TESTING SYSTEM FOR FILM ELECTRONIC PROTECTIVE ELEMENTS

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The creation of new functionally active instrument smart structures for the needs of microwave micro- and nanoelectronics in order to increase the safety level of electronic control and power systems against the influence of pulsed electromagnetic radiation of artificial origin in the conditions of the modern world is an urgent scientific problem of the world level. The new approaches implemented in this study are the experimental study of the physical processes of switching between states with high and low electrical conductivity in semiconductor film systems based on cadmium telluride, obtained in different physical and technological modes, under the action of microwave electromagnetic radiation pulses. For this, it is necessary to carry out complex experimental studies of the influence of the amplitude, duration and nature of electromagnetic pulses on the parameters of the kinetic switching processes between states with high and low electrical conductivity in semiconductor film systems based on cadmium telluride obtained in different physical and technological regimes. To carry out such research, it is necessary to solve the task of creation the equipment which can generate the microwave electromagnetic pulses with necessary characteristics and the conditions of their use for the study of fast switching processes in experimental samples based on cadmium telluride. And to carry out an analytical study of the effect of microwave electromagnetic pulses on the electrical properties of cadmium telluride films.

The abstract presents studies of the characteristics of ultrahigh-frequency (HF) electromagnetic pulses, which have a destructive effect on the elements of radio-electronic equipment. The development of experimental stands and methods for the study of fast switching processes in samples based on cadmium telluride are described. The results of the testing of experimental stands for the generation of nanosecond microwave electromagnetic pulses and the optical range for the study of the effect of such pulses on the switching characteristics of cadmium telluride films have been obtained. A series of experiments on the influence of microwave electromagnetic pulses on the switching processes between states with low and high conductivity in cadmium telluride were conducted and it was established that the minimum pulse voltage at which switching begins to be observed varies from 10 to 20 V, for a CdTe film thickness of 3 to 4 μm to more than 100 V for a CdTe film thickness in the range of 8 – 10 μm. General theoretical ideas about the change in electrical parameters of cadmium telluride films with different crystal structures under the influence of microwave and optical range electromagnetic pulses were formed. It was established that when the critical threshold voltage is reached in the pulse in a time from 3 to 8 ns, electrical breakdown of the CdTe film occurs.

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