Nanosize radiation defects in arsenic implanted HgCdTe epitaxial films of *n*- and *p*-type studied with TEM/HRTEM

***Izhnin I.I.*[1], Mynbaev K.D.[2], Swiatek Z.[3], Morgiel J.[3], Korotaev A.G.[4], Voitsekhovskii A.V.[4], Fitsych O.I.[5], Varavin V.S.[6], Dvoretsky S.A.[4,6], Mikhailov N.N.[6], Yakushev M.V.[6], Bonchyk O.Yu.[7], Savytskyy H.V.[7]**

[1] *Scientific Research Company "Electron-Carat". Stryjska St., 202, Lviv-79031, Ukraine. E-mail: i.izhnin@carat.electron.ua*

[2] *Ioffe Institute. Politekhnicheskaya St., 26, St. Petersburg-194021, Russia.*

[3] *Institute of Metallurgy and Material Science PAN. Reymonta St., 25, Krakow-30059, Poland.*

[4] *National Research Tomsk State University. Lenina Av., 36, Tomsk-634050, Russia.*

[5] *P. Sagaidachny National Army Academy. Gvardijska St. 32, Lviv-79012, Ukraine.*

[6] *A.V. Rzhanov Institute of Semiconductor Physics, SB RAS. ac. Lavrentieva Av., 13, Novosibirsk-630090, Russia.*

[7] *Ya.S. Pidstryhach Institute for Applied Problems of Mechanics and Mathematics NASU. Naukova St., 3b, Lviv-79060, Ukraine.*

We report on the results of comparative study of defect microstructure of molecular-beam epitaxy-grown epitaxial films of $Hg_{1-x}Cd_xTe$ (x=0.22) implanted with arsenic ions with 190 keV energy and 10^{14} cm^{-2} fluence. Two samples were studied: as-grown *n*-type sample and vacancy-doped *p*-type sample obtained with thermal annealing (220 °C, 24 h) at low mercury pressure in helium atmosphere. The microstructure observations were performed with transmission electron microscopy in bright field and high-resolution modes. It was found that after the implantation radiation-damaged area in two studied samples was identical and consisted of three characteristic layers, including a sub-surface layer with low defect density, a deeper layer with big dislocation loops and a deeply buried layer with small dislocation loops. Both the characteristic sizes of these regions and the types of radiation nano-defects were identical: dislocation loops, stacking faults, and crystal lattice disturbances. This confirms the conclusion that it is possible to study the electrical properties of radiation donor defects in *p*-type samples, since under real conditions in n-type samples they are masked by the high conductivity of the *n*-base.