PHOTOELECTRIC PROPERTIES in CdTe

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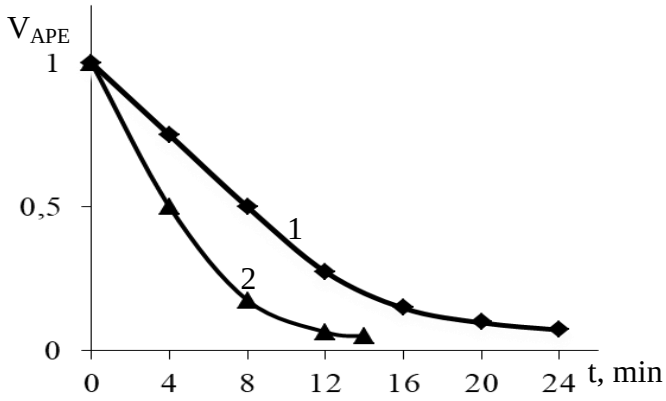
At present, the issues of studying the electrophysical properties of semiconductor films attract the attention of specialists, since thin films with anomalously high photovoltages (APV) and anomalously high photomagnetic voltages (APMK) can be used to create miniature converters, memory devices, photodetectors, etc[1].

The studied samples were obtained by thermal evaporation of CdTe and CdTe <Sn> in a vacuum of 10-4 mm Hg. The film thickness was 0.5÷1 μm, the resistance was ~1010 Ohm. Under the action of white light with an intensity of I=10 Lx, the films generated a photovoltage of up to 400 Volts. The resistance and photovoltage were measured based on the current-voltage characteristics of the samples. The capacitance of the circuit was 10 picofarads. In this case, the circuit relaxation time ranged from 10 to 200 s[2-4].

We have studied the dependences of the stationary photoelectret voltage (PEV) on the relaxation time at various illumination values. To study the above processes, a device was assembled that allows short-circuiting the film for a certain time and connecting it to the device.

When the film is illuminated, an anomalous photovoltage occurs, which is recorded by a measuring device. Then the electrodes are short-circuited, after which the film with short-circuited electrodes is kept for several seconds in the dark, and then, when the contact is opened, the value of the photoelectret voltage is measured on the device.



Rice. Fig. 1. Dependence of voltage on dark relaxation time for two studied samples (1-CdTe+Sn; 2-CdTe)

From fig. Figure 1 shows that in CdTe films with and without tin dopant, relaxation occurs at different times. We can say that it is associated with the presence of sticking levels[5-7].

The dependences of Lg(It) on LgI are studied, from which it follows that the law of interchangeability in the investigated CdTe<Sn> films is practically fulfilled.

The depolarization dependences of AFN films for CdTe and CdTe+Sn show that in the studied films, the depolarization time of activated films was significantly longer than that of non-activated ones[8].

The results obtained indicate that in the studied samples, the APV effect is formed due to the summation of elementary photovoltages at p-n junctions. The presence of sticking levels in such structures leads to a photoelectret state [2]. The conducted experiments showed that the relaxation of photovoltage in activated samples occurs within 60-100 minutes, and in non-activated samples 10-30 minutes[9].

For a more detailed analysis and comparison of the parameters with the parameters of the new AFS films, cadmium telluride films were fabricated at different substrate temperatures. The deposition angle was within ~45°. The substrates were glass, quartz, LiF, NaCl and luda. The layer thickness was within ~1 μm[10].

Table 1

lists some parameters of AFN-films of cadmium telluride.

Support number	T°C substrates	Vacuum, mm Hg	0°, spray angle	V, v	V', v
6	50	10^{-4}	40	100	600
14	70	10^{-4}	40	200	920
16	150	10^{-4}	45	350	1200
21	200	10^{-4}	40	650	4000
29	250	10^{-4}	45	1300	7000
31	300	5.10^{-5}	45	950	1200
36	350	5.10^{-5}	40	650	1100

(V, V'-photovoltages at room and nitrogen temperatures).

In individual samples, the photovoltage reached values of more than 1000 volts. At liquid nitrogen temperature, it reached 7000 V. at a substrate temperature of 250°C (see Table 1).

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