DESCRIPTION FOR THE GENERAL PUBLIC

Modern technology, and electronics in particular, is based on silicon semiconductor application for integral circuits and cobalt-based magnetic recordings with general tendency toward miniaturization and optimization almost every devices generation. One way to preserve such a pace is to combine the best of two worlds – semiconducting flexibility in parameters manipulation with doping and charge carrier manipulation together with magnetic high operating speed and fast switching in one material. Among the best-known semiconductors is GaAs, which is already widely used today for circuitry in satellite communications, mobile phones and higher frequency radar systems. In addition to charge carrier use, as in conventional technology, with an addition of a magnetic material, like manganese, one may take an advantage over another parameter of a carrier – spin, introducing magnetic field dependent magnetization.

(Ga,Mn)As dilute magnetic semiconductor (DMS) is an outstanding ternary alloy by itself, widely investigated for the last decades, served both for concept application as well as a creation of strong theoretical base for III-V material physics. Within our investigation we plan to go further and add heavy pentavalent bismuth in order to enhance and tune particular electron-transport properties. In order to achieve described goals, our team would create a new artificial material of quaternary alloy DMS (Ga,Mn)(Bi,As) with a help of low-temperature molecular beam epitaxy (LT-MBE) and further careful treatment; check the quality and understand how the lattice is built with means of X-ray techniques and electron microscopy. Further, on the best selected samples we'll create different nano-structures to combine information processing and magnetic data storage properties in a single prototype, proceeding with concepts evaluation with low–temperature magnetic and magneto-transport experiments in different fields.

With new materials emerging every day, (Ga,Mn)(Bi,As) and (Ga,Mn)As thin layers models show very perspective and peculiar properties for both experimental and theoretical researches. Ultimate objective of the project is being able to contribute to the physics of III-V DMS and to come one step further with our investigations to spintronic era of technology.