

Tuesday November 19th 2019 - 11h 00

Room A005-A007

“Engineering materials for All Optical magnetic recording”

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The possibilities of manipulating magnetization without any applied magnetic field have attracted the growing attention of researchers during the last fifteen years. From the discovery of spin transfer torque switching [1], the effect of electric fields on magnetic devices [2] to magnetization switching using femto or pico second pulsed lasers [3,4,5] the manipulation of magnetization at ultra-short time scales has become a fundamentally challenging topic with implications for magnetic data storage. Here we demonstrate optical manipulation of the magnetization of carefully engineered magnetic materials and devices. We prove that polarized light induced magnetization reversal can be observed not only in very particular rare-earth transition-metal alloys [3,4] but also in a variety of materials (alloys, multilayers and complex structures) [5]. In particular we show optical magnetization reversal for ferromagnetic thin film and granular media. This is a breakthrough for application since it provides materials “compatible” with spintronic applications for data storage, memories and logic. Furthermore we show that it is possible to create femto-second electron pulse which also induce magnetisation reversal [6,7]. In addition this study offers valuable information to understand the underlying fundamental mechanisms involved.

- [1] J. Katine et al *Phys. Rev. Lett.* **84** 3149 (2000)
- [2] H. Ohno, et al, *Nature* **408**, 944 (2000)
- [3] C. D. Stanciu, et al *Phys. Rev. Lett.* **99**, 047601 (2007).
- [4] S. Mangin, et al, *Nature Materials* **13**, 286-292 (2014)
- [5] C-H. Lambert et al, *Science* **345** (6202), 1337 (2014)
- [6] Y. Xu, et al *Adv Matter* **29** 42 1703474 (2017)
- [7] S. Iihama et al *Adv Matter* 1804004 (2018)



Stephane MANGIN

2008 **Full Professor**, Université de Lorraine – Nancy (France)
 2010 - **Head of the Nanomagnetism and Spintronic team** of the Université de Lorraine
 45 members (15 researchers + 15 PhD students, 10 Post-Doc, 5 visitors)
 Budget: 1 M€ /year (From ANR, EU, UL, CNRS)
 2012- **Scientific Director** of a large user scientific facility, unique in the world: *TUB Davm* (70 meters under ultra-high vacuum to connect 30 equipment clusters to grow and characterize material at the nanoscale: Budget: 19 M€
 2015- **Co-Director** of the Associated International Laboratory (LIA) on Nanoelectronics (CNRS – University of California San Diego)
 2016- **Project Leader** of “Nanomaterials for smart sensors”: one of the 6 projects supported by the Université de Lorraine of Excellence. Budget: 2,5 M€ for 4 years

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