Structure of Oxide Film Formed on ZnSe Surface at the Contact with Air

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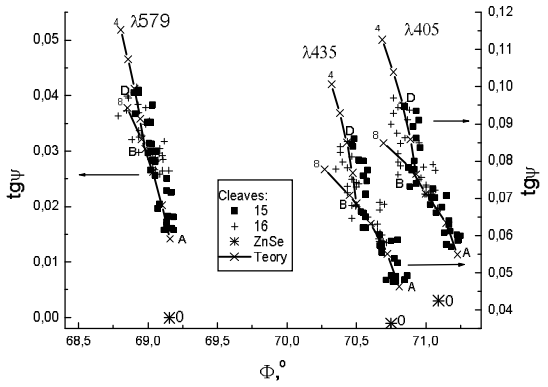
The surface condition of the semiconductor crystals has a significant influense on the foto- and microelectronic devices performance. It is determined by the characteristics of the surface interaction with the environment. Here we report an ellipsometric measurements realized on freshly made single-crystal zinc selenide cleaves for a long time from the moment of their production to one year exposing in atmospheric conditions. It has been shown that the process of surface interaction with air is formed two-layer system. The inner layer is formed mainly within the first few tens of days, and external layer show itself at the final oxidation period in last of months. Ellipsometric parameters changing with time of oxidation in the first stage can be described in the model of the absorbing layer, on the contrary, in the last months of the oxidation process can be described by using the transparent outer layer model. Optical constants – refractive index n, absorption index κ and the thickness d of the layers were obtained. Ellipsometric parameters changing over time well describe by the obtained parameters values. The figure shows the measured ellipsometric parameters tgψ and Φ (symbols) in comparison with the theoretical curves, calculated on the basis of the parameters founded (table). The inner layer corresponds to the curve AB, the outer – curve BD.



Λ, NM	INNER LAYER			OUTER LAYER	
	n_2	κ_2	d_2, nm	n_1	d_1, nm
579	2,33	0	8	1,2–1,4	2,5
435	2,53	0,13	7	1,21–1,3	3
405	2,6	0,2	7	1,305–1,4	2,5

Because optical constants inner layer is less than the optical constants zinc selenide, he probably formed by the mixture of base material and a stable oxide (ZnO). The outer layer may be formed by a mixture of air and an unstable oxide of the type SeO_2.