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Topic of Research : **Growth And Characterization Of Nonlinear Optical Single Crystals Of Pure And Doped Lithium Niobate And A Few Semiorganic Single Crystals.**

ABSTRACT

In the present thesis work, we mainly concentrate about the growth of high quality nonlinear optical single crystals and study their property/crystalline perfection with respect to dopants or growth improvisations in the technique. Main focus of the thesis work is to look into the following problems and to carry out their investigations:

- (i) Effect of Mg doping on the growth aspects, crystalline perfection, optical and thermal properties of LiNbO₃ single crystals.
- (ii) Crystal growth, crystalline perfection and optical property analyses of Ru doped LiNbO₃ single crystals.
- (iii) Structural, optical and thermal properties of Zr co-doped with Fe:LiNbO₃ single crystals.
- (iv) Unidirectional crystal growth, crystalline perfection, mechanical and dielectric studies of L-arginine phosphate monohydrate single crystals.
- (v) Effect of crucible design on crystalline perfection and the enhanced optical properties of benzimidazole (BMZ) single crystals grown by vertical Bridgman technique.

Chapter 1 & 2 discussed about the introduction of crystal growth, nonlinear optics, importance of crystalline perfection, theory of nucleation, crystal growth, Nonlinear optics and fundamental description of all the characterization techniques which have been used in the present thesis work. Chapter 3 describes about the growth of pure and Mg-doped LiNbO_3 bulk single crystals of different Mg concentration by Cz technique using resistive heating setup and their characterization by high resolution X-ray diffraction, UV-VIS-NIR, conoscopy, refractive index, thermal conductivity and various other optical parameters. Chapter 4 includes the discussion about the growth of photorefractive Ru doped LiNbO_3 single crystals by using RF assisted Cz method. The grown crystals were cut into two different pieces from top and bottom portions and analyzed through different characterization tools like inductively coupled plasma spectroscopy, high resolution X-ray diffraction, UV-VIS-NIR, FT-Raman, conoscopic and refractive index to estimate the concentration variation at different portion of the grown single crystals. Chapter 5 describes in details the influence of double dopant (Zr and Fe) on crystalline perfection, optical properties and thermal conductivity LiNbO_3 samples. Chapter 6 describes the growth of L-arginine phosphate monohydrate single crystal by SR growth technique and its characterization by various instrumentation techniques to validate its performance on device point of view. Chapter 7 explains about the design and fabrication of single walled and double walled growth ampoules and vertical Bridgman furnace for the growth of benzimidazole single crystal. The crystalline perfection and optical properties of the single and double walled ampoule grown crystals were compared with each other.