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GROWTH AND CHARACTERIZATION OF L- ALANINE AND AMMONIUM DI HYDROGEN PHOSPHATE BY SLOW EVAPORATION METHOD

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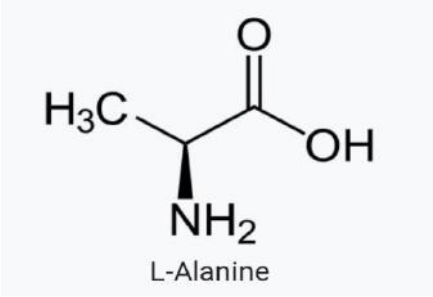
Abstract: *L-Alanine doped ammonium dihydrogen phosphate crystals were grown from aqueous solutions by natural evaporation process. The grown crystals are characterized by Fourier Transform Infrared spectroscopy, UV-visible spectroscopy. The optical transparency is found to increase with the increase of doping concentration in the grown crystals and band gap energies of all crystals have been calculated at their cut off frequencies. It is found that the optical band gap increases with doping concentrations. Hardness was found from the Vicker's micro hardness measurement.*

Key Words: *Amino Acid, Solution Growth, Decomposition, Electrical Conductivity, Optical Transmission.*

1. INTRODUCTION OF L-ALANINE:

Alanine was first synthesized in 1850 by Adolph Srrecker. The amino acid was named Alanine in German, in reference to aldehyde, with the infix and for ease of pronunciation, the German ending used in chemical compounds.
Alanine is an α-amino acid that is used in the biosynthesis of proteins. It contains a d-amino group, a-carboxylic acid group and aside chain methyl group, making it a nonpolar, aliphatic amino acid. Itis non-essential in humans: because the body can synthesize it, it does not need to be present in the diet. It is one of the 20 amino acids encoded by the human genetic code, and is encoded b all co dons starting with GC, namely GCU, GCC, GCA and GCG.
The L-isomer of Alanine is ne one that is incorporated into proteins. L-Alanine is second only to Lucien in rate of occurrence, accounting for 7.8% of the primary structure in a sample of 1,150 proteins. The right – handed form, D-Alanine occurs in polypeptides in some bacterial cell walls and in some peptide antibiotics and occurs in the tissues of many crustaceans.

2. STRUCTURE OF L-ALANINE:



L-Alanine

Alanine is an aliphatic amino acid, because the Side-chain connected to the α-carbon atom is a methyl group (-cH_3), making it the simplest α -amino acid except for glycine. The methyl side-chain of Alanine is non-reactive and is therefore hardly ever directly involved in protein function. Because L-Alanine side-chain cannot be phosporylation. Some techniques involve creating a library of genes.

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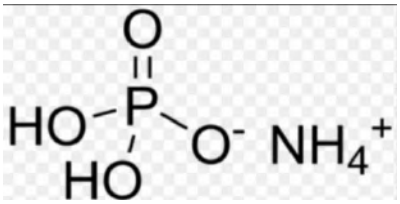
3. PROPERTIES OF L-ALANINE:

Chemical formula	$C_3H_7NO_2$
Molar mass	89.09g.mol^{-1}
Appearance	White powder
Density	1.424g/cm^3
Melting point	258 °c (496 °F; 531k) (sublimes)
Solubility in water	167.2g/L(25°C)
Acidity(pK_a)	2.35(carboxyl),9.69(amino)
Thermodynamic data	Phase behavior solid–liquid gas
Magnetic susceptibility	-50.5.10^{-6}cm^3/mole

INTRODUCTION OF AMMONIUM DIHYDROGEN PHOSPHATE

Ammonium di hydrogen phosphate can be made by reacting ammonium bicarbonate or ammonium carbonate with phosphoric acid. Ammonium dihydrogen phosphate is commonly called mono ammonium phosphate is a chemical compound with the formula NH_6 PO_4.It is a white crystalline solid consisting of ammonium cautions $[NH_4]^+$ and dihydrogen phosphate anions $[_{H2PO4]^-}$ in equal proportions.

