PS10.07.13 Er3+-DOPED KTiOPO4 WAVEGUIDE BY ION EXCHANGE. P.Q. Huang and P.A. Thomas, Department of Physics, University of Warwick, Coventry CV4 7AL, U.K.

Optical waveguides of Er3+-doped KTiOPO4 were formed, for the first time, using an ion exchange process. Scanning electron microscopy and secondary ion mass spectroscopy have been used to study the depth distribution of the Er3+ ions and the morphology of the erbium doped crystal. The diffusion concentration was found to change two orders of magnitude in a depth of 8μm. There was no obvious diffusion of Er3+ into KTiOPO4 in the temperature range of 400–500°C. The erbium concentration and depth were improved after annealing at 800°C for a few minutes to four hours in crystals. Strong characteristic Er3+- intra-4f shell emission 1500–1600nm @1.532 - λ1.52 was observed at 205K. Fluorescence showed a 2–6μm lifetime and was site-dependent. The polarization dependence of the emission spectrum at 1508nm suggested that the KTP crystal structure was preserved in the doped layer. The experimental results obtained so far have shown a promising outlook for the development of a waveguide laser and an amplifier based on Er3+-doped KTP.

PS10.07.14 STRUCTURE AND PROPERTIES OF Na0.35K0.45TiOPO4 SINGLE CRYSTAL, SYNTHESIZED BY FLUX METHOD. D.Y.Lee, N.I.Sorokina, I.A.Verin, V.I.Simonov, Inst.of Crystallography RAS, Leninski pr.59, Moscow, 117333, Russia, V.I.Voronkova, V.K.Yanovsky, Moscow State U., Dept. of Physics, Leninskiy Gory, Moscow, 117234, Russia.

Structure of Na0.35K0.45TiOPO4, which belongs to the crystal type of KTiOPO4, characterized by nonlinear optical properties and superionic conductivity, was analyzed by single crystal X-ray diffraction method and the structure-property correlation of this crystal was investigated. A single crystal, used for experiment, was prepared by spontaneous crystallization from flux. The temperature dependence of relative dielectric constant ε33 and electric conductivity of crystals S33 were measured at a frequency of 1MHz by means of the TESLA BM341E bridge. A full X-ray structural study was performed on CAD-4F ENRAF NONIUS autodiffractometer, using MoK radiation. The structure was refined, using Prometheus program. A special attention was given to cation sites, occupied by K+ and Na+ in the channels in form TiO6 octahedra. At these sites anharmonic thermal motion was established and thermal parameters were calculated up to 4th order tensor. In the difference Fourier map an additional peak of about 1 e/A3 was found around these sites. These results obtained so far have shown a promising outlook for the development of a waveguide laser and an amplifier based on Er3+-doped KTP.


The crystal structures of four compounds from a family of commonly used building blocks for non-linear optical materials, amino-nitropyridines, have been determined, 2-amino-5-nitropyridine1, the solvated compound 2-amino-5-nitropyridine monohydrate1 2, a new polymorph of 2-amino-3-nitropyridine 3, and the co-crystal 2-amino-3-nitropyridine with 2-amino-5-nitropyridine 4. These compounds are all stabilised by a combination of hydrogen bonds (including C-H...π X interactions) and ring-ring interactions. The balance between these intermolecular forces and the way they influence the packing of these materials is examined, and the problems associated with polymorphism in this system is addressed.

References:

PS10.07.16 CRYSTAL STRUCTURE OF VACANCY ORDERED ZnGa2Se4. O. Nittone, T. Hanada, and Y. Nakamura, Department Metallurgical Engineering, Tokyo Institute of Technology, Oh-Okayama, Meguro-ku Tokyo 152, Japan

ZnGa2Se4 is a representative of II-III-VI compound semiconductors and the basic structure is chalcoprite. In the ZnGa2Se4 compound, Se sublattice is perfect FCC but the cation sublattice is ternary: Zn, Ga and structure vacancy. The structure of ZnGa2Se4 is reported to be either defect stannite or defect chalcopyrite whose space group is I 2m or I respectively. In each structure, metal atoms and the structure vacancy are arranged in order. They are different in the configuration of metal atoms and structure vacancy even though the projected structures on the fundamental planes are identical. In the present work, convergent electron beam diffraction (CBED) are applied to determine the space group of ZnGa2Se4, and then crystal structure is refined by X-ray Rietveld method.

The specimens of ZnGa2Se4 are synthesized by melting of GaSe3 (3N) and ZnSe (5N) at 1673K, and then annealed at 1273K for 60 days. Sharp reflection spots are observed in the selected area electron beam diffraction (SAED) patterns, which indicates the good crystallinity of the specimen. TEM observation shows that domains grow up well and the but there is as large as 5μm. A CBED whole pattern taken along the [001] direction clearly exhibits 4mm symmetry, so that it is found that ZnGa2Se4 belongs to the space group I m2. Based on the result, X-ray Rietveld refinement (F. Izumi, 1993) has been done and that converged at a=5.5095Å, b=10.9450Å, c=9.5406Å, β=18.49°, Rp=5.60%, S=1.7065. F. Izumi, "The Rietveld Method," ed. by R. A. Young, Oxford University Press, Oxford (1993), Chap. 13

PS10.07.17 NEW-TYPE INTERFERENCE PATTERN GENERATED BY INTERNAL STRESS AROUND A MICROPipe IN THE 6H-SiC SINGLE CRYSTAL. By H. Ohsato1, T. Kato1, M. Razeghi2, T. Okuda1, 1Department of Materials Science and Engineering, Nagoya Institute of Technology, Nagoya 466, Japan, 2Center for Quantum Devices, Northwestern University, IL 60208-3118, USA

SiC has been expected for substrate for GaN single crystal thin film which is available for blue laser diode, but the crystalline quality of SiC substrates is low grade affected by internal stress around micropipes. Usually, sapphire (α-Al2O3) is the most commonly used for substrates, as it gives the best crystalline quality. Moreover GaN grown on sapphire has been used for blue LED and emission of blue laser has just succeeded. The reason of the phenomena is, however, not clear enough. That is why an accurate structural study of this crystal is so important in establishing the structure-property correlation and computing with those of KTiOPO4 and NaTiOPO4.

Fig.1: Q1:micropipe, O2& O3: no birefringence points