

ROBERTO BERGAMASCHINI

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ACADEMIC POSITIONS

09.2019-current Assistant professor at the Department of Materials Science, University of Milano Bicocca, Milano (Italy)

03.2013-08.2019 Post-doctoral fellow at the Department of Materials Science, University of Milano Bicocca, Milano (Italy)

EDUCATION

2010-2012 Ph.D. candidate in Materials Science, Department of Materials Science - University of Milano-Bicocca, Milano (Italy)

2007-2009 Master in Materials Science, University of Milano-Bicocca (Italy). 110/110 cum laude

RESEARCH KEYWORDS

Epitaxy; Semiconductors; Continuum models; Phase-field; Nanostructures; Self-assembly

PROFESSIONAL PROFILE

Expert in the modeling of crystal growth processes from atomistic (kinetic monte-carlo) to continuum approaches (partial differential equation systems and phase-field). Development and implementation of state-of-the art modeling approaches based on advanced numerical methods for the solution of dynamical problems in semiconductor physics, including elastic and plastic relaxation effects, alloy intermixing and surface kinetics. Study of morphological and compositional properties in low-dimensional systems (films, nanomembranes, nanowires), precipitates, micro-crystals, aimed at supporting, interpreting and predicting experiments.

Author of 39 publications in international peer-reviewed journals with about 500 citations and h-index 12. Speaker at several international conferences.

Teaching assistant in courses (Solid State Physics and Laboratories of computational material science) of the Master in Materials Science at the University of Milano-Bicocca.

Participant to several research projects, most recent the European H2020 projects MicroSpire and Challenge, with contributions to reports and review meetings.

Guest editor for the special issue "Semiconductor Heteroepitaxy" on the peer-reviewed, international journal "Crystals".

TECHNICAL SKILLS

Expert in Finite Element Method (FEM) codes, in particular AMDiS, FEniCS and COMSOL.

Advanced programming skills in C/C++, Fortran, Python, Matlab, Mathematica.

Italian mother-tongue, fluent English, intermediate French.

LIST OF PUBLICATIONS

Publication type	#.R Review	#.A Articles	#.p Conference proceedings	
Total:	3	33	3	39

