

VSM COLLEGE(A) RAMACHANDRAPURAM

NAAC Re-accredited with 'B' Grade at 2.69 CGPA

(Affiliated to ADIKAVI NANNAYYA UNIVERSITY, RAJAMAHENDRAVARAM)



RESEARCH IN PHYSICS DEPARTMENT

Physics Department in our college was established in the year 1966. Presently we are offering Physics to 1000 UG and 30 PG students. We have well equipped five spacious Physics labs. We arrange field trips to the students to motivate them towards research. We also offer certificate course “Electrical wiring”. Our department also offers Inter-disciplinary courses like Physics in Daily Life to non-physics students and Fundamentals of Nano Technology to Physics students. Recently we have organized a National level Conference on “Recent Trends in Advanced Materials and Characterization” RTAMC 2020 during January 2020 and also we have published a special issue of a UGC care listed journal namely “Journal of Information and computational Sciences” with twenty two conference research papers submitted by the participants. This conference was very successful with eminent scientists and researchers from all over India like Prof. Shankarnarayanan (Inventor of SR Crystal Growth Method) and Prof. Ravi from Maduari Kamaraj University Dr Ashok Kumar from NPL, New Delhi

Prof. G. Bhagavannarayana, former chief scientist of NPL CSIR Labs, New Delhi is presently working for our College in Physics department. Under his able guidance, we have recently established Crystal Growth laboratory in our college using cost effective methods like: (i) Slow Evaporation Solution Technique (SEST), (ii) Temperature Lowering with Seed Rotation (TLRS) technique and Sankaranarayanan-Ramasamy (SR) method. The below are the particulars of the crystals grown in our Research Lab.

4-Chloro 3-Nitrobenzophenone Single crystal grown in SEST method

Single crystals of a novel organic material, 4-Chloro-3-Nitrobenzophenone (4C3N) were grown from acetone solution employing the technique of controlled evaporation. 4C3N belongs to the Orthorhombic system.



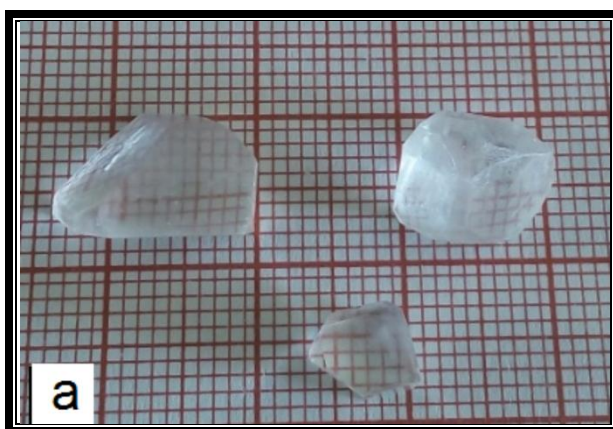
Crystal growth of 4C3N is purified by recrystallization, several times in acetone. For crystal growth of organic materials, purification of starting material has been found to be an important step. 4C3N is A novel organic optical crystal, 4-chloro-3-nitrobenzophenone soluble in acetone, ethanol and methanol. Selection of suitable solvents is very definitive for the growth of good quality single crystals. Acetone is a good solvent for growth of 4C3N. The 4C3N crystals were grown from saturated solution at room temperature by controlled evaporation technique.

ZTS (tris- Thiourea Zinc II sulphate) in SEST method

Good quality of zinc sulphate heptahydrate [$\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$] and thiourea [$\text{CS}(\text{NH}_2)_2$] were chosen to prepare pure ZTS (PZTS) in 1:3 stoichiometric ratio in aqueous medium. The prepared solution was stirred using a magnetic stirrer at 350 rpm and at room temperature for six hours to prepare a homogeneous solution. For purification, the solution was filtered with a whattman filter paper ($\sim 100 \mu\text{m}$) to remove any impurities and also recrystallised the compound for two times. The chemical reaction of the above said compounds follows as



The prepared saturated solution of ZTS was kept for slow evaporation, after stirring for a few hours, in a beaker which was covered with a thin polythene sheet with only a few pin holes to control the evaporation process.



ZTS (tris- Thiourea Zinc II sulphate) crystals grown in SEST method

8-hydroxyquinolinium succinate (8-HQSU)

8-hydroxyquinolinium succinate (8-HQSU) has been synthesized and single crystals were grown from ethanol solvent by employing the technique of slow evaporation at room temperature. The title compound was synthesized by dissolving equimolar ratio of commercially available AR grade 8-hydroxyquinoline (Merck) in ethanol solution and succinic acid (SRL) in the aqueous solution. The solution was prepared by continuous stirring for two hours at the room temperature and then filtered in a clean vessel. Then the prepared solution was covered by the perforated polythene paper to control the fast evaporation of the solvent and kept for slow evaporation. The crystalline substances were obtained from the solution within a week.

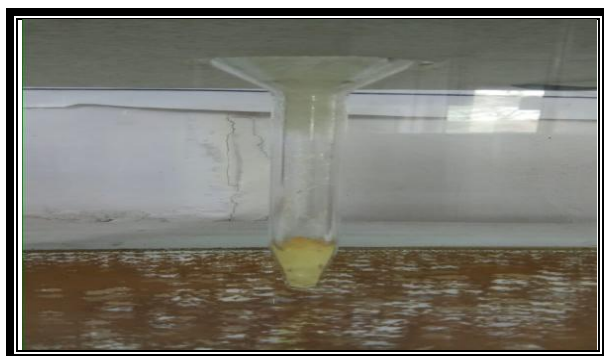
L-arginine phosphate monohydrate single crystals

L-arginine phosphate monohydrate has been synthesized from the strongly base amino acid, L-arginine and ortho-phosphoric acid as per the following reaction:

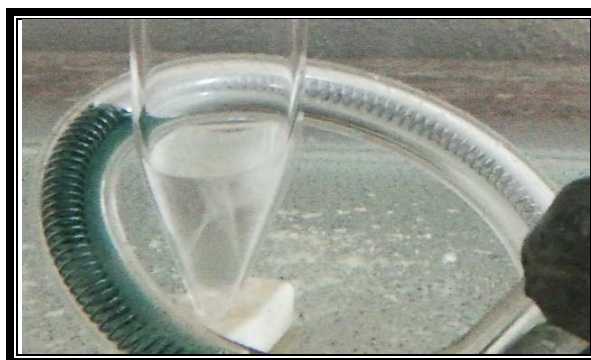


L-arginine (98%) and ortho-phosphoric acid (95%) have been taken in equimolar ratio and dissolved in excess double distilled Millipore water (resistivity of 18.3 MU cm) as per the above reaction. The starting material has been prepared by evaporating excess water to almost dryness at room temperature. It has been then purified by recrystallization process.

Crystals successfully grown in Sankar Narayana Ramaswamy method



4C3N crystals in SR method



ZTS (tris- Thiourea Zinc II sulphate) crystals grown in SR method

In **SR method** the growth is performed at a constant temperature with long range stability. The growth conditions were closely monitored and within two days, slight dissolution is observed at the surface of the seed crystal. The size of the seed crystal started increasing within five days.