

Silvia Vignolini Curriculum Vitæ

Personal Data

Name: Silvia Vignolini
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Education & Professional Experiences

Current Position : Postdoct @ University of Firenze, in Physics Department and European Laboratory for Non-linear Spectroscopy (LENS)

January 2006 - December 2008 PhD student @ University of Firenze in Physics Department and European Laboratory for Non-linear Spectroscopy (LENS). Research supervisor Prof. Diederik Wiersma. Activity: Near-field probing and modification of complex photonic structures.

June-September 2007 Three-months collaboration activity @ Instituto de Ciencia de Materiales de Madrid (ICMM) (Spain). Research chief Prof. Cefe Lopez. Activity: Time and space fluctuations of the lifetime of a source embedded in a disordered nanostructure.

February 2007 One week collaboration activity @ Center for Nanophotonics at the FOM-Institute for Atomic and Molecular Physics (AMOLF) (The Netherlands). Research chief Prof. Kobus Kuipers. Activity: Vortices in the near-field speckle of a 3D disordered photonic crystal opals.

May-December 2005 Research Fellowship activity @ University of Firenze, Research supervisor Prof. Diederik Wiersma.

April, 2005 *Degree in Physics* @ University of Firenze,
Final Mark 110/110 cum laude
Specialization: *Structure of matter, solid state physics*
Thesis Title: "*Controlled Micro-infiltration of two dimensional photonic crystals: Rewritable Photonic Circuits*".

Research Experiences

Scanning Probe Microscopy and Imaging I used different scanning probe microscopes and imaging techniques to characterize the optical properties of low-dimension photonic nanostructures, from disordered systems to photonic crystals. I took advantage of the high spatial resolution of Scanning Near-field Optical Microscope (SNOM) for performing spectroscopy on nano-scale devices I worked with a sophisticated imaging system, that is the result of the combination in the same set up of a SNOM, a Confocal Laser Scanning microscope (CLSM) and a Wide-field imaging system, for investigating the light diffusion in random media and the light propagation in photonic structures.

- Fiber Optics** I produced near-field probes by chemical etching single mode optical fiber. I'm experienced in efficiently coupling laser sources in single mode optical fibers and in general to transport optical signals on optical fibers supports.
- Sample Fabrication** I produced direct opal and inverse opal with different types of materials. Direct opals with polystyrene (PS), polymethyl-methacrilate (PMMA) and Silica spheres. I also able to invert PS and PMMA opal structures and obtain Silica inverse opal. I worked with a commercial direct laser writing system for the realization of three dimensional photonic crystal (like woodpiles) and quasi-crystals.
- Spectroscopic Techniques** I have experience in several optical spectroscopic techniques time-integrated and time-resolved photoluminescence. I built different setup for micro and nano-photoluminescence (PL). By coupling the excitation sources with the near-field microscope (and/or the confocal microscope) and collecting the PL signal from the investigated sample it is possible to combine the spectroscopic information with the spatial information with a high resolution in using several laser sources.
- Skills** Experience in several **optical spectroscopic techniques**: time-integrated and time-resolved photoluminescence. Experience in using several laser sources, both pulsed and continuous wave and in using the most common detection systems (Photodiodes, Photomultipliers, CCDs). Experience in scanning probe microscopy and imaging techniques: **near-field microscopy and confocal laser scanning microscopy**.
- Patents** *PCT/IB2007/050989* In the patent a method For Producing Rewritable Photonic Devices is described. The developed technique based on controlled microinfiltration in in two dimensional photonic crystal structures forms an enabling technology for the realization of all optical devices and circuits. Besides the increased flexibility in introducing defects of different types and natures, this approach offers the possibility of exactly tuning the energy resonance of the defect after fabrication by using a mixture of liquids of different refractive index. Since each pore of the photonic crystal can be addressed individually, these different materials can be combined to write either permanent or rewritable photonic circuits containing waveguides, active elements, and sources. Beyond integrated optics, the technique can be applied for any local infiltration application, e.g., to realize sensor chips by locally infiltrating a liquid that changes its optical properties when exposed to gas or biological species. <http://www.wipo.int/pctdb/en/wo.jsp?WO=2007107959>

Personal skills & competences

- Languages* **Italian**: mother tongue, **English**: fluent, **Spanish**: basic.
- Computer* Knowledge of Windows Operating System, Linux
Drawing Programs and Data Analysis Programs (OriginLab, Corel-Draw, MatLab ...)
Detailed knowledge of Text Editors (Word, L^AT_EX,...)

