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Topic of the research: **Synthesis and Growth of Some Organic and Semiorganic Single Crystals for Nonlinear Optical Applications**

ABSTRACT

Chapter 1 covers history about crystal growth, various technique in crystal growth and in particular, with emphasis on solution growth method, brief introduction about the nonlinear optics, nonlinear optical materials and its various uses in present day technology such as in medicine, engineering, space science etc.

Chapter 2 will give a brief introduction about various characterization techniques with fundamental physics/chemistry behind them. Various characterization techniques used in the present study are: (i) Powder X-ray diffractometer (ii) High Resolution X-ray diffractometer (iii) Spectroscopic methods (FTIR, NMR, PL, and UV-Vis-NIR) (iv) Impedance analyzer (v) Vickers hardness tester equipped with a diamond square indenter (vi) Ion implantation is done by using low energy ion beam facility (LEIBF) at IUAC, New Delhi.

Chapter 3 discusses the effect of polymer coating on solution grown hygroscopic nonlinear optical single crystal of L-lysine monohydrochloride (LLMHCL). The bulk sized and fairly transparent LLMHCL single crystals are hygroscopic in nature. After a period of two months, due to its hygroscopic nature, the transparency is completely vanished and became opaque. The crystal is coated with poly methyl methacrylate (PMMA) polymer on the surface of L-lysine monohydrochloride single crystal by dip coating method. Then we have systematically studied the different properties of bare, polymer coated and hygroscopic LLMCHL single crystals.

Chapter 4 focuses on growth and characterization analyses of pure and p-nitroaniline doped L-lysine monohydrochloride (LLMHCL) monohydrate single crystal for nonlinear optical applications. Single crystal of pure and p-nitro aniline doped L-lysine monohydrochloride (LLMHCL) monohydrate were grown from the aqueous solution by slow evaporation solution growth technique at room temperature. The effects of p-nitroaniline doping on the L-lysine monohydrochloride crystal properties have been deliberated elaborately with help of different characterization technique.

Chapter 5 describes crystalline perfection, optical and third harmonic generation analyses of non-linear optical single crystal of L-lysine acetate. The single crystals have been grown by slow evaporation solution growth technique. The grown single crystals were subjected to different instrumentation technique in order to find its suitability for device fabrications.

Chapter 6 resolves on single crystal growth of Ninhydrin by unidirectional SR method by using glass ampoule for nonlinear optical applications. Its lattice dimension and functional groups were confirmed from powder X-ray diffraction and FTIR respectively. Laser damaged threshold, relative second harmonic generation (SHG) and phase matching were measured by using high intensity Nd: YAG laser as a source having the wavelength of 1064 nm. Its thermal stability has been assessed by TG/DTA and specific heat measurements with respect to different temperatures.

Chapter 7 emphasize on the effect of 100keV N^+ ion irradiation on organic single crystal of Hippuric acid (HA) for nonlinear optical applications. Single crystals of pure HA were irradiated at room temperature with 100 keV Nitrogen (N^+) ions affluence of 1×10^{16} and 5×10^{16} ions/cm². The pure and irradiated HA single crystals were characterized by different characterization technique.

Chapter 8 provides the summary of the work presented in the thesis and the scope for future work.

