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ELECTRICAL AND OPTICAL PROPERTIES OF COPPER TARTRATE CRYSTAL

Dr. C. Balalakshmi* J Mani

[1]*Department of Nanoscience and Technology Alagappa University, Karaikudi Tamil Nadu, (India)*

[2]*Department Of Nuclear Physics, University Of Madras, Chennai, Tamil Nadu (India)*

ABSTRACT

In this study, we investigated the electrical and optical properties of *copper tartrate. Sample was prepared and grown by gel growth using chemical reaction method. The UV-VIS and Photoluminescence spectroscopic experimental techniques for Copper Tartrate crystal were examined. The band gap energy is found to be 5.48eV. The UV-VIS transmission spectrum of Copper Tartrate exhibits high absorption about 210nm which is in the ultra-violet region and can be adopted as UV filters.*

Keywords: Photoluminescence, Gel growth, copper tartrate, UV-VIS,

I INTRODUCTION

Applications of derivatives of tartaric compounds attracted the researchers due to the practical applications in various fields like Sensors, Lasers, Optical filters, Non-linear optics and exhibits properties such as dielectric, ferroelectric[1-4]. Due to insolubility and decomposition during the process of evaporation and melting, we implemented the gel growth technique for preparing the for Copper Tartrate crystal[5-8]. In this study we mainly focus on the Photoluminescence and UV-Visible.

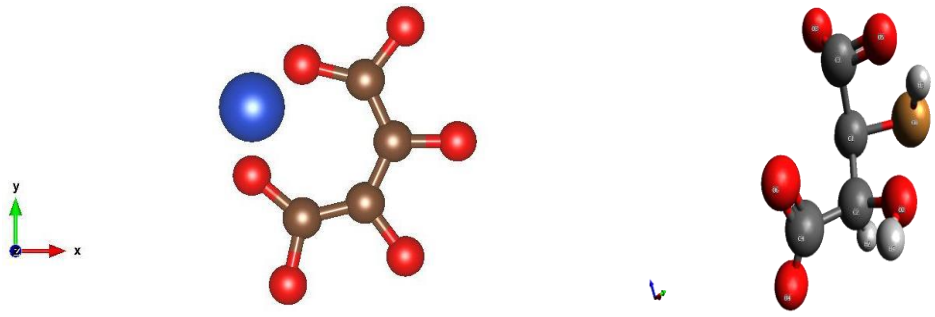

Figure 1: Structure of Copper Tartrate crystal

1.1 Material Preparation and Experimental Procedure

The growth of copper tartrate crystal by gel growth technique with borosilicate glass tubes of length 20cm and diameter 2.5cm placed vertically on a wooden stand[13]. Gel was prepared by adding a solution of sodium meta silicate ($Na_2SiO_3 \cdot 9H_2O$) to tartaric acid slowly with continuous stirring. pH value was set to 4.0 and adding 1M

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solution of tartric acid with density 1.04 g/cm3 specific gravity[10]. To avoid the contamination due to exposure test tubes were sealed and time of settling down was strongly on the pre set value of pH. Once gel was settled aqueous solution of copper sulphate was carefully handled and poured [9,14]. The expected reaction is followed by

$CuSO4.nH2O+H2C4H4O6 \longrightarrow CuC4H4O6.mH2O+H2SO4+(n-m)H2O$ Where,$n \geq m$

The reaction between the ions is exchanged between Cu^{2+} ions and $C4H4O6^{2-}$ ions through the narrow pores of silica gel with process called diffusion. The above reaction results in the formation of CuC4H4O6 .mH2O (copper tartrate crystal)[11,13].

1.2 Characterization

The grown Copper tartrate by gel growth method has been characterized UV-VIS and Photoluminescence**.** The UV-Visible absorption spectrum was recorded using UV-visible SPECORD spectrophotometer in the spectral range 200 to 900nm.

UV-Visible:

The UV-Visible absorption spectrum of Copper tartrate was carried out and recorded in the UV-Vis. It shows that the copper tartrate have high absorption in the ultra-violet region of the spectrum at about 210nm. Based on the absorption range the chosen sample is good for UV absorbers/filters. There is prominent region from the wide range spectrum which is suitable optoelectronic applications. The energy gap has been deduced as 5.48eV.

Photoluminescence:

The photoluminescence spectrum of Copper tartrate was carried out and recorded in the excitation wavelength of 250nm at room temperature. The observed photoluminescence spectrum consists of two bands one sharp peak with high intensity is at 508.6nm and other one is small peak at 764.7nm

Crystal	**λ (nm)**	**Band gap Energy (eV)**
Copper Tartrate crystal	210	5.48eV

Table 1: Band gap energy Copper Tartrate crystal

II CONCLUSIONS

The high absorption in the ultra-violet region at about 210nm makes the material is good for UV absorbers/filters and the wide transmission in the entire visible region enables it suitable candidate for optoelectronic applications. The observed photoluminescence spectrum comprises two bands of which one is at 508.6nm and other one is small peak at 764.7nm.

Future scope: Theoretical calculation using first principle study can be done and verify the band gap studies.

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