Conferences & Workshops

2009

- 8-11 April 2007 *International Symposium on Photonic and Electromagnetic Crystal Structures (PECS VIII)*, Conference in Sydney, Australia. [Oral Contribution: Sub-wavelength probing and modification of two dimensional photonic crystal nanocavities and Poster Contribution: Vortices in the near field of three dimensional photonic crystal]
- 2008
- 4-5 December 2008 *50 Years of Anderson Localization Symposium*, Symposium in Paris (France). [Poster Contribution: Vortices and field correlation in the near-field of three dimensional photonic crystal]
- 30-31 October 2008 *PhOREMOST "ADVANCES IN NANOPHOTONICS" Workshop*, Workshop in Barcelona (Spain). [Oral Contribution: Vortices in the near field of three dimensional photonic crystal; Poster Contribution: Time and space fluctuations of the lifetime of a source embedded in a disordered nanostructure]
- 1-5 September 2008 *NFO 10: 10th International Conference on Near-field Optics, Nanophotonics and Related Items*, Conference in Buenos Aires (Argentina). [Oral Contribution: Near field characterization of a local and re-writable light sources in Silicon Photonic Crystal Nanocavities; Poster Contribution: Spectral Tuning and Near-Field Imaging of Photonic Crystal Nano-cavities]
- 16-20 June 2008 *International School on Nanophotonic and Molecular Photonics*, Summer School in Santander (Spain). [Poster Contribution: Control on Photonic Crystal Nanocavities via Near-Field Microscopy]
- 23-26 April 2008 *New frontiers in micro and nano photonics*, Conference in Firenze (Italy). [Oral Contribution: Rewritable Photonic Circuits]
- 2007
- 16-21 September 2007 *Frontiers in Science and Technology: NANO-PHOTONICS AND OPTICS*, Summer School in Miraflores de la Sierra, Madrid (Spain). [Poster Contribution: Rewritable Photonic Circuits]
- 8-11 April 2007 *International Symposium on Photonic and Electromagnetic Crystal Structures (PECS VII)*, Conference in Monterey, California (U.S.). [Oral Contribution: Rewritable light sources in a photonic crystal cavity]
- 2006
- 18-22 June 2006 *PhOREMOST "ADVANCES IN NANOPHOTONICS" Workshop*, Workshop in Firenze (Italy).
- 2005
- 1-7 August 2005 *Photonics metamaterials: From Micro to Nano-scale*, Summer School in Erice (Italy).

22-25 June 2005 *Matter materials and devices MMD-meeting*, Workshop in Genova (Italy). [Oral Contribution: Controlled Micro-infiltration of 2D photonic crystals : the road to rewritable devices]

List of publications

Near-field imaging of coupled photonic crystal microcavities

S. Vignolini, F. Intonti, M. Zani, F. Riboli, D. S. Wiersma, L. Balet, L. H. Li, M. Francardi, A. Gerardino, A. Fiore, and M. Gurioli
Appl. Phys. Lett., **94**, 151103, (2009).

Local nanofluidic light sources in silicon photonic crystal microcavities

S. Vignolini, F. Riboli, F. Intonti, M. Belotti, M. Gurioli, Y. Chen, M. Colocci, L. C. Andreani, and D. S. Wiersma
Phys. Rev. E, **78**, 45603(R), (2008).

Polarization-sensitive near-field investigation of photonic crystal microcavities

S. Vignolini, F. Intonti, F. Riboli, D. S. Wiersma, L. Balet, L. H. Li, M. Francardi, A. Gerardino, A. Fiore, and M. Gurioli
To be published in Appl. Phys. Lett.

Nonlinear optical tuning of photonic crystal microcavities by near-field probe

S. Vignolini, F. Intonti, L. Balet, M. Zani, F. Riboli, A. Vinattieri, D. S. Wiersma, M. Colocci, L. H. Li, M. Francardi, A. Gerardino, A. Fiore, and M. Gurioli
Appl. Phys. Lett., **93**, 023124, (2008).

Spectral tuning and near-field imaging of photonic crystal microcavities

F. Intonti, S. Vignolini, F. Riboli, A. Vinattieri, D. S. Wiersma, M. Colocci, L. Balet, C. Monat, C. Zinoni, L. H. Li, R. Houdre, M. Francardi, A. Gerardino, A. Fiore, and M. Gurioli
Phys. Rev. B, **78**, 41401(R), (2008).

Near-field mapping of quantum dot emission from single-photonic crystal cavity modes

F. Intonti, S. Vignolini, F. Riboli, A. Vinattieri, D. S. Wiersma, M. Colocci, M. Gurioli, L. Balet, C. Monat, L. H. Li, N. Le Thomas, R. Houdre, A. Fiore, M. Francardi, A. Gerardino, F. Roemer and B. Witzigmann
Phys. E, **40**, 1965, (2008).

Rewritable photonic circuits

F. Intonti, S. Vignolini, V. Turck, M. Colocci, P. Bettotti, L. Pavesi, L. S. Schweizer, R. Wehrspohn, and D. S. Wiersma
Appl. Phys. Lett., **89**, 211117, (2006).

Fotonica liquida

S. Vignolini, F. Intonti, M. Colocci, and D. S. Wiersma.

Le Scienze, **474**, 100, (2008).

Photons flow in liquid circuits

F. Intonti, S. Vignolini, M. Colocci, and D. S. Wiersma.

Laser Focus World, **43**, 8, (2007).

Vortices and field correlations in the near-field speckle of a three dimensional photonic crystal

S. Vignolini, M. Burrese, S. Gottardo, K. L. Kuipers, and D. S. Wiersma

in preparation.

Complete Trapping of Light by Anderson localization

F. Riboli, S. Vignolini, P. Bartelemy, F. Intonti, S. Combrie, A. de Rossi and D. S. Wiersma

in preparation.

July 7, 2009