Crystal growth involves a variety of research fields ranging from surface physics, crystallography and material science to condense matter physics. In the recent years, the organic single crystals of technological importance such as scintillator, semiconductor, nonlinear optical (NLO) and laser materials have received greatest attention and have formed the basis of new crystals. Photonics and laser related technologies need high quality single crystals. The researchers have prompted to search for the newer promising materials.

The thesis consists of seven chapters. The first chapter contains the introduction of the crystal growth, Bridgman technique, ampoule shape, review of melt growth of organic single crystals and the characterization techniques.

The second chapter discusses the construction of single zone transparent modified vertical Bridgman setup, growth of naphthalene and benzil single crystals. The naphthalene single crystals have been grown with three different types of single wall ampoules with various translation rates. The large size 20 mm diameter naphthalene single crystals were grown by the modified vertical Bridgman technique. The benzil single crystals have been grown using the single and double wall ampoules with the nano translation. The characterization studies of benzil crystals grown by both single and double wall ampoules were analyzed. The grown crystals are confirmed by X-ray diffraction studies and Fourier transform infrared (FTIR) studies. The crystalline perfection of the grown benzil crystals was analyzed by High resolution X-ray diffraction (HRXRD) studies. The optical property of the grown crystals was analyzed by the UV-vis spectral studies. The
photoluminescence (PL) studies reveal the grown benzil crystals have green emission. The thermal studies are used to identify the melting points of the grown crystals. The dielectric properties of the grown crystals were carried out using the conventional parallel plate capacitor method. The mechanical property of the grown naphthalene crystal was analyzed by the microhardness studies. The nonlinear optical property of the grown benzil was analyzed by the second harmonic generation (SHG) studies. The present study indicates that the benzil crystal grown with double wall ampoule is superior to that grown with the single wall ampoule.

The third chapter reveals the growth and characterization of organic material 4-nitrobenzaldehyde single crystal by the modified vertical Bridgman technique using the single wall ampoule with nano translation. The grown crystal was confirmed by single crystal XRD, powder XRD and FTIR. UV-vis-NIR studies show the cutoff wavelength is around 404 nm. The photoluminescence studies reveal the grown crystal has blue emission. The thermal studies show the grown crystal melts at 107°C. The dielectric studies were carried out using the conventional parallel plate capacitor method. The mechanical property shows the grown crystal is of the soft material category. The nonlinear optical property of the grown crystal was analyzed by the second harmonic generation studies.

The fourth chapter discusses the growth and characterization of organic material 3-hydroxybenzaldehyde (3HBA) single crystal by the modified vertical Bridgman technique using the single and double wall ampoules with the nano translation. Single crystal XRD reveals the grown crystal crystallizes the orthorhombic system with the non-centrosymmetric
space group Pna$_2$1. The powder XRD pattern was indexed. The functional
groups were confirmed by the FTIR analysis. The optical property of the
grown crystal was analyzed by UV-vis-NIR and photoluminescence (PL)
spectral measurements. Thermal behavior of the grown crystal was analyzed
by the thermogravimetric (TG) and the differential thermal analyses (DTA).
The dielectric studies were carried out using the conventional parallel plate
capacitor method with four different frequencies 1 kHz, 10 kHz, 100 kHz and
1 MHz using Agilent 4284A LCR meter at various temperatures ranging from
308 to 373 K. The SHG studies reveal that the efficiency of 3HBA is two
times higher than that of KDP.

The fifth chapter discusses the growth and characterization of the
organic material 2-hydroxypyridine single crystal by the modified vertical
Bridgman technique using the double wall ampoule with nano translation.
The large size good transparent 2-hydroxypyridine single crystal (15 mm
diameter and 80 mm length) was obtained with the translation rate 0.01 mm/h.
The grown crystal was conformed by the single crystal XRD, powder XRD
and FTIR. The HRXRD studies indicate the crystalline perfection was
reasonably good. The optical property of the grown crystal was analyzed by
UV-vis-NIR and photoluminescence spectral measurements. The thermal
characteristics of the grown crystal were analyzed by thermogravimetric and
differential thermal analyses. The dielectric measurements were carried out
with four different frequencies and the results indicate an increase in dielectric
and conductivity parameters with the increase of temperature at all
frequencies. The second harmonic generation (SHG) studies were used to
analyze the nonlinear optical property of the grown crystal.
The sixth chapter discusses the growth and characterization of the organic materials 2-methylamino-5-chlorobenzophenone (MACB) and 2-hydroxy-4-methoxybenzophenone single crystals by the modified vertical bridgman technique using the single and double wall ampoules with the nano translation. The grown crystals were conformed by the single crystal XRD, powder XRD and the FTIR studies. The HRXRD studies reveal that the crystalline perfection of the grown crystals was reasonably good. The optical property of the grown crystals was analyzed by UV-vis-NIR studies. The photoluminescence studies show the grown MACB crystal has green emission. The thermal property of the grown crystals can be analyzed by using the thermogravimetric and differential thermal analyses. The microhardness studies show that the grown crystals are of soft material category. The results of dielectric measurements indicates that dielectric constant ($\varepsilon_r$), dielectric loss (tan $\delta$) and AC conductivity ($\sigma_{ac}$) increase with the increase of temperature which can be understood as due to the temperature variation of polarizability. In addition, the results obtained in the present study indicate that the grown MACB and 2-hydroxy-4-methoxybenzophenone single crystals are promising low $\varepsilon_r$ value dielectric materials, expected to be useful in the microelectronics industry.

The seventh chapter represents the summary of the present investigation and gives the suggestion for the future work. The results of the findings have been published in the International journals and conferences.