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MODIFICATION OF THE ELECTRICAL CHARACTERISTICS OF A PBSE FILM BY LASER RADIATION

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This work studies the mechanism of change in the electrical characteristics of thin PbSe chalcogenide films. This happens as a result of the photothermal action of continuous laser radiation. It is shown that under laser radiation an intensity of 76 W/cm2 and a scanning rate of 150 μm/s, the electrical resistance changes from 1.4 kΩ to 1.2 kΩ. After photothermal treatment, the current in the modified region increased by 62.8% compared to the original film in the absence of an external voltage. The current also increased by 40% when a voltage of 4 V was applied.

Introduction. Chalcogenide materials are widely applicable and promising for research. Due to their unique properties, chalcogenide films have recently found wide application in the field of photonics as photoelectric and optical materials. PbSe films are promising materials due to their high absorption in the mid- and far-IR ranges. This feature allows them to be used as photoelectric elements in sensors for express analysis of organic substances and gases.

Main part. This work studies the influence of continuous laser radiation on the electrical and optical characteristics of PbSe films in the regime of structure modification. The processing of such films by laser radiation in the scanning mode led to the formation of a track, as well as a decrease in reflection by a factor of 5 compared to the initial sample. In addition, the electrical characteristics of the samples were obtained. These characteristics indicate an increase in the current values by more than 6 times for the treated films without an external voltage, and by a factor of 4 with a voltage source. Also, the resistance of the treated films decreased by more than 10%.

Conclusion. In this study, PbSe chalcogenide films were modified by laser radiation in order to change the electrical characteristics of the sample and compare them with the properties of the untreated film. In the future, laser processing will increase the photosensitivity of sensors for gas analysis applications, as well as for creating substrates for microanalytical studies of various liquids. The results show a decrease in the resistance of the films after laser exposure, which indicates structural changes in the material, as well as the appearance of new sources of free charge carriers.