SPINTECH

Boosting the scientific excellence and innovation capacity in spintronics of the "D. Ghițu" Institute of Electronic Engineering and Nanotechnologies of the Academy of Science of Moldova

Newsletter No.1
Sep 2018 - Apr 2019
www.h2020-spintech.eu

SPINTECH at a glance

Project SPINTECH is a Coordination and Support Action which aims at boosting the scientific excellence and innovation capacity in the field of spintronics of the D. Ghiţu Institute of Electronic Engineering and Nanotechnologies (IEEN) in Moldova. The project will be implemented through collaboration and staff exchanges with two highly experienced partners: the University of Stockholm in Sweden and the University of Twente in the Netherlands.

SPINTECH, which has been awarded a total funding of 1 million € in the framework of the Twinning call of the EU H2020 Widening work programme, will be led by Prof. Anatoli Sidorenko from IEEN and will have a total duration of 3 years.

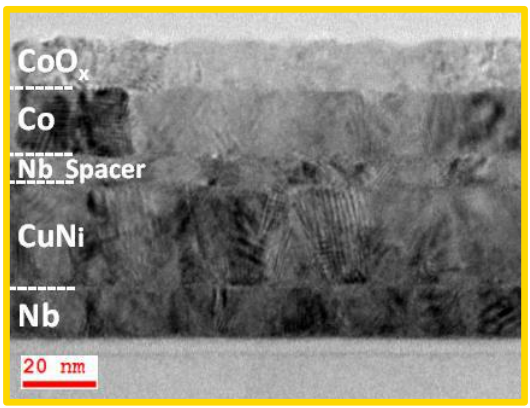
The kick-off meeting for the project was held on September 20th, 2018 on the premises of the Ministry of Education, Culture and Research in Chișinău. The meeting saw the participation of Moldovan representatives of the project's Advisory Board as well as of the Moldovan Minister of Education, Culture and Research Monica Babuc and the Secretary of State Elena Belei. During the meeting Project Coordinator Prof. Anatoli Sidorenko (together with Prof. Vladimir Krasnov from Stockholm and Prof. Alexander Golubov from Twente) presented the action's implementation plan, while the general framework of the Twinning call was illustrated by Pepa Krasteva, EU Project Officer responsible for project monitoring.

What is Spintronics?

Spintronics is a new field of research and engineering exploiting the influence of intrinsic electron spin on electrical transport. It is a rapidly developing area that allows insight into fundamental spin-dependent physical properties and exponentially expanding practical applications — such as the read head sensors for hard drives and memory elements for computers.

One of the main challenges in this field is the realization of spintronics based devices; in particular, there is intense research activity focused on combining superconductivity and spintronics, to enhance device functionality and performance. In this framework, strengthening IEEN's research excellence in superconducting spintronics will be achieved by focusing efforts on two sub-topics with the support of the Twinning partners:

- Advanced vacuum technologies development for fabrication of layered nanostructures for spintronics (IEEN and University of Stockholm), and
- Elaboration and testing of a superconducting spin-valve for switching and memory elements (IEEN and University of Twente)



Triplet spin valve nanostructures (layered hybrid structure); from bottom to top: Nb (Superconductor) / CuNi (Ferromagnet - 1) / Nb (Spacer) / Co (Ferromagnet - 2) / CoOx (Antiferromagnet).

European Commission

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Staff Exchanges

Staff exchanges, especially those involving early stage researchers, represent the core of SPINTECH activities. In the period between September 2018 and April 2019 more than 8 months of staff exchanges have already taken place. Most of the exchanges involved younger researchers visiting the Twinning partners in Stockholm and Twente, where they learned about advanced lithography technology and SQUID microscopy respectively.

Dr. Roman Morari (IEEN) during his stay at the University of Stockholm.

Workshops, conferences and summer schools

A first workshop, focused on technical issues as well as on opportunities for H2020 support to early stage researchers, was held in Chişinău on March 5th in conjunction with the first periodic project meeting and saw the participation of several members of the advisory board as well as of representatives from MECC. Shortly after, on March 27th, IEEN organized a seminar for its researchers by inviting Dr. N. Klenov from Lomonosov Moscow State University, who presented superconductor-ferromagnet hybrid structures for artificial neural networks. A second technical workshop is expected to take place in Stockholm in June. The consortium partners are currently defining the details of the main events which will take place during the project. According to SPINTECH work plan, 2 international conferences will be hosted in Moldova before the end of the project; the first one, titled "*SPINTECH-NANO-2019: Limits of Nanoscience and Nanotechnologies*", is planned on 24-27 September 2019 in Chişinău and is currently being organized. The second one will be part of the Plasma Workshop series and is expected to take place in the first half of 2021. Finally, with regard to summer schools, the first one will be focused on "S/F Hybrid Structures for Spintronics" and will follow the conference in September 2019. The other two summer schools are expected to take place in Sweden (in 2020) and Twente (in 2021).

M06 project meeting and technical workshop in Chişinău (05.03.2019)

Seminar by Dr. N. Klenov on superconductor-ferromagnet hybrid structures for artificial neural networks in Chişinău (27.03.2019)

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Upcoming events

- *Functional S/F nanostructures for superconducting electronics.* A. Sidorenko. 30th World Nano Conference, May 20th - 21st, 2019, Zürich (CH).
- *Superconducting supercomputer: challenges and solutions.* V.M. Krasnov. 30th World Nano Conference, May 20th - 21st , 2019, Zürich (CH).
- *Superconductor/Ferromagnet layered nanostructures for superconducting spintronics.* A. Sidorenko. World Chemistry Forum 2019, May 22nd - 25th, 2018, Barcelona (ES).
- Technical Workshop *"High-resolution lithography for functional nanostructures design"*, Jun 14th , Stockholm (SE)
- *SPINTECH-NANO-2019: Limits of Nanoscience and Nanotechnologies International Conference,* Sep 24th - 27th , 2019, Chișinău (MD)
- *S/F Hybrid Structures for Spintronics*, Summer School, Sep 28th - 30th , 2019, Chişinău (MD)

Dissemination activities

Since the kick-off meeting, SPINTECH Project Coordinator and other Consortium members have been actively promoting the project during several international conferences and seminars in which they participated. A full list of events where SPINTECH was promoted is reported below.

