



EXPLORING THE IMPACT OF $C_3H_7NO_2$ ON SURFACE HABITAT OF POTASSIUM ACID PHTHALATE CRYSTAL

Syeda Bushra^a, Atul Birajdar^b, Mohd Anis^c, M.I. Baig^e, M.D. Shirsat^d, S.S. Hussaini*

^aCrystal Growth Research Laboratory, Milliya Arts, Science & Management Science College, Beed-431122, Maharashtra, India.

^bDepartment of Physics B.S.S College of Arts, Science and Commerce, Makni-413604, (MS) INDIA

^cDepartment of Physics and Electronics, Maulana Azad College of Arts, Science and Commerce, Aurangabad -431001, (MS) INDIA

^dRUSA Centre for Advanced Sensor Technology, Dr. B.A.M. University, Aurangabad - 431004 (MS) INDIA

^eDepartment of Physics, Prof. Ram Meghe College of Engineering and Management Bandnera Amravati -444701, (MS) INDIA

*Corresponding Author: +91 9325710500

E-mail address: Shuakionline@yahoo.co.in

Abstract: Crystals find very high stature for designing the photonics devices owing to which current investigation is aimed to grow single crystals of pure and L-alanine doped potassium acid phthalate material by slow solvent evaporation method. The crystalline nature and structural parameters of L-alanine doped potassium acid phthalate has been evaluated by means of powder XRD analysis. The effect of L-alanine on modified surface habitat of potassium acid phthalate crystal has been investigated by surface etching analysis.

Keywords: Crystal growth, XRD analysis, Etching studies

1. INTRODUCTION

In current era the crystal find exceptional applications in field of optical designing and innovative optical techniques. The fabricating of optical devices need optically active substitute which can be of organic/inorganic/semi-organic domain. It is notable that, potassium acid phthalate (KAP) is special and industrially vital crystal which has widespread applications [1-4]. Literature analysis reveals that KAP crystal exhibit unique elastic, piezoelectric, nonlinear optical, pyro-electric traits

owing to which huge research is done by several research groups [5-8]. It is evident that effect of like amino acids namely L-lysine, DL-alanine, L-methionine, L-arginine, L-valine on physical, optical and electrical traits of KAP crystal has been

investigated [9]. It is noted that doping of L-alanine in KAP crystal has not been done. However, we firstly report the effect of L-alanine on structural and surface habitat of KAP crystal.

2. Experimental procedure

Merck make potassium hydrogen phthalate (KAP) solution was prepared in 300 ml of double distilled water and added with 1 mole of L-alanine. The L-alanine added KAP solution was stirred for four hours and this solution was filtered using the No. 1 Whatman filter paper. The filtered L-alanine added KAP solution was kept for evaporation at room temperature. The crystal of pure and L-alanine doped KAP (LA: KAP) were picked after few days as shown in Fig. 1a and 1b respectively

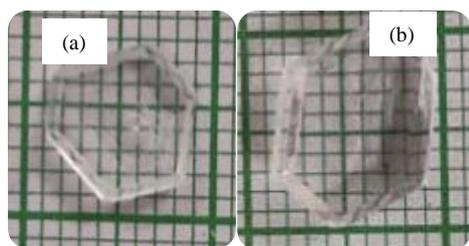


Fig.1. Single crystal of (a) Pure KAP (b)

LA:KAP

3. Results and discussion

3.1. Powder X-ray diffraction analysis (PXRD)

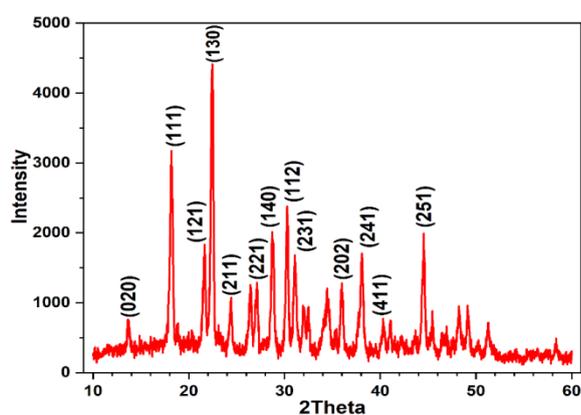


Fig. 2. Powder XRD pattern of LA:KAP crystal

The PXRD analysis of LA:KAP crystal has been performed using the Bruker Advanced D8 powder X-ray diffractometer. The PXRD pattern of LA:KAP has been recorded as depicted in Fig. 2. The sharp and defined peaks in XRD pattern reveals the crystalline nature of LA:KAP crystal. The structural parameters of LA:KAP crystal has been indexed and evaluated using the PowderX software. The structural parameters of LA:KAP crystal material are slightly deviated from pure KAP [9] as evident from table 1.

Table 1. Structural parameters

Crystal	a (Å)	b (Å)	c (Å)	V(Å) ³	Structure	Reference
KAP	9.595	13.872	6.463	860.23	orthorhombic	[9]
LA:KAP	9.597	13.870	6.465	860.55	orthorhombic	Present study

3.2. Etching analysis

The growth nature of crystal can be revealed well when etching can be done by suitable solvent for adequate time. The pure and LA:KAP crystal has been subjected to etching analysis under optical microscope (Micron)

and the surface images were captured in reflectance mode at 40X zoom. The etch pattern of pure and LA:KAP crystal before and after etching is shown in Fig. 3. It is evident that before etching the surface of pure (Fig. 3a) and LA:KAP (Fig. 3a) crystal show inclusions, disordered defects and striations however after etching the surface with solvent (water) the KAP (Fig. 3c) crystal show stacked triangular growth habitat while after doping KAP by L-alanine triangular growth habitat of KAP has been effectively modified to rectangular growth pattern consistent along the surface.

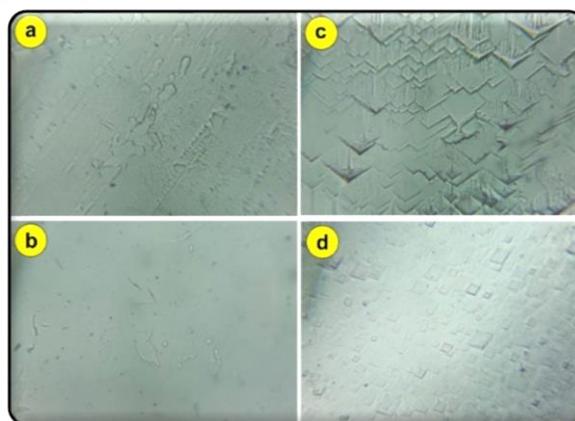


Fig.3. Image before etching (a) KAP (b) LA:KAP and after etching (c) KAP (d) LA:KAP

4. Conclusion

Optically transparent pure and LA:KAP single crystals have been successfully grown by slow solvent evaporation technique. The PXRD analysis confirmed the orthorhombic structure of grown crystals and slight change in LA:KAP crystal with reference to KAP. The etching analysis revealed that crystal have 2D growth along the surface and doping of LA in KAP crystal effectively optimized the growth habitat of KAP from triangular to rectangular shape. This investigation confirmed that L-alanine is effective dopant for modifying the crystal surface growth nature of KAP crystal surface.

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