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INVESTIGATION OF THE INFLUENCE OF GAMMA-RADIATION ON ELECTRICAL AND PHOTOELECTRIC PROPERTIES OF Pb1-XMnXSe EPITAXIAL FILM

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Semiconductors AIVBVI are of great scientific and practical interest in connection with the possibility of their use in the field of infrared technology and also as thermoelectric converters.. The presence of elements of heavy metals in the crystal lattice of these semiconductors provides a high radiation and thermal stability of devices manufactured on their basis. These semiconductors and compounds derived from them are widely used in infrared (IR) technology in the spectral range of 3-5 μm. Studying of the effect of ionizing radiation on electrical properties of these materials has great scientific and applied significance.
Pb1−xMnxSe epitaxial films were prepared on (111) BaF2 substrates by molecular beam condensation (at a pressure of 10−4 Pa) using a UVN71-P3 standard vacuum system. For study the properties of the epitaxial film on the basis of the Pb1-xMnxSe compound on a glass substrate, a silver paste was used as the contact material. The thickness of the obtained epitaxial film was 3 μm, the distance between the contacts was 0.6 mm. After applying the silver paste, the contacts were dried at room temperature for 24 hours. It was determined that the contacts are ohmic.
İn order to study the influence of gamma radiation on electrical properties the sample was exposed to a dose of Dγ = 10 kGy using an MRX γ-25 setup with a Co60 isotope source (E = 1.25 MeV) after studying electrical and photoelectric properties of the initial sample.
It was determined that, the volt-ampere characteristics of the sample obtained at a temperature of 300 K after irradiation with a gamma-ray to a dose of 10 kGy slightly differs from the volt-ampere characteristics of the initial (unirradiated) samples at the same temperature. It is interesting that, in this case the value of the current strength to a voltage of 1.2 V is less than its value in the initial (unirradiated) state, then in the irradiated sample the current becomes larger than the current in the sample in the initial state at the same voltages, and with increasing voltage the difference between the current strength for the initial and irradiated samples at the same voltage increases.

Summary

Summarizing to the obtained results, it can be noted that the electrical conductivity of the p-type Pb1-xMnxSe epitaxial films which irradiated with gamma rays at a temperature of 300 K varies slightly in comparison with the electrical conductivity of initial samples. At this temperature they can be considered as materials resistant to their gamma-radiation. The increase in conductivity at low temperatures after irradiation with gamma quantum is due to the fact that the defects generated by the action of gamma quantum are defects of the acceptor type. İn the irradiated samples under the influence of the light after the definite estimate of the temperature the current strength becomes lower than in the darkness. It was explained that, as a result of gamma radiation appear local levels which is playing the role of recombination center in the band of gap of Pb1-xMnxSe epitaxial films.

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