07.X-14 CRYSTAL STRUCTURE AND THE OPTICAL PROPERTIES OF DIELECTRIC CRYSTALS: A REVIEW.* By D. Eimerl, Lawrence Livermore National Laboratory, Livermore, California 94550, USA.

The development of new optical materials for specific applications requires an understanding of the relationship between structure and chemistry and the optical properties. The relevant properties here are the refractive indices, the optical absorption, and the nonlinear optical coefficients controlling second harmonic generation, and four-wave mixing. The UV absorption in general, and the average refractive index of birefringent materials can be described quite well in terms of a Gladstone-Dale model. Some early work on the birefringence and nonlinear optical constants was based on bond models with effective charges. However, for the most part only qualitative conceptual models exist for these properties, and only recently has the development of quantitative models been examined.

The optical properties of high-band-gap dielectric crystals are a simple function of the electron states of the crystal. The low-lying states are single electron excitations which usually are quite localized. They are being studied quantitatively using models based on anionic groupings within the crystal structure. This model extends the bond models, which are based on pairings within the crystal structure. Calculations based on simple quasimolecular elements within the crystal give a good empirical and quantitative picture of the optical properties.

Examples will be presented for the birefringence and nonlinear optical properties of several crystals. One particularly useful class of crystals contains the aminoacid L-arginine, and other useful classes contain simple organic acids such as tartrates and malates. Recent work in the USA and the People's Republic China will be reviewed.

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07.X-15 CRYSTAL STRUCTURE AND CRYSTAL OPTICS. By R.E. Newnham, Materials Research Laboratory, Pennsylvania State University, University Park, PA, 16802, U.S.A.

Structure-property relationships involving linear and non-linear optical properties of engineering interest will be discussed from a crystallographic viewpoint. Absorption, dispersion, birefringence, electro-optic coefficients, and photoelastic effects are all important in integrated optic systems. Illustrative examples will be drawn from silicate glasses, III-V semiconductor compounds, polar ferroelectric crystals, and organic molecular structures. The importance of symmetry, molecular packing, and electronic polarizability will be emphasized.

07.1-1 THE EFFECT OF MICROGRAVITY ON THE GROWTH OF GaSb. By L.Petrás I.Gyürö, and E.Lendvay, Research Inst. for Technical Physics of the Hungarian Academy of Sci, Budapest

During the space flight of the first Hungarian astronaut on board of SALYUT-6 a part of his program was the growth of GaSb crystal under microgravity. Polycrystalline GaSb was closed into a quartz capsule of 8 mm in diameter and an ingot was grown from it without seed crystal using a Bridgman method in a horizontal furnace under microgravity circumstances (I.Gyurö at al., Acta Astron. Vol. 11, No.7-8, 361-368, 1984). In order to estimate the effect of microgravity on the growth mechanism correctly, a parallel growth process was done under terrestrial conditions, and the defect structure of the samples were compared. Both samples were cut lengthwise and the grain boundaries were developed by chemical etching. It appeared that both samples were macrocrystalline but the "space sample" [A] contained larger crystallites than that of the terrestrial one [sample B]. The orientations of the crystallites were determined by the aid of X-ray patterns. The results showed that there was no correlation between the orientation of neighbouring crystallites of sample A. In the case of sample B, however, a special type of twinning was observed: 511 type planes of some crystallites and 333 plane of an other were parallel to each other. It was therefore possible to make double crystal topograph from nearly the whole specimen simultaneously, because these planes have the same Bragg angles. Topographs were made from different crystallites of sample A, too. The topograph of