- 39.A** A. Tuktamyshev, A. Fedorov, S. Bietti, S. Tsukamoto, **R. Bergamaschini**, F. Montalenti, S. Sanguinetti, “*Reentrant Behavior of the Density vs. Temperature of Indium Islands on GaAs(111)A*”, *Nanomaterials* **10**, 1512 (2020).
- 38.A** **R. Bergamaschini**, F. Montalenti, L. Miglio, “*Sunburst pattern by kinetic segregation in core-shell nanowires: A phase-field study*”, *Applied Surface Science* **517**, 146056 (2020).
- 37.A** A. Barzaghi, S. Firoozabadi, M. Salvalaglio, **R. Bergamaschini**, A. Ballabio, A. Beyer, M. Albani, J. Valente, A. Voigt, D. J. Paul, L. Miglio, F. Montalenti, K. Volz, G. Isella, “*Self-Assembly of Nanovoids in Si Microcrystals Epitaxially Grown on Deeply Patterned Substrates*”, *Crystal Growth & Design* **20**, 2914 (2020).
- 36.A** S. Assali, **R. Bergamaschini**, E. Scalise, M. A. Verheijen, M. Albani, A. Dijkstra, A. Li, S. Koelling, E. P. A. M. Bakkers, F. Montalenti, L. Miglio, “*Kinetic Control of Morphology and Composition in Ge/GeSn Core/Shell Nanowires*”, *ACS Nano* **14**, 2445 (2020).
- 35.A** M. Bollani, A. Fedorov, M. Albani, S. Bietti, **R. Bergamaschini**, F. Montalenti, A. Ballabio, L. Miglio, S. Sanguinetti, “*Selective Area Epitaxy of GaAs/Ge/Si Nanomembranes: A Morphological Study*”, *Crystals* **10**, 57 (2020).
- 34.A** S. Assali, M. Albani, **R. Bergamaschini**, M. A. Verheijen, A. Li, S. Kölling, L. Gagliano, E. P. A. M. Bakkers, L. Miglio, “*Strain engineering in Ge/GeSn core/shell nanowires*”, *Applied Physics Letters* **115**, 113102 (2019).
- 33.A** M. Masullo, **R. Bergamaschini**, M. Albani, T. Kreiliger, M. Mauceri, D. Crippa, F. La Via, F. Montalenti, H. Känel, L. Miglio, “*Growth and Coalescence of 3C-SiC on Si(111) Micro-Pillars by a Phase-Field Approach*”, *Materials* **12**, 3223 (2019).
- 32.A** **R. Bergamaschini**, B. A. Rosen, F. Montalenti, J. Colin, “*Motion of crystalline inclusions by interface diffusion in the proximity of free surfaces*”, *Journal of Nanoparticle Research* **21**, 271 (2019).
- 31.A** M. Albani, **R. Bergamaschini**, M. Salvalaglio, A. Voigt, L. Miglio, F. Montalenti, “*Competition Between Kinetics and Thermodynamics During the Growth of Faceted Crystal by Phase Field Modeling*”, *Physica Status Solidi B* **256**, 1800518 (2019).
- 30.A** B. Douat, J. Colin, **R. Bergamaschini**, F. Montalenti, M. Drouet, J. Bonneville, C. Coupeau, “*Slip trace-induced terrace erosion*”, *Applied Surface Science* **466**, 454 (2019).
- 29.A** M. Albani, S. Assali, M. A. Verheijen, S. Koelling, **R. Bergamaschini**, F. Pezzoli, E. P. A. M. Bakkers, L. Miglio, “*Critical strain for Sn incorporation into spontaneously graded Ge/GeSn core/shell nanowires*”, *Nanoscale* **10**, 7250 (2018).
- 28.A** M. Salvalaglio, P. Zaumseil, Y. Yamamoto, O. Skibitzki, **R. Bergamaschini**, T. Schroeder, A. Voigt, G. Capellini, “*Morphological evolution of Ge/Si nano-strips driven by Rayleigh-like instability*”, *Applied Physics Letters* **112**, 022101 (2018).
- 27.A** S. De Cesari, **R. Bergamaschini**, E. Vitiello, A. Giorgioni, F. Pezzoli, “*Optically reconfigurable polarized emission in Germanium*”, *Scientific Reports* **8**, 11119 (2018).

