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Study of the surface morphology of copper doped barium tartarate crystals

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ABSTRACT

Cupper doped Barium Tartarate crystals have been prepared by single gel method. Surface morphology of materials was studied by scanning electron microscopy [SEM) and dispersive analysis of X-ray [EDAX). SEM shows grown crystals are triangular in shape & broad at the border like structure of the grown crystals and not affected significantly by the doping. The incorporation of Copper in the Barium Tartarate crystals well confirmed by EDAX.

Keywords: gel technique, SEM, EDAX.

INTRODUCTION

Crystals habit of various crystals grown under different conditions and also different technique where described by Buckley [1], Hartman [2], kern [3], chernor [4], Burton [5]. Number of factors such as degree of saturation, type of solvent [6] pH of the gel media [7] presence of impurities [8] the in growth temperature also presumably affect significantly the morphology of the crystal [9].

MATERIALS AND MEHTODS

To grow the cupper doped $BaC_4H_4O_6$ crystals, the required silica gel medium was prepared by adding the Sodium meta silicate solution of specific gravity 1.05 gm/cc drop by with constant stirring by using magnetic stirrer into the Acetic Acid and adding to the above Sodium meta silicate solution drop by drop of pH 4.3. Aqueous solution of 0.1m $BaCl_2$ and 0.1 m $CuCl_2$ were added as inner reagent with constant stirring at 10 minutes [10, 11]. This mixture was then transferred to the test tube of having length 15cm & diameter of 2.5 cm. The mouth of tube is covered by cotton plug & kept for setting. After setting the gel supernatant Tartaric Acid $C_4H_6O_6$ of 1M concentrate was poured over the set gel by using pipette & kept undisturbed by covering cotton plug on the mouth of tube. Due to the diffusion of the outer into reagent the gel medium &its reaction with the inner reagent crystals started growing. Nucleation was observed within 12 hours of addition of the other reagent. The semitransparent platy shape and spherules crystals where observed. As shown in fig 1.The reaction that place in the gel medium is given below

$2CH_3COOH + Na_2SiO_3 \rightarrow 2CH_3COONa\downarrow + SiO + H_2O$
$4CH_3COONa + BaCl_2 + CuCl2 \rightarrow (CH_3COO)_2\,BaCu\downarrow + 4NaCl$
$(CH_3COO)_4\,BaCu + C_4H_6O_6 \rightarrow C_4H_6BaCuO_6\downarrow + 4\,CH_3COOH$

The grown CBT crystals were subjected to the single crystals X-ray diffraction to confirm the values of the lattice parameters obtained from single crystal XRD studies and identify the diffraction planes, powder X-ray diffraction pattern of the powdered sample was obtained using a powder X-ray diffractometer (Bruler, D-Advance) having wavelength of λ=1.54060 Å. The sample was scanned over the range of 20^0 - 80^0 for 2θ values. Surface microstructure of deposited films was investigated by scanning electron microscopy [SEM) by using Zeiss EVO 50. The quantitative compositional analysis of the CdS-Te films was carried out by EDAX [Energy dispersive X-ray Analyzer) technique attached with SEM.

RESULTS AND DISCUSSION

SEM

The figures 1 to 4 represents the micro photographs of the powdered sample of Copper Barium Tartarate with various magnifications.

