ISSN: 2278 – 1323
International Journal of Advanced Research in Computer Engineering & Technology
Volume 1, Issue 4, June 2012

Behavior of mixture of Sulfamic Acid and Sodium Chloride

Dr. Rita A. Gharde[1]*, Divakar T. Chunarkar [1],

Department of Physics, Mumbai University, Kalina (Santacruz), Mumbai – 400 008. (India)

E-mail ID: gharde.rita@gmail.com, divakar.chunarkar@rediffmail.com

Abstract:-

A mono crystal known as single crystal of sulfamic acid (H_2NSO_3H) and sodium chloride (NaCl) is an inorganic non-linear optical material was grown by slow evaporation solution growth technique. In this work, we are interested in growing single crystal for non-linear optical application. Beside this, we are trying to develop new material that, have specific thermo mechanical properties to be used as a suspension for the mirror in advanced gravitational waves detector in order to decrease low thermal noise. Crystallization may be carried out from a vapor, from a melt or from a solution.

Nucleation and crystal growth are two important steps involved in the synthesis of any material. The present study discuss how the nucleation and crystal growth rates can be modified by the changing experimental parameter like starting regent, solvent, temperature, pressure etc. Mainly focus on the recent progress in the synthesis, properties, modification and application of crystal growth material as whole with special emphasis. A variety of material in the big size dimension has been synthesis and are characterized [1].

Crystal growth technology can be used gainfully to enhance biotechnology development, has been fabricated and tested with a variety of optical, electrical, magnetic or dielectric properties, present study doping of sulfamic acid and sodium chloride were prepared by unidirectional crystal and the influence of the compound on structure, quality and optical properties were investigated. FTIR and X-Ray diffraction and dielectric study analyses a revealed the diffraction pattern for sulfamic acid and sodium chloride crystal have almost the same set of peaks [2]. Our study also found that good quality crystal growth material can only be obtained into doping range this were suggest a new approach for using material for the crystal growth material. It is found that the dielectric constant of the material is enhanced due to doping of Sodium Chloride so Sulfamic Acid. This can be used in many application. For example. Azo dyes Industries, Influent water Treatment Plant, Swimming pool and material strength increasing in dyes etc [3]. Crystallization is important as an industrial process because of the material that are and can be marketed in the form of crystals.

Key Words :–Growth from solution, X-ray diffraction, FTIR, nonlinear optical material, Melting Point, pH scale and Dielectric studies etc.

Introduction :-

Crystallization is an important and industrial process because of the number of martial can be marketed in the form of crystals. Its wide use is probably due to the highly purified and attractive form of a chemical solid, which can be obtained from relatively impure solution in a single processing step .The shape of the particle involve the stacking of atom in cretin sequence direction [4]. The atomic arrangements are govern by the inter atomic course and chemical bonds. With growth in size, the crystalline order starts appearing and ultimately result in chunks of In a particle, the ratio of number of atom, on the surface to the total number of atom is matter exhibiting solid like properties inversely

proportional to the particle size. Crystalline material exhibits grain structure feature, which differ from those shown by bulk solid. The stability of the crystals and the value of the equilibrium lattice parameter are controlled by balance between short range repulsive forces and long range coulomb forces. The later forces are comparatively more affected by the crystal size changes depending on the size the particle. As a result the physical properties such as magnetic, Ferro electricity and super conductivity of materials are expected to be effected [5]. In conventional slow solvent evaporation growth, all crystal bounded by planner habit faces contain separate region common to each fact having their own sharply defined growth direction known as growth sector.

The boundaries between these growth sector are more strain than the extended growth sector due to mismatch of the lattice on either side of the boundary are result of preferential incorporation impurities into the lateral section. Further, in solution growth method many of the commonly observed, characteristic growth induced defect structure comprising growth the sector and boundaries, growth bounding, solvent inclusion, dislocation and staking faults can be attributed to impurities. Single crystal are free form internal boundaries. They give rise to characteristic x-ray diffraction pattern. A single crystal can be as big as few centimeter or it may be as small as fraction as a centimeter such that its feature can not be seen by necked eye. Such crystal is called mono crystal. It is known that the demotion of the typical unit cell is high into 5X $10^{-8cm.}$ Hence even if mono crystal has 10^4 unit cell, it size will be 5 x 10^{-4} cm which can be seen the necked eye), Following factor to grow crystal form solution [6].

