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XVII МІЖНАРОДНА ФРЕЇКІВСЬКА КОНФЕРЕНЦІЯ З ФІЗИКИ І ТЕХНОЛОГІЇ ТОНКИХ ПЛІВОК ТА НАНОСИСТЕМ

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Photosensitivity of Polycrystalline Films of Cadmium Telluride

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In recent years, scientific research has increasingly focused on renewable energy sources, in particular solar energy. Promising solar cells are second-generation photovoltaic cells, where cadmium telluride thin-film materials are commonly used. In addition, II-VI compounds are relevant due to the prospect of their use to create ionizing radiation detectors and as IR filters.

CdTe films were obtained from a pre-synthesized material by vacuum-evaporation technique and physical vapour deposition on freshly prepared mica chips and polished glass. The photoelectric properties of CdTe semiconductor films obtained on various substrates have been investigated using the developed automated device. The dependence of the photosensitivity on the structure of the films and the technological conditions of growing has been determined.

The photosensitivity is defined as $S = (\sigma_L - \sigma_D)/\sigma_D$, where σ_D is dark conductivity, σ_L is conductivity under illumination. Photosensitivity largely depends on structural defects that can act as trapping or recombination centres. In CdTe polycrystalline films, photoconductivity is mainly determined by processes at the grain boundaries. Based on the results of AFM studies (Fig. 1, a), the average crystallite size has been determined, and the photosensitivity of the films of various thickness and structural perfection is shown in Fig. 1, b.

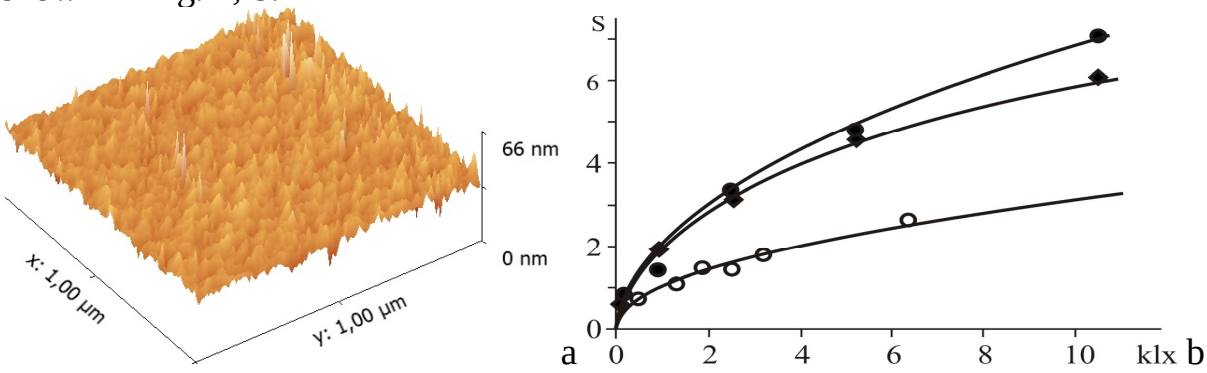

Fig. 1. AFM image of the surface of a CdTe film with a thickness of 300 nm on the polished glass substrate (a) and photosensitivity of films on mica (○) and polished glass (●, ♦); thickness is 200 nm (●), 320 nm (♦), 540 nm (○); the average grain size is 25 nm (●), 30 nm (♦), 90 nm (○) (b).

It can be seen that the photosensitivity of the films obtained on the polished glass substrates is significantly higher than those of the films on freshly prepared mica chips (111) and increases with decreasing film thickness. This is due to the fact that the specific contribution of the grain boundaries increases with decreasing crystallite size.