Séminaire de Pierre Vallobra

Hangzhou International Innovation Institute of Beihang University

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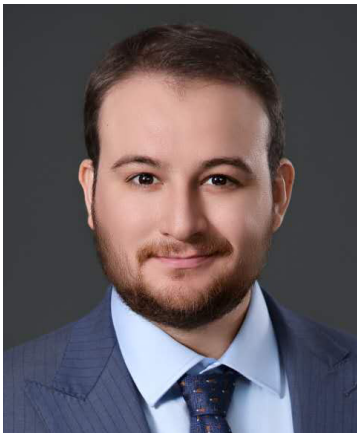
Room Alnot 4-A014, IJL

Magnetic tunnel junctions and all-optical switching



Predicted by Neel in 1936 and exhibited for the first time in 1938 by Bizette, antiferromagnetic (AFM) materials have since attracted increasing attention. Indeed, their null magnetic moment allows for an increased stability of their magnetic configuration. Thus, they became primary candidates for applications in magnetic memories and the manipulation of their magnetic configuration developed as a major area of study. The recent demonstrations of AFM manipulation with spin transfer torque and spin torque are further proofs of this enthusiasm from the scientific community. AFM materials are currently used on an industrial scale in magnetic random-access memories and magnetoresistive heads because they allow for the emergence of an exchange bias field (HEB). This phenomenon that has been first uncovered by Meiklejohn and Bean in 1956 occurs in AFM/FM heterostructures where the hysteresis loop of the FM layer is shifted of a value HEB due to the local exchange interactions with the interfacial AFM moments. While the standard way of setting the exchange bias fields consists in an annealing above the blocking temperature, we show that it can also be achieved with ultra-short polarized laser pulses. In AFM/FM materials, several laser pulses are needed to reverse the EB sign. When substituting the FM material by a CoGd alloy, a single laser pulse is enough to observe such a reversal. We further demonstrate the usefulness of ultrafast exchange bias setting for the patterning of thin films.

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