- *Direct Evidence of Proximity Induced Abrikosov Vortex Core in a Nonsuperconducting Metal.* A.A. Golubov; *Static and dynamic properties of Josephson junctions with thin superconducting layer inside the weak link.* A.A. Golubov. Tunneling through Nanoscience (TTN) 2018 International Conference, Oct 17th - 20th, 2018, Ravello (IT).
- *Functional Nanostructures for Superconducting Spintronics*. A. Sidorenko. BIT's Annual World Congress of Nano S&T 2018. Oct 23rd - 27th, 2018, Potsdam (DE).
- *Expansion of a superconducting vortex core into a diffusive metal*. A.A. Golubov. Topological Materials Science Seminar (82), Dec 3rd, 2018, Kyoto (JP).
- *Boson emission up to 13 THz from small $Bi_2Sr_2CaCu_2O_8+\delta$ mesa structure*. V.M. Krasnov. Plasma 2019 Workshop, Jan 18th - 21st, 2019, Orlando (FL, US).
- *Profound surface superconductivity in conventional and unconventional superconductors, single crystals and thin films.* V.M Krasnov. XXIII Symposium on Nanophysics and Nanoelectronics, Mar 11th - 14th, 2019, Nizhnij Novgorod (RU).

Additionally, recent research activities closely related to SPINTECH themes have already led to the publication of four papers, in which support from SPINTECH was acknowledged:

- *Planar Superconductor-Ferromagnet-Superconductor Josephson Junctions as Scanning-Probe Sensors.* T. Golod, O.M. Kapran, and V.M. Krasnov. Phys. Rev. Applied 11, 014062 (2019).
- *Effects of the phase coherence on the local density of states in superconducting proximity structures*. S.-I. Suzuki, A.A. Golubov, Y. Asano, Y. Tanaka. Physical Review B (submitted).
- *Interplay of Magnetization Dynamics with a Microwave Waveguide at Cryogenic Temperatures*. I.A. Golovchanskiy, N.N. Abramov, M. Pfirrmann, T. Piskor, J.N. Voss, D.S. Baranov, R.A. Hovhannisyan, V.S. Stolyarov, C. Dubs, A.A. Golubov, V.V. Ryazanov, A.V. Ustinov, and M. Weides. Phys. Rev. Applied, accepted for publication (2019)
- *Periodic Co/Nb pseudo spin valve for cryogenic memory.* N. Klenov, Y. Khaydukov, S. Bakurskiy, R. Morari, I. Soloviev, V. Boian, T. Keller, M. Kupriyanov, A. Sidorenko, and B. Keimer. Beilstein J. Nanotechnol. 10, 833–839 (2019)

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Communication activities

In addition to disseminating results and promoting the project in the spintronics community, SPINTECH also aims at increasing general public awareness of nanotechnology research performed in Moldova and specifically at IEEN, possibly stimulating young students towards choosing a scientific career path. To this purpose, SPINTECH has been advertised on several media since its beginning:

- *Presentation of SPINTECH to Moldovan press, including addresses by MECC representatives and Project Officer P. Krasteva.* SPINTECH Kick Off Meeting, Conference Hall of the Ministry of Culture, Education and Research of Moldova (MECC).
- *Web Interview with A. Sidorenko about project SPINTECH.* Sputnik Moldova, Sept 25th, 2018 (https://ru.sputnik.md/technologies/20180925/22072129/nauka-moldova-sidorenko.html)
- *Radio Interview with A. Sidorenko about project SPINTECH.* Teleradio-Moldova, Oct 21st, 2018 (http://www.trm.md/ro/album-duminical/album-duminical-din-21-octombrie-2018/)
- *TV Interview with A. Sidorenko and other IEEN members about IEEN and project SPINTECH*. "Stiinta si Inovare", Moldova 1, Jan 27th, 2019 (https://www.youtube.com/watch?v=3rxRgma6oSQ)
- *Presentation of IEEN and SPINTECH to high school students,* N. Gogol Lyceum in Chişinău (MD), Mar 5th, 2019.
- *Web Interview with A. Sidorenko about project SPINTECH.* Sputnik Moldova, Mar 6th, 2019 (https://ru.sputnik.md/technologies/20190306/25079376/moldova-prikhodit-spintronika-deystvuet-na-praktike.html)
- *TV Interview with A. Sidorenko, A.A. Golubov and V.M. Krasnov about project SPINTECH*. "Stiinta si Inovare", Moldova 1, Mar 24th, 2019 (https://www.youtube.com/watch?v=mLxZXuSban4)

A. Sidorenko (IEEN), A.A. Golubov (Univ. of Twente) and V.M Krasnov (Univ. of Stockholm) during their visit at the N. Gogol Lyceum in Chişinău (MD)

Contact

Prof. Anatoli Sidorenko (Project Coordinator)

D. Ghițu Institute of Electronic Engineering and Nanotechnologies (IEEN)
Academiei str., 3/3, MD-2028, Chișinău, Republica Moldova

https://www.researchgate.net/project/SPINTECH-superconducting-spintronics

https://twitter.com/H2020_SPINTECH

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