AMMONIUM DIHYDROGEN PHOSPHATE STRUCTURE



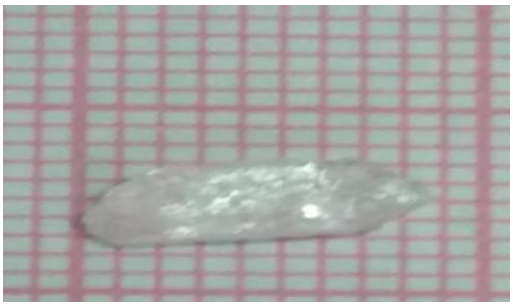
OTHER NAME : mono ammonium phosphate

4. PROPERTIES OF AMMONIUM DI HYDROGEN PHOSHPATE :

Chemical formula	H_6NO_4P
Molar mass	115.03g/mol
Appearance	White crystalline powder
Density	1.8g/cm^3
Melting point	190°C(374°F;463K)
Solubility in water	g/dL28(10°C) 36(20°C)
Solubility	Insoluble in ethanol, acetone
Odor	None

EXPERIMENTALTECHNIQUES

The present work is growth of common L-Alanine and ammonium di-hydrogen phosphate single crystals.



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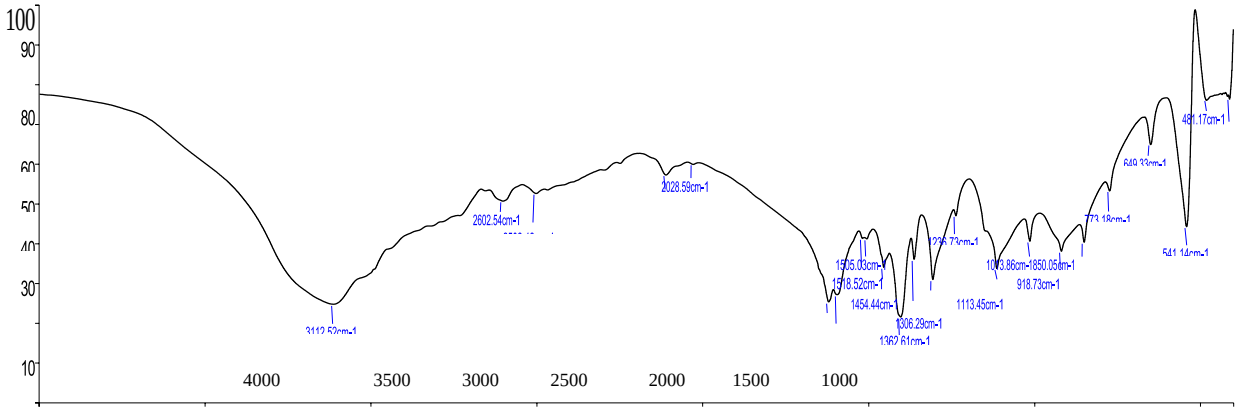
SYNTHESIS AND CRYSTAL GROWTH

L-Alanine and ammonium dihydrogen phosphate crystals were grown by the solution method with a slow solvent evaporation technique at room temperature (303K). In accordance with solubility data saturated solutions of the synthesized salt of L- Alanine and ammonium dihydrogen phosphate (1:1) separately. The solutions were continuously stirred for about 3 hours using magnetic stirrer and the solutions were filtered by micro filter papers. Then the filtered solutions were kept in borosil beakers covered with porous papers and kept in a dust-free atmosphere. The crystals were harvested after a period of about 25 days. The grown crystals are presented in figure.

5. RESULTS AND DISCUSSION :

FTIR ANALYSIS OF L ALANINE AND AMMONIUM DIHYDROGEN PHOSPHATE:

Characterization of grown sample is complete with the chemical composition analysis. Fourier transforms infrared absorption spectrum of L Alanine and ammonium di hydrogen phosphate is recorded in the range of 1100cm^{-1}to 200cm^{-1}. LA: ADHP are assigned sand recorded in the table.



IR-SG01-
Name Description

The following table reveals the absorption peaks corresponding to L Alanine and Ammonium Dihydrogen Phosphate.