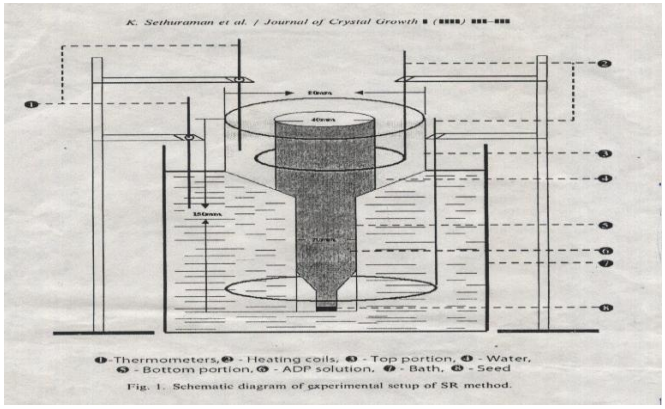
1) A good solubility for the given solute.
2) A good temperature coalition of solute solubility
3) Less viscosity
4) Less volatility.
5) Less corrosion and non toxicity.
6) Small vapor pressure.
7) Cost advantage.

Preparing single crystal is a solid throughout which the atoms or molecule are arranged in a regularly repairing pattern [8].

Experimental Set up :

As shown in fig.1 the schematic diagram of the experimental set up is shown in fig. It consist of a growth ampoule made out of glass with seed mounting pad. An outer glass shield tube protect and holds the inner growth ampoule. A ring heater positioned at the top of the growth ampoule was connected to the temperature controller and it provides the necessary temperature for solvent evaporation. The temperature around the growth ampoule was selected based on the solvent used and was controlled with the aid of the temperature controller. Depending on the growth rate of the crystal, the ring heater was the moved down using a translation mechanism [7].

Fig.1 Experiment set up mixture sample

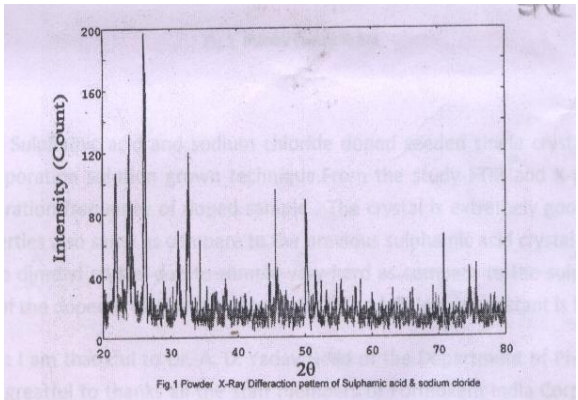


Charechtarisation:-

X-ray Diffraction Analysis :-

Powder x ray diffraction spectrum of a grown crystal has been recovered on SIEFERT X-ray diffracto meter. The sample was scanned for 30 range 20 to 80^0C and at a scan rate 3mm per min. The X-ray diffraction spectrum shown in fig.1. The powder XRD was taken and compared SADA data [8]. The cut and polish wafer, fabricated out of the grown doping single crystal was subjected to x-ray diffraction spectrum were analyzed and indexed using the XRD

instrument, software package and the data obtained by the powder XRD analysis are in accordance with the single crystal XRD data. The calculated plans satisfy the general reflection condition of space group observed form the structure determination of the crystal. In previous study the single crystal XRD reveals that the Sulfamic Acid crystal belongs to orthorhombic structure. From this spectrum proved to be highly useful in determining structure and dimension of crystal as well as in the study of number of properties of x-ray is same as like a previous sulfamic acid sample the value of 0 for the first order reflection form the three faces of doping crystal are found [7]. We conclude that there is not much change in the molecular structure of sulfamic acid due to doping of sodium chloride. As shown in fig.2. Powder X-ray diffraction pattern of mixture sample

