Project 4.21. CdTe/PbTe heterostructures for photonic applications

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Background:
The CdTe/PbTe quantum structures, with PbTe regions forming quantum wells or quantum dots embedded in the CdTe barriers, exhibit very strong photoluminescence intensity resulting from the large difference in the energy band gaps of the both materials In addition, the both materials show very large contrast in refractive indexes, what makes the CdTe/PbTe material system particularly attractive for construction of photonic crystals. Photonic crystal is a well-defined nano- or microstructure with periodic distribution of refractive index in one, two or three spatial directions. Within CdTe/PbTe heterosystem (using molecular beam epitaxy) it is possible to obtain all of types photonic structure in the form of CdTe/PbTe multilayers (1D photonic crystal), PbTe (CdTe) nanopilars (2D p.c.) and PbTe (CdTe) dots (3D p.c.) embedded in CdTe (PbTe) matrix.
In particular, the project envisages: numerical simulations of optical properties of CdTe/PbTe 2D and 3D heterostructures, molecular beam epitaxy of CdTe/PbTe heterostructures; developing of experimental set-up and performing optical measurements; data analysis; writing papers; presenting results in oral and written forms.

Aim:
Despite of the obvious potential of CdTe/PbTe heterostructures for photonic applications this subject is not exploit so far. The main objective of the proposed project is to manufacture and study photonic crystals made of CdTe/PbTe semiconductor heterosystem. We expect that the realization of the project will results, among others, in a development of control and integration methods of CdTe/PbTe structures for new kinds of optical devices exploiting simultaneously quantum and photonic properties of this semiconductor system.

Requirements:
Master of Sciences in physics; experience in solid state physics; basic knowledge of optical experimental techniques, particularly in infrared spectral region; basic knowledge of molecular beam epitaxy of II-VI and IV-VI compounds; experience in simulation software for light propagation in solids; knowledge of written and spoken English