PS16.06.04 CRYSTAL GROWTH OF LITHIUM TRIBORATE FROM Li2OB3O8 SOLUTION. H.G. Kim, J. K. Kang, S.J. Chung, Dept. of Inorganic Materials Engineering, Seoul National Univ., Seoul 151-742, Korea

The non-linear optical characteristics of lithium triborate (abbreviated to LBO) are superior to those of KTP, BBO etc., especially in THG and OPO fields. But, the high viscosity of solution makes serious problems in crystal growth. In this study, LBO single crystals were grown from Li2O-B2O3 solutions. And the effects of seed orientations on crystal quality and morphology were investigated. The morphology of grown crystals was usually formed with large (110) faces and small (011), (111) faces.

The morphology of crystals grown from seeds parallel to <100>, <001> direction were symmetrical. But, the seeds perpendicular to (110), (011) faces made the crystal morphology asymmetrical along growth axis.

Second phase was detected in some crystals grown under inadequate condition by x-ray powder diffraction. The composition of inclusion was determined as Li3B7O12 by heat treatment of 3Li2O·7B2O3 and 2Li2O·5B2O3 glasses.

For the determination of crystal defects, x-ray topographic observations were carried out. The non-linear optical properties for SHG, THG and OPO applications of grown crystals were measured.

PS16.06.05 CRYSTAL STRUCTURE AND DEFECTS IN CZOCHRALSKI-GROWN LiCaAlF6. D. Klimm, K. Seiranian, P. Reiche, Institut für Kristallzüchtung, Rudower Chaussee 6, Geb. 18.46, D-12489 Berlin, Germany

Two colquiriite type fluorides, Cr3+:LiCaAlF6 and Cr3+:LiSrAlF6, were reported as new tunable laser hosts (Lin + Keszler, Chem. Mater. 4 (1992), 645). The Cr3+ substitutes Al3+ ions isomorphically, and thus very high doping levels can be obtained. Moreover, the segregation coefficient kCr2O3/CrF3 for the lasing ion Cr3+ is close to 1, resulting in a homogeneous Cr distribution along the length of the growing crystal. Accordingly, both substances are suspected to have considerable advantages over conventional high power dye lasers.

Many authors reported on the occurrence of scattering centers in the Czochralski (CZ) grown crystals, that reduce the lasing efficiency. Usually these particles are attributed to CrO3 resulting from the moisture contained in the ambient atmosphere reacting with the CrF3 dopant during crystal growth.

This work reports on the automatized CZ growth of Cr3+:LiCaAlF6 single crystals. Crystal growth was performed with RF heating using Pt crucibles under flowing nitrogen atmosphere (<10 ppm H2O). The quality of the boules was characterized by light microscopy and by means of EDX and X-ray topography. As usual, the near surface region of the crystals turns out to be free from scattering centers. Scattering centers in the interior of the crystals are investigated by transmission electron microscopy and by positron annihilation, respectively, and are discussed in terms of extrinsic (CrO3) as well as intrinsic defects. The relation between the ideal structure and the defect structure of the colquiriite type crystals is discussed.

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PS16.06.06 MELT GROWTH AND CHARACTERIZATION OF 2-METHYL-4-NITROANILINE CRYSTALS. Masaru Tachibanana, Masaaki Satoh, Kenichiro Kojima, Faculty of Science and Graduate School of Integrated Science, Yokohama City University, 22-2 Seto, Kanazawa-ku, Yokohama 236, Japan

Recently considerable interest has developed for organic materials with extremely high optical nonlinearities. In particular, 2-methyl-4-nitroaniline (MNA) is one of the most promising materials for nonlinear optical devices. The growth of single crystals with large size and high quality is important for accurate characterization and technical applications of the materials. In this work, MNA single crystals were grown from melt by Bridgman method, and their perfection was examined by X-ray topography.

MNA powder was well-purified not only by sublimation at 90°C but also by zone-refining, where its melting point is 132°C. The purified powder was deposited in a pyrex tube. The tube was placed in a vertical Bridgman furnace with two temperature zones, where the temperatures of upper zone and lower zone were kept at 139°C and at 110°C, respectively. The material in the tube was completely molten at the upper zone. The molten material was crystallized at the lower zone by slowly pulling down the tube at the rate of 0.8 mm/h. After the crystallization, the crystal was cooled down to room temperature at 0.5°C/h. Consequently single crystals with cylindrical shapes of 5 mm diameters were grown in the tubes. Large volumes of the crystals were optically clear and appeared pale yellow. The perfection of the grown crystals was examined not only by projection topography but also by section topography. As a result, the crystal defects, especially dislocations, were characterized.

In addition, the nonlinear optical properties of the grown MNA crystals were investigated by the measurements of second harmonic generation (SHG).

PS16.06.07 THE METAL MELT STATE EFFECT ON THE MONOCRYSTAL GROWTH. N.M. Kochegura, Institute of Foundry Problems, Ukrainian National Academy of Sciences, Kiev, Ukraine

The work is devoted to the study of the influence of the state of high temperature resistant nickel melt on the monocrystal growth in the compound Ni-Cr-Mo-Ti-Al-Co-Nb-C system. The monocrystal growth was performed in directionally solidified process by Bridgman-Stockbarger's method. Monocrystal specimens were grown from ordinary or homogenised at 2000-2020 K melts. The monocrystals had a dendritic branch which was grown from crystal nucleus and in this direction <001>. The specimens which was grown from the ordinary melt had a dendrite structure with different irregular intervals between branches. There were "mat spot" on periphery. This "spots" had structure with small equiaaxis crystal. The specimens grown from homogenised melts had structure <001> without pseudograins. In this case dendrite cross-section had the regular form. The dendrite axis’ and iterator space didn’t differ neither in size nor in the configuration at the centre as well as at the periphery of the specimens.

These results may be explained thus the homogenised melt creates favourable conditions for the monocrystal growth mostly due to the decrease the deactivation of crystal nuceles and cluster decays of such metals as W, Mo, Nb, etc.