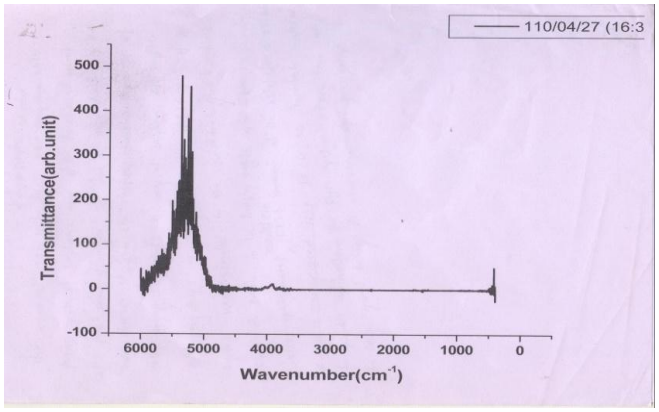


Point:- We studied the melting point of grown dopping crystal b

FTIR :-

The recorded FTIR spectra of doped sample as shown in fig.3 were compared with the previous spectra of sulfamic acid of the functional group. The pick around 5200 cm^{-1} is due to N-H stretching and the bond observe at 3900 cm^{-1} arises symmetric abrasion of NH_3 group of both.

Fig.3. FTIR Spectrum of mixture sample



The range of slpfamic acid sample and doping sample is nearly same. The FTIR spectra of the crystal were recorded in the sulfamic acid and doping sample in the frequency range 400 to 6000 cm^{-1} using Jusco spectro meter model 610 FTIR at the resolution of 490 arb. It is an important material for possible application the single crystal FTIR show that, the doping crystal belongs to Centro symmetric space group [9].

Melting Point :-

We studied the melting point of grown doping crystal by capillary melting method. Crush doped crystal sample and filled in the capillary tube and measure the melting point with the help of the help of the melting point instrument. We found that it gives higher heat energy as compared to sulfamic acid single crystal. Such type of material are used in the photo electric effect.

PH Scale :-

The solution are acidic or alkaline depend upon the two ions is present grater concentration than the other [10]. The doping crystal is an acidic medium and its pH value of preparing 1% solution is 1.82 by using model CL – 46 SR. No. 4944, power 230 V ac pH meter about 31^0C normal temperature. In this doping crystal we found that, Na being highly electro positive removes H_2 atom from sulfamic acid and form Na salt of Sulfamic acid. Hence no effect on the crystal. Due to Na^+ is more electropositive then H^+ and hence doping sample formed is more

hard and with high melting than previous crystal. It is found that doped single crystal are more clear than the single crystal of sulfamic acid form that we can predicted that due to doping. The Impurity inside the crystal is less reduce without change.

Dielectric Studies :-

The mixture single crystal crushed in the powder form, there are no any shape and size. Such type of crushed material filled in the assemble of dielectric instrument and found the capacitance with help of multi meter. The precaution must be taken that the air do not pass through the copper plate therefore to used the rubber ban packed with fevi quick. The doping material with high dielectric constant vales are quite good can be used in tunneling devices, insulator, fabricated capacitance and in other electric field

Result at a glance:-

Sulfamic acid and sodium chloride doped unidirectional seeded single crystal was successfully grown by slow evaporation solution grown technique. From the study x-ray diffraction, FTIR it is confirm that vibration frequency of doped sample. The crystal is extremely good of orthorhombic structure and properties also same as compare to the previous crystal [10]. But hardness are more as compared to sulfamic acid single crystal and clarity is also very high as like as a diamond crystal than this single crystal [11]. The melting point of the doped crystal is found to be 211^0C to 218^0 and dielectric constant to be 31088. This type of material used in the azo dyes industries strength increase the strength of materials.

Acknoledgement :-

I am thankful to Dr. D. C. Kothari Head of the Department of Physics, University of Mumbai. I am grateful to thanks Archana and Vrushali mam and I am also extreamly greatful to Mam. Ranjana B. Patil Principal, Pravin patil Engg. and Tech.College, and thankful to all Staff member of Formokem India Corporation Kashigaon Branch.

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Divakar T. Chunarkar [M.Sc.-Physics]
Department. Of Physics Kalina (Santacruz)
Mumbai University Mumbai india-4000098.

Dr. Rita A. Gharde [M.Sc. PH.D.]
Assi. Pro. Of Physics
Depart. Of Physics
Mumbai University Mumbai (Santacruz)
India-4000098.