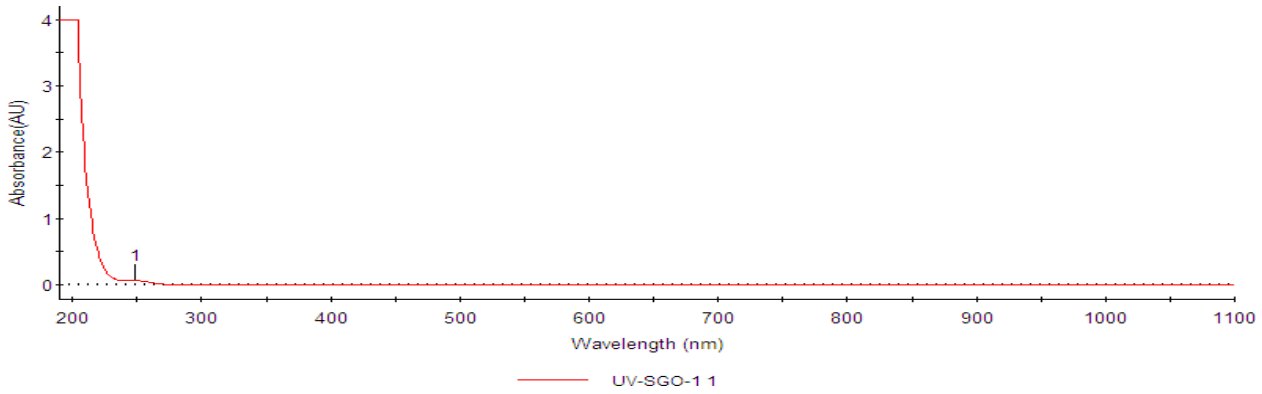
FREQUENCY	ASSIGNMENT RANK
3112.52	O-H STRETCHING
2602.54	**C**-H STRETCHING
2110.95	**C**≡STRETCHING
2028.59	**N**≡**N**≡**N** STRETCHING
1620.29	**C**=**C** STRETCHING
1518.52	N-O STRETCHING
1505.02	N-O STRETCHING
1402.05	C=O STRETCHING
1302.61	O-H BENDING
1206.29	C-O STRETCHING
850.05	C-Cl STRETCHING
773.18	**C**-H BENDING
649.22	**C**-Br STRETCHING
541.14	**C**-L STRETCHING

UV VISIBLE SPECTRAL ANALYSIS OF L ALANINE AND AMMONIUM DIHYDROGEN PHOSPHATE:

In crystalline material the region of transparency of electromagnetic radiation defines the intrinsic loss mechanism and also theoretical transmittance achievable within region. Transmission spectra are also very important for any optical material because it can be practical use only if it has wide transparency window in the visible region.

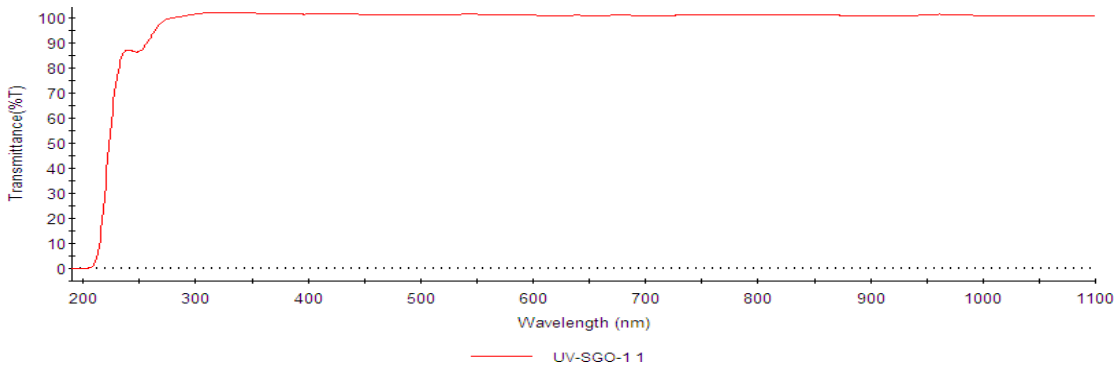
The UV and Visible spectrum gives limited information about the structure of the molecule because the absorption of UV and visible light involves promotion of the electron in σ and μ orbital from the ground state to higher energy states. To find the transmission range of the grown crystals, the optical transparency of the grown crystals were analyzed by taking the UV –Visible spectra using Lamda -35 spectrometer between 200nm to 1100nm. Ultra violet< 400μm, violet 430-450 μm, blue 500-550μm, orange 590-590 μm, red 620-769μm, infrared >760 μm.