- 26.A M. Albani, L. Ghisalberti, **R. Bergamaschini**, M. Friedl, M. Salvalaglio, A. Voigt, F. Montalenti, G. Tütüncüoğlu, A. Fontcuberta i Morral, L. Miglio, “*Growth kinetics and morphological analysis of homoepitaxial GaAs fins by theory and experiment*”, [Physical Review Materials](#) **2**, 093404 (2018).
- 25.R F. Montalenti, F. Rovaris, **R. Bergamaschini**, L. Miglio, M. Salvalaglio, G. Isella, F. Isa, H. Känel, “*Dislocation-Free SiGe/Si Heterostructures*”, [Crystals](#) **8**, 257 (2018).
- 24.A M. Albani, A. Marzegalli, **R. Bergamaschini**, M. Mauceri, D. Crippa, F. La Via, H. Känel, L. Miglio, “*Solving the critical thermal bowing in 3C-SiC/Si(111) by a tilting Si pillar architecture*”, [Journal of Applied Physics](#) **123**, 185703 (2018).
- 23.A Y. Yamamoto, P. Zaumseil, G. Capellini, M. Andreas Schubert, A. Hesse, M. Albani, **R. Bergamaschini**, F. Montalenti, T. Schroeder, B. Tillack, “*A self-ordered, body-centered tetragonal superlattice of SiGe nanodot growth by reduced pressure CVD*”, [Nanotechnology](#) **28**, 485303 (2017).
- 22.A M. Salvalaglio, **R. Bergamaschini**, R. Backofen, A. Voigt, F. Montalenti, L. Miglio, “*Phase-field simulations of faceted Ge/Si-crystal arrays, merging into a suspended film*”, [Applied Surface Science](#) **391**, 33 (2017).
- 21.A **R. Bergamaschini**, S. Bietti, A. Castellano, C. Frigeri, C. V. Falub, A. Scaccabarozzi, M. Bollani, H. Känel, L. Miglio, S. Sanguinetti, “*Kinetic growth mode of epitaxial GaAs on Si(001) micropillars*”, [Journal of Applied Physics](#) **120**, 245702 (2016).
- 20.A F. Rovaris, **R. Bergamaschini**, F. Montalenti, “*Modeling the competition between elastic and plastic relaxation in semiconductor heteroepitaxy: From cyclic growth to flat films*”, [Physical Review B](#) **94**, 205304 (2016).
- 19.A O. Skibitzki, G. Capellini, Y. Yamamoto, P. Zaumseil, M. A. Schubert, T. Schroeder, A. Ballabio, **R. Bergamaschini**, M. Salvalaglio, L. Miglio, F. Montalenti, “*Reduced-Pressure Chemical Vapor Deposition Growth of Isolated Ge Crystals and Suspended Layers on Micrometric Si Pillars*”, [ACS Applied Materials & Interfaces](#) **8**, 26374 (2016).
- 18.A M. Albani, **R. Bergamaschini**, F. Montalenti, “*Dynamics of pit filling in heteroepitaxy via phase-field simulations*”, [Physical Review B](#) **94**, 075303 (2016).
- 17.R **R. Bergamaschini**, M. Salvalaglio, R. Backofen, A. Voigt, F. Montalenti, “*Continuum modelling of semiconductor heteroepitaxy: an applied perspective*”, [Advances in Physics: X](#) **1**, 331 (2016).
- 16.A **R. Bergamaschini**, M. Salvalaglio, A. Scaccabarozzi, F. Isa, C. V. Falub, G. Isella, H. Känel, F. Montalenti, L. Miglio, “*Temperature-controlled coalescence during the growth of Ge crystals on deeply patterned Si substrates*”, [Journal of Crystal Growth](#) **440**, 86 (2016).
- 15.A M. Salvalaglio, **R. Bergamaschini**, F. Isa, A. Scaccabarozzi, G. Isella, R. Backofen, A. Voigt, F. Montalenti, G. Capellini, T. Schroeder, H. Känel, L. Miglio, “*Engineered Coalescence by Annealing 3D Ge Microstructures into High-Quality Suspended Layers on Si*”, [ACS Applied Materials & Interfaces](#) **7**, 19219 (2015).
- 14.A M. Salvalaglio, R. Backofen, **R. Bergamaschini**, F. Montalenti, A. Voigt, “*Faceting of Equilibrium and Metastable Nanostructures: A Phase-Field Model of Surface Diffusion Tackling Realistic Shapes*”, [Crystal Growth & Design](#) **15**, 2787 (2015).
- 13.p H. Kanel, F. Isa, C. V. Falub, E. J. Barthazy, E. Müller Gubler, D. Chrastina, G. Isella, T. Kreiliger, A. G. Taboada, M. Meduna, R. Kaufmann, A. Neels, A. Dommann, P. Niedermann, F. Mancarella, M. Mauceri, M. Puglisi, D. Crippa, F. La Via, R. Anzalone, N. Piluso, **R. Bergamaschini**, A. Marzegalli, L. Miglio, “*Three-Dimensional Epitaxial Si_{1-x}Ge_x, Ge and SiC Crystals on Deeply Patterned Si Substrates*”, [ECS Transactions](#) **64**, 631 (2014).

