Executive Summary of the work done on the Minor Research Project	
UGC Reference No	MRP(S)-0142/12-13/KAMA002/UGC-SWRO KAMA 002
Title of Research Project	**Study of Growth of Amino Acid based crystals for NLO applications**
a) Name of the Principal Investigator	Dr Narayan Bhat M
b) Dept and University where the work progressed	Physics Department, St Aloysius college, Mangalore

Non-linear optics is the study of the interactions of light with matter under conditions in which the non-linear response of the atoms plays an important role. Developments in the field of non-linear optics hold promise for important applications in optical information processing, telecommunications and integrated optics.

One of the most intensively studied nonlinear optical phenomenon is second harmonic generation. Second Harmonic Generation (SHG) is a nonlinear optical process that results in the conversion of an input optical wave into an output wave of twice the input frequency. Such frequency doubling processes are commonly used to produce green light (532 nm) from, an Nd:YAG (Yttrium-Aluminium-Garnet) laser operating at 1064 nm

Amino acids are the major building blocks of all forms of life. Most of the amino acids crystallize in non-centrosymmetric space groups and are good candidates for nonlinear optical applications. In order to use amino acids in these applications, it is necessary to grow the bulk crystals of amino acids. Although growth of bulk crystals of most of the amino acids is reported in the literature, no work has been reported on the growth of bulk crystals of L-Arginine. It is surprising to see that even the structure of L-Arginine was reported only in 2012 [1]

Basic Requirements

The basic requirement for the growth bulk crystals of any organic or inorganic material is the selection of a suitable solvent. .The solubility of L-Arginine is determined

in various solvents. This is likely to result in the more focused work on the growth of bulk crystals of L-Arginine by solvent evaporation technique.

Methodology

A simple method was adopted for the determination of solubility. In this method, Predetermined quantity of Commercially available L-Arginine L-Arginine was taken in a test tube immersed in a water bath maintained at constant temperature. Double distilled water was added drop wise from a burette to this test tube while shaking the test tube continuously. The addition of the solvent was continued till the entire amount of the L-Arginine is completely dissolved.. The solubility was evaluated by measuring the amount of solvent required to dissolve the given amount of L_Arginine completely. The same procedure was repeated by maintaining the water bath at different temperatures in the range between 30°C-55°C.

Observations

It was found that the solubility of L-Arginine in water is greater than that in the other mixed solvents. Moreover the solubility is least in the mixture of water and propanol. However in both the cases the solubility was found to increase with temperature. It was observed that solubility of L-Arginine shows a drastic increase the solubility around 50°C to 55°C range in the mixture of water and methanol/propanol mixed in the ratio 1:1.

The observations are in agreement with the fact that amino acids are normally soluble in polar solvents and less soluble in non-polar solvents. From the observations it can be concluded that it bulk crystals of L Arginine can be grown either in distilled water or 1:1 mixture of distilled water and ethanol as the solvent. The temperature range of 30°C-40°C is favourable for the bulk single crystals and hence crystal growth by slow cooling in this temperature range could be attempted.