

## Applied MDLx™ Ginestra™ Simulation Software The Scientific Basis of Ginestra™ Physics

### Recommended Methods to Study Resistive Switching Devices

Journal Advanced Electronic Materials, 5.1 (2019)

*M. Lanza, Luca Larche, Andrea Padovani*

The most recommended methodologies for the fabrication, characterization, and simulation of RS devices, and proper methods for displaying the data obtained.

<https://onlinelibrary.wiley.com/doi/full/10.1002/aelm.201800143>

### A Sensitivity Map-Based Approach to Profile Defects in MIM Capacitors From I – V , C – V , and G – V Measurements

IEEE Transactions on Electron Devices Volume: 66 , Issue: 4 , April 2019

*Andrea Padovani, Ben Kacze, Milan Pešić, Luca Larcher*

Defect spectroscopy technique for profiling the energy and spatial distribution of defects within a material stack from leakage current (J-V), capacitance (C-V), and conductance (G-V) measurements.

<https://ieeexplore.ieee.org/abstract/document/8660699/authors#authors>

### Understanding and Variability of Lateral Charge Migration in 3D CT-NAND Flash With and Without Band-Gap Engineered Barriers

2019 IEEE International Reliability Physics Symposium (IRPS)

*Andrea Padovani, Milan Pesic, Mondol Anik Kumar, Luca Larcher*

Ginestra multiscale modeling to identify defects responsible for the charge trapping and quantify the LCL and VLC.

<https://ieeexplore.ieee.org/abstract/document/8720566/authors#authors>

### Statistical Simulation to Predict Variability of TANOS Program/Erase Characteristics for Non-Volatile Memory Applications

2019 Electron Devices Technology and Manufacturing Conference (EDTM)

*Md Zunaid Baten, Mondol Anik Kumar, Andrea Padovani, Luca Larcher, Dipankar Pramanik*

The impact of device-to-device statistical variation on Program/Erase (P/E) transients of planar TANOS devices using Ginestra multiscale simulation.

<https://ieeexplore.ieee.org/abstract/document/8731308>

### **Field Cycling Behavior of Ferroelectric HfO<sub>2</sub>-Based Capacitors**

Ferroelectricity in Doped Hafnium Oxide: Materials, Properties and Devices, 2019. 381-398.

*Franz Fengler, Min Hyuk Park, Tony Schenk, Milan Pešić, Uwe Schroeder*

Review and improvement of the wake-up, imprint, and fatigue effect of fluorite structure-type ferroelectrics.

<https://www.sciencedirect.com/user/login?option=ForceLogin&targetURL=%2Fscience%2Farticle%2Fpii%2FB9780081024300000176>

### **Ferroelectric One Transistor/One Capacitor Memory Cell**

Ferroelectricity in Doped Hafnium Oxide: Materials, Properties and Devices, 2019. 413-424

*Milan Pešić, Uwe Schroeder, Thomas Mikolajick*

A summary of the basic realization of the capacitor-based FeRAM memory cell.

<https://www.sciencedirect.com/user/login?option=ForceLogin&targetURL=%2Fscience%2Farticle%2Fpii%2FB978008102430000019X>

### **Modeling of Field Cycling Behavior of Ferroelectric Hafnia-Based Capacitors**

Ferroelectricity in Doped Hafnium Oxide: Materials, Properties and Devices, 2019. 399-411

*Milan Pešić, Luca Larcher*

Modeling approaches that improve the understanding of processes and mechanisms occurring within hafnia-based ferroelectric memories.

<https://www.sciencedirect.com/user/login?option=ForceLogin&targetURL=%2Fscience%2Farticle%2Fpii%2FB9780081024300000188>

### **Time-dependent dielectric breakdown statistics in SiO<sub>2</sub> and HfO<sub>2</sub> dielectrics: Insights from a multi-scale modeling approach**

2018 IEEE International Reliability Physics Symposium, IRPS 2018; Burlingame; United States; 11 March 2018 through 15 March 2018

*Padovani, A., Larcher, L.*

Multiscale modeling framework to investigate time dependent dielectric breakdown (Tddb) distributions in SiO<sub>2</sub>- and HfO<sub>2</sub>-based stacks.

<https://ieeexplore.ieee.org/document/8353552>

### **Multiscale modeling of neuromorphic computing: From materials to device operations**

Technical Digest - International Electron Devices Meeting, IEDM23 January 2018

*Larcher, L., Padovani, A., Di Lecce, V.*

Multiscale modeling platform for neuromorphic computing devices connecting atomic material properties to electrical device performance.

<https://ieeexplore.ieee.org/abstract/document/8268374>

### **A multiscale modeling approach for the simulation of OxRRAM devices**

17th Non-Volatile Memory Technology Symposium, NVMTS 2017; RWTH Aachen University Aachen; Germany; 30 August 2017 through 1 September 2017

*Padovani, A., Larcher, L., Woo, J., Hwang, H.*

Multiscale modeling platform that exploits ab-initio calculation results and a material-related description of the most relevant defect-related phenomena in dielectrics (charge trapping and transport, degradation, and atomic species motion) to interpret and understand the electrical characteristics of OxRAM memory devices for non-volatile memories and neuromorphic applications.

<https://ieeexplore.ieee.org/abstract/document/8171306>

### **Multiscale modeling of oxide RRAM devices for memory applications: from material properties to device performance**

Journal of Computational Electronics; Volume 16, Issue 4, 1 December 2017

*Larcher, L., Padovani, A.*

Multiscale modeling platform connecting the microscopic properties of the resistive switching material to the electrical characteristics and operation of RRAM devices.

<https://link.springer.com/article/10.1007/s10825-017-1095-3>

### **Multiscale modeling of defect-related phenomena in high-k based logic and memory devices**

24th International Symposium on the Physical and Failure Analysis of Integrated Circuits, IPFA 2017; Cheng du; China; 4 July 2017 through 7 July 2017

*Padovani, A., Larcher, L., Puglisi, F.M., Pavan, P.*

Multiscale modeling platform that exploits ab-initio calculation results and a material-related description of the most relevant defect-related phenomena in dielectrics (charge trapping and transport, degradation and atomic species motion) to interpret the reliability and electrical characteristics of logic and memory devices.

<https://ieeexplore.ieee.org/abstract/document/8060063>

**Multiscale modeling of electron-ion interactions for engineering novel electronic device and materials**

26th International Workshop on Power and Timing Modeling, Optimization and Simulation, PATMOS 2016/25

January 2017

*Larcher, L., Puglisi, F.M., Padovani, A., Vandelli, L., Pavan, P.*

Multiscale simulation platform for engineering novel electron devices by connecting specific material properties (atomic defects, interfaces, material morphology) to the electrical behavior of the device, thus creating a virtual space for designing novel electron devices that purposely exploit atom-electron interactions.

<https://ieeexplore.ieee.org/abstract/document/7833676>