- 12.A R. Backofen, **R. Bergamaschini**, A. Voigt, “*The interplay of morphological and compositional evolution in crystal growth: a phase-field model*”, [Philosophical Magazine](#) **94**, 2162 (2014).
- 11.A F. Pezzoli, F. Isa, G. Isella, C. V. Falub, T. Kreiliger, M. Salvalaglio, **R. Bergamaschini**, E. Grilli, M. Guzzi, H. Känel, L. Miglio, “*Ge Crystals on Si Show Their Light*”, [Physical Review Applied](#) **1**, 044005 (2014).
- 10.A C. V. Falub, T. Kreiliger, F. Isa, A. G. Taboada, M. Meduña, F. Pezzoli, **R. Bergamaschini**, A. Marzegalli, E. Müller, D. Chrastina, G. Isella, A. Neels, P. Niedermann, A. Dommann, L. Miglio, H. Känel, “*3D heteroepitaxy of mismatched semiconductors on silicon*”, [Thin Solid Films](#) **557**, 42 (2014).
- 9.A C. Frigeri, S. Bietti, A. Scaccabarozzi, **R. Bergamaschini**, C. Falub, V. Grillo, M. Bollani, E. Bonera, P. Niedermann, H. Känel, S. Sanguinetti, L. Miglio, “*A Structural Characterization of GaAs MBE Grown on Si Pillars*”, [Acta Physica Polonica A](#) **125**, 986 (2014).
- 8.A T. Kreiliger, C. V. Falub, F. Isa, G. Isella, D. Chrastina, **R. Bergamaschini**, A. Marzegalli, R. Kaufmann, P. Niedermann, A. Neels, E. Müller, M. Meduña, A. Dommann, L. Miglio, H. Känel, “*Epitaxial Ge-crystal arrays for X-ray detection*”, [Journal of Instrumentation](#) **9**, C03019 (2014).
- 7.R **R. Bergamaschini**, F. Isa, C. Falub, P. Niedermann, E. Müller, G. Isella, H. Känel, L. Miglio, “*Self-aligned Ge and SiGe three-dimensional epitaxy on dense Si pillar arrays*”, [Surface Science Reports](#) **68**, 390 (2013).
- 6.A **R. Bergamaschini**, J. Tersoff, Y. Tu, J. J. Zhang, G. Bauer, F. Montalenti, “*Anomalous Smoothing Preceding Island Formation During Growth on Patterned Substrates*”, [Physical Review Letters](#) **109**, 156101 (2012).
- 5.p C. V. Falub, T. Kreiliger, A. G. Taboada, F. Isa, D. Chrastina, G. Isella, E. Muller, M. Meduna, **R. Bergamaschini**, A. Marzegalli, E. Bonera, F. Pezzoli, L. Miglio, P. Niedermann, A. Neels, A. Pezous, R. Kaufmann, A. Dommann, H. Kanel, “*Three dimensional heteroepitaxy: A new path for monolithically integrating mismatched materials with silicon*”, in [Cas 2012 \(international semiconductor conference\)](#), Vol. 1 (2012), p. 45.
- 4.p C. V. Falub, F. Isa, T. Kreiliger, **R. Bergamaschini**, A. Marzegalli, A. G. Taboada, D. Chrastina, G. Isella, E. Muller, P. Niedermann, A. Dommann, A. Neels, A. Pezous, M. Meduna, L. Miglio, H. Kanel, “*Space-Filling Arrays of Three-Dimensional Epitaxial Ge and Si_{1-x}Ge_x Crystals*”, in [2012 international silicon-germanium technology and device meeting \(istdm\)](#) (2012), p. 1.
- 3.A C. V. Falub, H. Kanel, F. Isa, **R. Bergamaschini**, A. Marzegalli, D. Chrastina, G. Isella, E. Muller, P. Niedermann, L. Miglio, “*Scaling Hetero-Epitaxy from Layers to Three-Dimensional Crystals*”, [Science](#) **335**, 1330 (2012).
- 2.A **R. Bergamaschini**, M. Brehm, M. Grydlik, T. Fromherz, G. Bauer, F. Montalenti, “*Temperature - dependent evolution of the wetting layer thickness during Ge deposition on Si(001)*”, [Nanotechnology](#) **22**, 285704 (2011).
- 1.A **R. Bergamaschini**, F. Montalenti, L. Miglio, “*Optimal Growth Conditions for Selective Ge Islands Positioning on Pit-Patterned Si(001)*”, [Nanoscale Research Letters](#) **5**, 1873 (2010).