PHOTOELASTICITY OF $CaWO_4$ CRYSTALS

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Calcium tungstate ($CaWO_4$) is a perspective material as in laser technology and also for electro- and acoustooptic applications. However for these crystal characteristics basing on which it is possible to determine the efficiency of application of these material are not explored. The first step towards determination of material acoustooptic efficiency is investigation of piezooptic effect (POE) in $CaWO_4$ crystals. For this purpose a modified polarized-oplical device [1] for determination of the POCs of optical path difference π^0_{km} in a reflected light and device based on Math-Zender interferometer for an absolute POCs π_{im} determination.

Complete correlation of absolute POCs with POCs of optical path difference and birefringence is carried out and by means of it an absolute POCs determination trustworthiness is proved in the limits of experiment error (7-10%). The $CaWO_4$ crystals POE is marked by a large anisotropy: POCs values alter from ~2,0 Br ($\pi^0_{\bar{B}\bar{4}}$) to ~21 Br ($\pi^0_{3\bar{6}'}$).

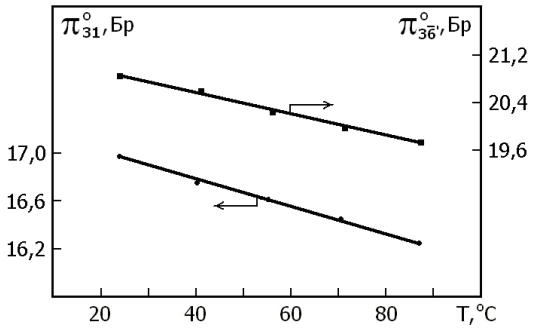

Fig. Examples of temperature dependences of the POCs π^0_{km}.

An important parameter of acoustooptic cells is their temperature stability. Therefore a temperature influence over piezooptic coefficients (fig.) is investigated and also a temperature dependence of $CaWO_4$ crystals birefringence is explored in temperature interval of 20÷90°C. The investigation technique of the temperature changes of π^0_{km} error is less then 0,5%. Temperature dependences of the largest POCs are explored. The example is presented on the fig.: coefficients π^0_{31} and $\pi^0_{3\bar{6}'}$ (here $\bar{6}'$ is a direction turned away on angle 22,5° from the crystallophysical axis X_2 the X_1X_2 plane) are decreasing by a 6,8% and 8,5% per 100 degrees respectively. Showed POCs temperature instability is ~ 4 times large then of model acoustooptic $LiNbO_3$ crystal one. Temperature decreasing of a birefringence is of value 3,2% per 100 degrees.

References

[1] Patent UA 16257/1. Mytsyk B., Andrushchak A., Kost' Ya., Yurkevych O. 27.11.2008.