Project 4.12. „Precessional magnetization switching in ferromagnetic (Ga,Mn)N layers using sub-nanosecond short electric pulses" (experimental)

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Institute: IPPAS

Unit: SL2.3

www: http://www.ifpan.edu.pl/SL-2/staff2.3.html

Background:

As we know, the switching of the magnetization direction between two stable states separated by an energy barrier is the underlying process for magnetic recording and information storage. Yet, contemporary methods of the manipulation of this content remains energetically very costly, vastly reducing, but not undermining, the commercial importance of these memories. Among a few possible solutions to overcome this large energy budget, the switching of magnetization by electric field remains as one of the most attractive and so actively researched approaches. Therefore we aim at demonstration of the repeatable precessional magnetization switching in ferromagnetic (Ga,Mn)N layer induced by an external electric field. The driving mechanism for this process stems from the already proven ability of tuning of the strength of the single ion magnetic anisotropy of Mn ions in GaN by the inverse piezo-electric effect [1]. In these systems a voltage V applied across the crystal strains it in a linear proportion, what either expands or contracts the crystal by Vd33, where d33 is the relevant piezoelectric coefficient. This in turn deforms the crystal field which surrounds the magnetic ions and so modifies their magnetic anisotropy.
[1] D. Sztenkiel et al., Nature Comm. 7, 13232 (2016).

Aim:

The selected applicant will participate in the realization of the OPUS-class project entitled: „Precessional magnetization switching in ferromagnetic (Ga,Mn)N layers using sub-nanosecond short electric pulses", financed by the National Science Centre (NCN). The aim of the project is to experimentally induce precession and the reversal of the magnetization in ferromagnetic layers of dilute magnetic semiconductor (Ga,Mn)N using sub-nanosecond electrical impulses. The novelty of our approach comes from the fact that we want to employ the inverse piezoelectric effect in ferromagnetic host: (Ga,Mn)N.

Requirements:

- good analytical skills
- experience in experimental work, particularly in electric transport and magnetometry. An experience with microwaves technique documented primarily by publications and / or reference letters will be advantageous.
- well-developed programming skills c++ and/or python.
- good knowledge of English in speech and writing.
- the ability to work independently and to effectively cooperate and communicate with other members of the group (including those working in theory), and with external colleagues.

Funding:

The scholarship is expected for 36 months as full-time with 4500 PLN per month (grant funding, before obligatory employer and employee social security contributions).