PSI1.05.51 THERMO-OPTIC STUDIES OF STRUCTURAL PHASE TRANSITIONS IN CRYSTALS OF THE KTIOP4 FAMILY. M. N. Womersley, P. A. Thomas, Department of Physics, University of Warwick, Coventry, CV4 7AL, England

A uniquely-modified Kösters prism interferometer is used for simultaneous and separate measurement of the change in refractive index, $dn$, and the thermal expansion coefficient with temperature, with a resolution of 4x10^{-7}, on 1mm$^3$ biaxial crystals, is described. The application of this technique to new nonlinear optical materials of the KTIOP4 (KTP) family is made with the aim of elucidating and modelling the onset and increase of the alkali-metal mobility in the temperature range from 300°C to 900°C and studying the high-temperature ferroelectric to paraelectric phase transition.

The evolution of the refractive index as a function of temperature, $n(T)$, is plotted for a number of materials, with the high-temperature high-symmetry component above the phase transition deducted from the low-temperature data and is fitted to a model describing both the extrinsic (structure-dependent) and intrinsic (polarizability-dependent) contributions to the thermo-optic effect. The results are reviewed within the context of structure-property relationships and the high-temperature phase transitions in the KTP family.

PSI1.05.52 DISORDER AND THE MECHANISM OF PHASE TRANSITION OF [(CH3)2CHNH3]2BiCl5. Jacek Zaleski and Adam Pietraszkow, Institute of Chemistry, University of Opole, 45-951 Opole, Oleska 48, Poland, *Institute of Low Temperature and Structure Research, Polish Academy of Sciences, 50-950 Wroclaw, Okolna 2, Poland

The alkylammonium halogenoantimonates (III) are ionic-molecular solids. Recently the physical properties have attracted considerable attention. Many compounds of this group show interesting ferroic properties. They possess complicated sequences of phase transitions, some of them to polar phases.

[(CH3)2CHNH3]2BiCl5 crystallises at 298 K in P21/c space group. Its anionic sublattice is composed of isolated BiCl$_6^{2-}$ units, composed of two BiCl$_4$-octahedra sharing an edge. There are two crystallographically non-equivalent cations in crystal structure. One of them, however, the true symmetry is orthorhombic (space group Pmm21) due to the distribution of metal atoms in twice their number of available sites. This orthorhombic cell occurs in three orientations giving rise to a three-component twinning. Moreover, due to antiphase formation, diffuse streaks along odd layer lines in oscillation photograph about c-axis and some diffuse spots in corresponding Weissenberg photographs are observed. At ~323K, these streaks disappeared, with no change in cell dimensions, but all spots in first layer Weissenberg photographs were elongated along c-direction. On cooling, elongation of spots vanished and the diffuse streaks originally present, did not reappear. Above ~363K, each spot splitted into two/three components along c-direction which coalesced into single sharp spots on cooling to room temperature. The overall hexagonal symmetry remained unchanged.

The splitting of the spots at high temperature in the crystal is probably due to slight deviation of the ratio of b/a of the three orthorhombic cells from 1/3 so that interplanar spacings of each of the three orthorhombic cells become different. The decrease in the probability of mistakes in repetition along b-axis of orthorhombic cells with increase in temperature accounts for the disappearance of diffuse streaks.

Phase Transition I

MSI1.05a.01 MARTENSITIC TRANSFORMATION IN Au-49.5at% Cd ALLOY. Takuya Ohba, Department of Materials Science and Engineering, Teikyo University, Utsunomiya, Tochigi, Japan

Martensitic transformation is the typical first order and diffusionless (displacive) transformation. In general, structure phase transformation may be divided into two, order-disorder and displacive type transformation. For the displacive type of the second order transformation, displacements are small comparing with the interatomic distances. In case of martensitic transformation, on the other hand, displacements are larger than that of the second order displacive type transformation. The mechanism of the martensitic transformation is the central issue in recent research. AuCd is the typical alloy which shows martensitic transformation. Near equiatomic composition the high temperature phase is well known to be CsCl type. The martensitic phase is called Z'2 phase. Although the crystal structure of the Z'2 phase was not solved for long time, recently it was successfully determined using a stress induced single crystal martensite.

The results of the structure determination of Z'2 martensite, a transformation mechanism was proposed. Phonon softening, which was expected from the proposed mechanism, was also observed using an iso-lead of Cd. The static approach was also made to reveal the characteristics of the martensitic transformation. Structure factors in the parent phase were measured at various temperatures. The measurements reveal that they decrease with approaching transformation temperature. These characteristics of the martensitic transformation in AuCd alloy will be discussed.