DR-23. MICROSTRUCTURE AND OPTIC PROPERTIES OF SUPERSATURATED SUBSTITUTIONAL $Cd_xPb_{1-x}S$ SOLID SOLUTION FILMS

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The development of optic and nanoelectronics, sensor production and solar power engineering requires new, relatively cheap functional materials such as the films of solid substitutional solution $Cd_xPb_{1-x}S$. This work considers the results of the research of microstructure and physical properties of $Cd_xPb_{1-x}S$ films depending on cadmium concentration that were obtained by bath deposition on the ceramized substrate [1, 2].

Films deposition of $Cd_xPb_{1-x}S$ solid solutions were obtained from the reaction mixture containing lead citrated complex $Pb(C_6H_7O_5)OH^{2-}$, cadmium ammonium complexes $Cd(NH_3)^{2+}_{1-6}$ and thiocarbamide N_2H_4CS on the preliminary degreased ceramized substrates. Cadmium salt concentration was varied from 0,01 to 0,1 mol/L, whereas lead salt concentration and thiocarbamide concentration were constant and equal to 0,04 mol/L and 0,58 mol/L respectively. Film synthesis was made at temperature 353 K during 120–140 min in the leakless reactors of molybdenum glass in the thermostat by ТС-ТБ-10 brand. Films of supersaturated solid substitutional solutions $Cd_xPb_{1-x}S$ ($0{,}03 \le x \le 0{,}22$) were produced with B1 Structure based on lead sulfide cubic lattice.

X-ray research showed that with the increase of the concentration of cadmium acetate in the reaction mixture there is an increase of microstrains in the deposited layers. The obtained films are formed from crystallites with the preferable orientation [200] and are characterized by the clear anisotropy. The crystallite sizes depend on the film composition and are within the ranges 100–1000 nm. The dependence of the conductivity decrease of the synthesized layers with the increase of cadmium sulfide content in them is determined. The synthesized $Cd_xPb_{1-x}S$ solid-solution films have the photosensitivity in the visible and near-infrared spectral ranges without any special sensibilization. It was determined that the maximum of the spectral characteristic and the long-wave limit of photo response of the $Cd_xPb_{1-x}S$ films gradually moved toward the short-wave spectral range from 3,1 to 1,6 мм and from 2,5 to 1,2 μm, respectively.

References

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The research was carried out in part at IMP Neutron Material Science Complex within the state assignment of FASO of Russia (theme «Flux» № AAAA-A18-118020190112-8). The work was supported by Act 211 Government of the Russian Federation, contract № 02.A03.21.0006.