

Daniela Petti

Born in Milan, 25th April 1982.



EDUCATION AND TRAINING

Ph.D. in Physics, Politecnico di Milano, Italy, 2010. Thesis: "Spin dependent transport across the Fe/MgO/Ge(001) heterostructure".

M.S. in Physics Engineering, (110 lode/110), Politecnico di Milano, Italy, 2006. Thesis: "Study of MgO/Fe (001) interface for tunnel magnetic junction".

B.S. in Physics Engineering, Politecnico di Milano, 2004.

PROFESSIONAL APPOINTMENTS

Since January 2013: Fixed-term research assistant at the Physics Department, Politecnico di Milano.

2010-2013: postdoc in the NanoBiotechnology and Spintronics (NaBiS) group at LNESS center of the Politecnico di Milano within the project SpinBioMed funded by Cariplo Foundation (grant No. 2008.2330).

2006-2010: PhD grant funded by SAES Getters Group.

RESEARCH ACTIVITY

I started my activity in the field of spintronics, with a M.S. Thesis on MgO based magnetic tunneling junctions and PhD Thesis on Fe/MgO/Ge junctions for spin-optoelectronic applications. During last two years (2011-2012), I also worked on other spintronics topics: magnetoelectric coupling and, antiferromagnets spintronics. At the beginning of my post-doc, I turned my attention to the applications of magnetism to biology and medicine. Within the project SpinBioMed (Cariplo Foundation, grant No. 2008.2330), I developed from scratch a platform for magnetic biosensing based on MTJs. I collaborated to the development in my group of a proprietary technology for the manipulation of biological entities via magnetic domain wall conduits. I am currently responsible of the NaBiS group's nano-biotechnology related activities.

MAIN RESEARCH TOPICS

- Semiconductors spintronics: this activity has led to the first demonstration of room-temperature operation of Ge-based spin-photodiodes for integrated electrical detection of the light polarization, finally opening the way towards a Ge-based spin-opto-electronics.

- Magnetoelectric coupling: it is studied at the interface between thin magnetic films of 3d-metals and alloys (such as Fe and CoFeB), with in-plane or out-of-plane magnetization and BaTiO₃ (100) films, a prototypical interface between a ferromagnet and a well known piezo-ferroelectric material. In this frame, the electrical tuning of the magnetic properties of Fe films by electric fields applied to BaTiO₃ has been demonstrated, finally opening the way towards a new-generation of electrically controlled magnetic memories.
- Antiferromagnets spintronics: spintronics, ferromagnets play, at the moment, an undismissable role, but from the applications perspective, it is particularly appealing the introduction of antiferromagnetic memory elements insensitive to external magnetic fields. Our research is devoted to the fabrication via magnetron sputtering of antiferromagnetic tunnel junctions (ATJs), electrically readable magnetic memory devices which contain no ferromagnetic elements and which store the information in an antiferromagnet (AFM).
- Biosensing: The research in the biosensing field aims to the development of a new type of compact diagnostic tool for the analysis of biomarkers in biological samples, oriented to point of care medical applications and based on a lab on chip approach. Magnetic nanoparticles with functionalized surfaces are used as labels for single molecule study, cell manipulation and biomagnetic sensing: in the latter case, magnetic beads are employed to detect target molecules at the surface of magnetic sensors where probe molecules are immobilized.
- On chip manipulation of biological entities: controlled transport of single magnetic beads of micro- and nano-metric size is realized by domain-wall motion in Permalloy conduits. After targeting with biomolecules, such magnetic beads can be employed for controlled drug delivery to tissues, cells. Moreover the very same technology can be used for the manipulation and/or the mechanical stimulation of cells (mechanobiology).

NATIONAL AND INTERNATIONAL COOPERATION

September 2011: at the Charles University of Prague: antiferromagnets spintronics project.

January-February 2011: at INESC MN of Lisbon (Pt): micro fabrication and characterization of magnetic tunnel junctions for biological applications.

AWARDS

Award for the best presentation of the Biophysics and Medical Physics session of the Italian Physics Society Conference, SIF 2011 held in L'Aquila on September 2011. The same work, entitled "Magnetic Tunneling Junctions for biosensors: from the growth to the detection" has been selected for publication in a special issue of Nuovo Cimento C - Colloquia and Communication in Physics to be published in 2012.

PUBLICATIONS and PATENTS: 31 publications, among these 28 ISI index publications, 1 issued patent and 1 granted patent, H index 6 (Scopus, 2013).

CONFERENCES: Coauthor of 22 works presented personally at international conferences: 12 orals (1 invited), 8 posters and 2 flash oral poster presentation. Chairman of the Session “Magnetic particles for hyperthermia, drug delivery and separation” of the 56th Magnetism and Magnetic Material (MMM) Conference, Scottsdale (USA). Member of the local committee of the First Edition of the Conference on Superconductivity and Functional Oxides (SuperFox2012) to be held on June 2012 in Como.

REVIEWER for Physical Review Letters, Physical Review B, Journal of Physics: Condensed Matter, New Journal of Physics, Physica Scripta.

TEACHING EXPERIENCE: Tutoring: 1 PhD student, 3 undergraduate students (M.S. in Physics Engineering), several undergraduate students (B.S. in Physics Engineering). She gives annual courses of classical Physics at Politecnico di Milano.