
- LabView
- HTML
- Mathematica
- LaTeX

Applications and OS

- MS Office
- Igor Pro
- Image processing softwares
- Linux
- Windows
- ...

Languages

English Proficient (written and spoken).

French Proficient (written and spoken). Mother Tongue.

Dutch Intermediate. Second National Language.

Japanese Beginner. Learning.

Publications

- **J. Rozen**, S. Dhar, S. K. Dixit, F. O. Roberts, H. L. Dang, S. Wang, V. V. Afanas'ev, S. T. Pantelides, J. R. Williams and L. C. Feldman, *Increase in oxide hole trap density associated with nitrogen incorporation at the SiO₂/SiC interface*. *J. Appl. Phys.* **103**, 124513 (2008).
- E. A. Ray, **J. Rozen**, S. Dhar, J. R. Williams and L. C. Feldman, *Pressure dependence of SiO₂ growth kinetics and electrical properties on SiC*. *J. Appl. Phys.* **103**, 023522 (2008) – Corresponding Author.
- **J. Rozen**, S. Dhar, S. Wang, V. V. Afanas'ev, S. T. Pantelides, J. R. Williams and L. C. Feldman, *Suppression of interface state generation upon electron injection in nitrided oxides grown on 4H-SiC*. *Appl. Phys. Lett.* **91**, 153503 (2007). **Selection of the Virtual Journal of Nanoscale Science & Technology** volume 16, issue 17 (2007).
- **J. Rozen**, S. Dhar, S. Wang, V. V. Afanas'ev, S. T. Pantelides, J. R. Williams and L. C. Feldman, *Impact of nitridation on negative and positive charge buildup in SiC gate oxides*. Proceedings of the 2007 International Conference on Silicon Carbide and Related Materials (Otsu, Japan) – Peer Reviewed – To be published in *Mater. Sci. Forum*.
- S. K. Dixit, S. Dhar, **J. Rozen**, S. Wang, R. D. Schrimpf, D. M. Fleetwood, S. T. Pantelides, J. R. Williams and L. C. Feldman, *Total dose radiation response of nitrided and non-nitrided SiO₂/4H-SiC MOS capacitors*. *IEEE Trans. Nucl. Sci.* **53** (6), 3687 (2006).
- **J. Rozen**, R. Lopez, R. F. Haglund and L. C. Feldman, *Two-dimensional current percolation in nanocrystalline vanadium dioxide films*. *Appl. Phys. Lett.* **88** (8), 081902 (2006).
- **J. Rozen**, R. Céolin H. Szwarc and F. Masin, *Dynamical model for the C₅H₅ cycles in the C₆₀·2 Fe(C₅H₅)₂ solvate*, *Phys. Rev. B* **70**, 144206 (2004).
- **J. Rozen**, R. Céolin J. L. Tamarit, H. Szwarc and F. Masin, *Solid State ¹³C and ¹H NMR Investigations on C₆₀·2 ferrocene*, Proceedings of the XVII International Winterschool Euroconference on Electronic Properties of Novel Materials (Kirchberg, Austria), *AIP Conf. Proc.* **685**, 19 (2003).

Selected Talks

- **J. Rozen**, S. Dhar, S. Wang, S. T. Pantelides, V. V. Afanas'ev, J. R. Williams and L. C. Feldman, *Suppressed electron-induced interface state generation and enhanced hole trapping in nitrated gate oxides on n-type 4H-SiC*. [2007 ICSCRM](#) International Conference on Silicon Carbide and Related Materials (Otsu, Japan).
- **J. Rozen**, S. Dhar, J. R. Williams, and L. C. Feldman, *Impact of nitridation on negative and positive charge buildup in SiC gate oxides*. [2007 ISDRS](#) International Semiconductor Device Research Symposium (College Park MD, USA)
- **J. Rozen**, R. Lopez, R. F. Haglund, Jr. and L. C. Feldman. *Percolation effects in networks of vanadium dioxide nanocrystals*. [2006 APS March Meeting](#) of the American Physical Society (Baltimore MD, USA).

List of Referees

- **Prof. Leonard C. Feldman**, Department of Physics and Astronomy, Vanderbilt University, Nashville TN, USA. E-mail: leonard.c.feldman@vanderbilt.edu
- **Prof. John. R. Williams**, Physics Department, Auburn University, Auburn AL, USA. E-mail: williams@physics.auburn.edu
- **Prof. Sokrates T. Pantelides**, Department of Physics and Astronomy, Vanderbilt University, Nashville TN, USA. E-mail: pantelides@vanderbilt.edu
- **Prof. Valeri V. Afanas'ev**, Department of Physics and Astronomy, Katholieke Universiteit Leuven, Leuven, Belgium. E-mail: valeri.afanasiev@fys.kuleuven.be
- **Prof. Dan M. Fleetwood**, Department of Electrical Engineering and Computer Science, Vanderbilt University, Nashville TN, USA. E-mail: dan.fleetwood@vanderbilt.edu