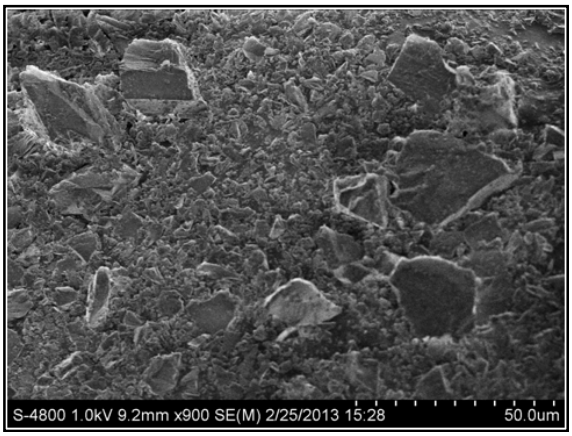

Fig 1 Barium Tartarate

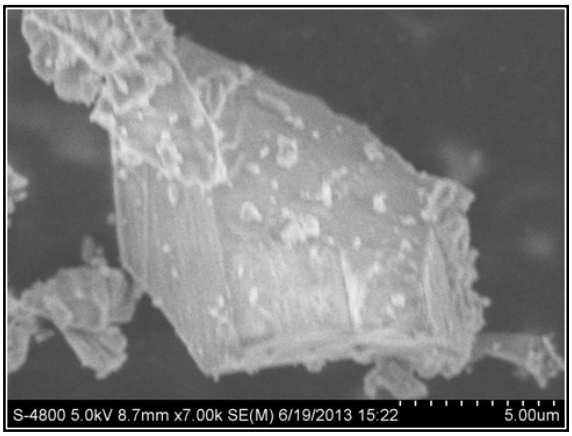

Fig 2 Copper Doped Barium Tartarate

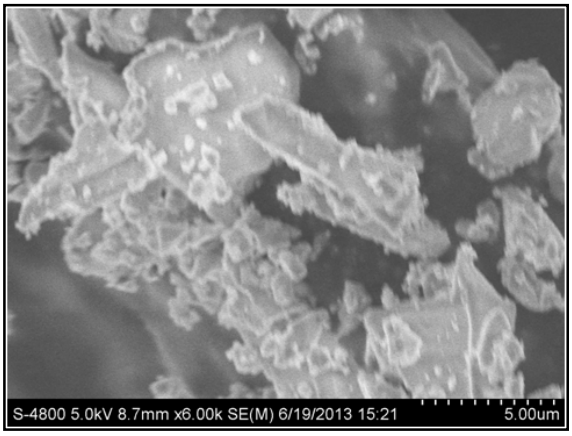

Fig 3

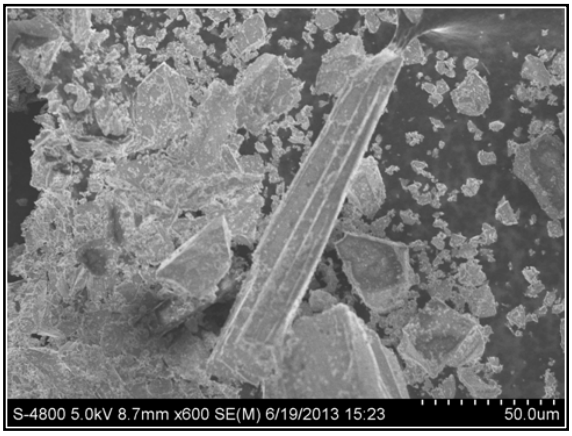

Fig 4

The SEM photographs reveal the geometrical figures like triangular, pentagonal and spherical. Also some are of rod and plate like shape with various size and orientations. It also shows large number of grains of different size. Fig. 2 shows parts of phase on higher magnification, pentagonal and triangular, pentagonal like shape fig pentagonal & flower like shape fig. 3 shows Triangular, and pentagonal, spherical, some are rod and plate like shape. Fig. 4 shows rod, square, & pentagonal like shape are observed. It also shows the well defined boundaries with no attachment of micro crystals, as the surface is optically uniform & with no attachment of micro crystals these facts manifest, the grown conditions of crystals of Cupper Barium Tartarate are somewhat controlled.

EDAX

The compositional analysis of Copper doped Barium Tartarate crystals carried out by using EDAX analysis. EDAX pattern of Copper doped Barium Tartarate crystals is shown in Fig 5.

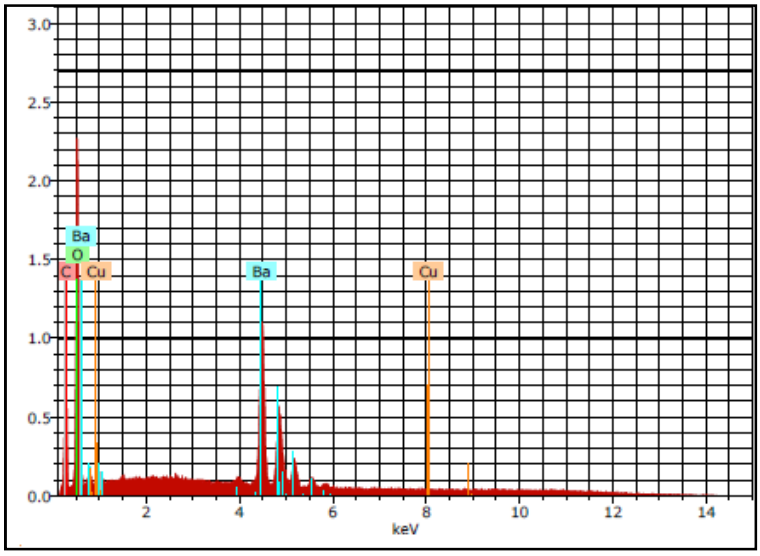

Fig. 5 EDAX spectra of $CuBaC_4H_4O_6$ crystals

The EDAX confirms the presences of Barium (Ba), Copper (Cu), Carbon (C) and Oxygen (O) with their atomic percentage ration 12.44 : 1.37 : 37.36 : 48.84 respectively. Recorded EDAX spectrum revels that there is no evidence of other impurity. It indicates purity of crystals.

CONCLUSION

The growth Copper doped Barium Tartarate crystals was accomplished using single test tube diffusion method. Gel method is suitable for growing crystals. The SEM photographs show cubic and triangular broad edges like structure of doped crystals. No morphological changes take place due to the incorporation of cupper, but this may be incorporated either by substitution ion. Qualitative elemental analysis (EDAX) confirms the presence of Copper, Barium, Carbon and Oxygen.

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