Detecting of light by means of “HTSC/photosemiconductor" hybrid contact structures

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The important factor, causing perspective of use high temperature superconductors (HTSC) v. photonics, are in comparison large value of superconducting gap $2\Delta_0$. So, for the $Y_1Ba_2Cu_3O_{7-\delta}$ compound (T_c=92K) the relation of cooper's pairs binding energy at zero temperature $2\Delta_0$ to value of the superconducting transition critical temperature T_c lies v. a interval $2\Delta_0/k_BT_c=4\div8$. It meets to photon energy of infra-red range of a spectrum. On the other hand, the occurrence HTSC materials with the T_c values $>$ 77K enables to use as semiconductor making hybrid junctions and hybrid contact structures (HCS) and such technological conventional (Ge, Si, GaAs, InAlAs) and unconventional (BiOHal; LnOHal; Ln- lanthanide; Hal= Cl,Br, I, F) semi- and photosemiconductors, the application of which before was impossible owing to a strong temperature degradation of conductivity (effect of a charge carrier “freezing").

In this paper we report the formation process of $YBa_2Cu_3O_{7-\delta}$ (ceramics) / BiOHal (singlecrystal (SC)) HCS's and the results of investigation our physical properties. The features of the physical properties “HTSC-SC" HCS's become much more significant within the temperature range $T<T_c$, due to the changes in the spectra of elementary excitations of HTSC. The “$YBa_2Cu_3O_{7-\delta}$ - BiOCl:Ti" and "$YBa_2Cu_3O_{7-\delta}$ - BiOI" HCSŠs are heterophotoresistors with large spectral sensitivity (0.31-0.80 μm) and which are suitable for photoelectric analysis of polarisation plane of linearly polarised irradiation.

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