The possibility of cut-off wavelength extension in the image converter based on the semiconductor-liquid crystal structure

N.J.Ismailov, T.D.Ibragimov

Institute of Physics of Azerbaijan National Academy of Sciences.
33, H.Javid avenue, AZ1143,Baku.

The night vision devices are the simple construction, easy in operation, having high resolution and relativity low costs. For creation of night vision devices with cut-off wavelength more than 1.2 μm is an use of the solid state image converter based on semiconductor –liquid crystal system. For realization of these devices the problem of balance between resistance of photosensitive layer and liquid crystal arises.

In this report the working principle of the solid state image converter based on semiconductor – liquid crystal layered structure with cut-off wavelength extended more than 1.2 μm is described. The photosensitive layer in this structure is produced as plan array of Scottky microdiodes which makes possible to increase the infrared boundary and resolution of the device. The cut-off wavelength is determined by spectrum of electron photoemission process in metal-silicon MIS structures with barrier potential height that is less than optical band gap of silicon. The photons with wavelength more than 1.2 μm, passing through silicon wafer, are absorbed in metal exiting electrons. Exited electrons, passing to space charge region of semiconductor, where their avalanche multiplication is occured. In order to decrease liquid crystal resistance for balance with differential resistance of microdiodes, the 0.3-0.5 μm silver particles in 0.05% weight quantity were added to nematic liquid crystal mixture EBBA-MBBA with molar ratio 1:1 . In this case the resistance and threshold voltage of electrohydrodynamic instability decrease, while contrast ratio, rise and decay times of switching are not changed.

The work has been supported by Scientific and Technology Center in Ukraine.