Project 4.22. Properties and interactions of group IV-VI semiconductor multiferroics (experimental)

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www: http://www.ifpan.edu.pl/ON-1/on13.html

Background:

Materials with large Rashba splitting and helical ferromagnetic order such as Ge1-xMnxTe provide extraordinary physical properties due to the coexistence and coupling between ferromagnetism and ferroelectricity in one system. Multiferroic Ge1-xMnxTe inherits from the ferroelectric □-GeTe the gigantic Rashba splitting of three-dimensional bulk states, which competes with Zeeman's spin-induced splitting induced by the magnetic exchange interactions. Through the use of strong magnetic fields, manipulation of spin textures can be shown, which is also possible for ferroelectric domains. The control of band spin splitting and blocking by using ferromagnetism and ferroelectricity opens fascinating new paths for highly multifunctional Rashba multiferroic devices adapted to reprogrammable logic and memory applications.

Aim:

The main aim of this project is to gain knowledge about coupling between the ferromagnetic and ferroelectric properties of tunable multiferroic (Ge,Sn,Mn)Te system. Multiferroics, such as (Ge,Mn)Te, combine interplay between spin and orbital degrees of freedom, with fundamental breaking of symmetries. The combination of the above effects in a single material can be utilized in spin-torque manipulation of magnetic domains. The use of Rashba splitting for spin manipulation is important in view of recent outstanding discoveries of new quantum phases such as topological insulators, Weyl semimetals, and Majorana fermions. Acquired knowledge will be used to understand the spin-texture and domain wall dynamics of (Ge,Sn,Mn)Te multiferroics in view of possible applications in spintronics.

Requirements:

Profile of a candidate for the PhD position:
- MSc (Master degree) or student of master's degree studies in one of the following disciplines: physics, material engineering or chemistry; master's degree to be obtained no later than September 30, 2020
- high grades in core subjects at the master's level studies
- passing courses in physics at academic level
- knowledge of experimental techniques in condensed matter physics
- experience in laboratory work with ferromagnetic semiconductors
- interest in condensed matter physics, ability to work in an interdisciplinary team and learning new subjects
- analytical thinking, diligence in work
- good spoken and written English skills
- ability to work under a pressure of time

- 10. High motivation for scientific work (publications, conference presentations or other achievements are highly welcome)

Funding:

Scholarship: grant funding of 4500 PLN per month, before subtracting obligatory employer and employee social security contributions, for 48 months.