ABSORPTION UV SPECTRUM OF L ALANINE AND AMMONIUM DI HYDROGEN PHOSPHATE



Name	No	Peak(nm)
SGO-1	1	247.6

TRANSMISSION UV SPECTRUM OF L ALANINE AND AMMONIUM DIHYDROGN PHOSPHATE



Name	No	Peak(nm)
UV-SGO-1	1	247.00

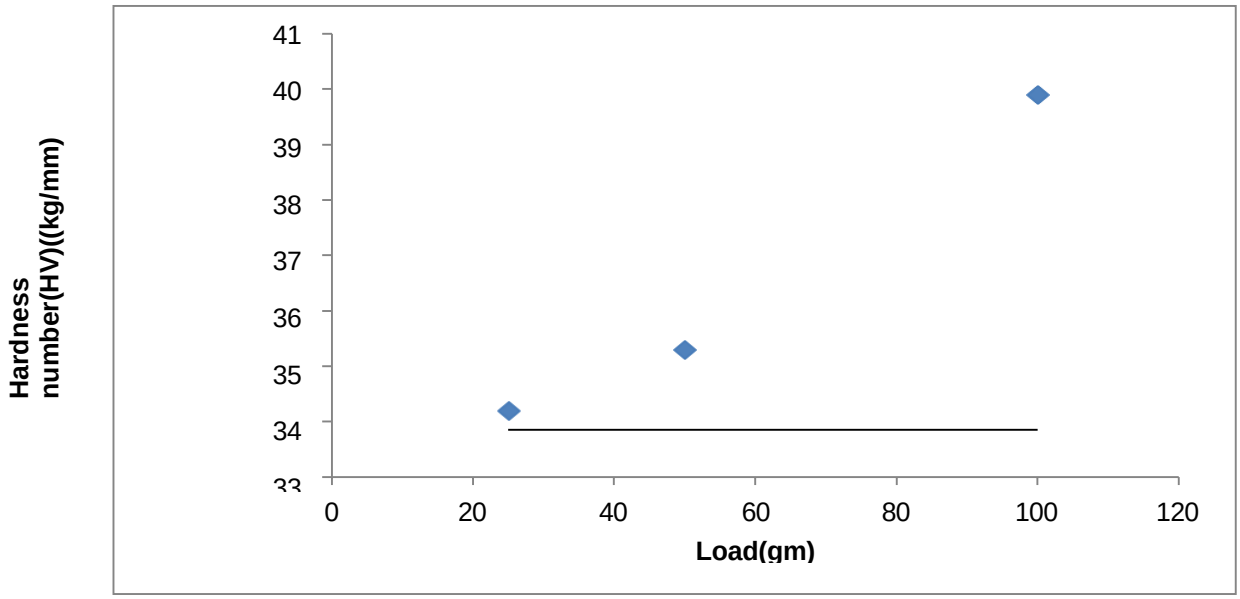
MICRO HARDNESS STUDIES:

The mechanical properties of the grown L Alanine with ammonium Dihydrogen phosphate crystals have been studied with the smooth surfaces of the mixed crystals selected smooth surfaces of the crystals were subjected to static indentation at room attached to an incident light microscope was used in the present work. Loads of magnitude varying from 25gm to 100gm is applied for a fixed interval of time over a well polished grown crystal. The Vickers's micro hardness number Hv is calculated using the relation,

$H_V=1.8544P/d^2$

Where p is the applied load in kg and d is the average diagonal length of the indentation in mm. a graph is plotted between Hardness number (Hv) and applied load (P).

A graph was plotted between hardness number (HV) and applied load (p) in a gram as shown in figure. We clearly seen that hardness values of L Alanine with ammonium Dihydrogen phosphate was increase with increase the load and similarly findings were observed in L Alanine with ammonium di hydrogen phosphate crystal this result are listed in table.



The following table reveals that the hardness peaks correspond to L Alanine with Ammonium Di hydrogen phosphate.

Load(gm)	Hardness number (HV)(kg/mm)
57.86	11.7
77.84	13.2
105.25	15.9

6. CONCLUSION :

L-Alanine Ammonium Di hydrogen phosphate crystal was grown by a slow evaporation solution grown technique at room temperature with good optical quality.

Vibrational frequencies were assigned from FTIR spectral analysis which confirm the presence of the LAADP crystal.

Optical transparency of the crystal analyzed from UV- VIS NIR spectrum. It was observed that the crystal is transparent in the entire visible region.

Micro hardness measurement implies that the pure and doped crystal come under the soft materials category. The vibration of Vicker's micro hardness of the crystal increases on increase the load.

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