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# COMPARATIVE SURFACE ETCHING ANALYSIS OF PRISTINE AND L-GLUTAMIC ACID DOPED POTASSIUM ALUMINIUM SULFATE CRYSTAL

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**Abstract :**Single crystal play vital role in NLO device fabrication hence current investigation is aimed to grow the pure and L-glutamic acid (LGA) doped potassium aluminium sulfate (KAS) crystal by slow solvent evaporation method. The qualitative and quantitative analysis of LGA doped KAS crystal has been performed by means of energy dispersive spectroscopic analysis. The impact of LGAon surface growth pattern of KAS crystal has been done by microscopic etching analysis.

**Keywords**: Crystal Growth, Mechanical studies, EDS analysis

## 1. Introduction

In current era optical materials are needed for designing opto-nonlinear devices. Amongst the

impact of LGA on crystal growth habitat of KAS crystal. organic, inorganic and semi-organic material the attraction is driven by inorganic materials owing to physical properties desirable for various photonic devices [1-4]. Hitherto, the technologically essential crystals are Li3PO4, KDP, BBO, ADP, LBO, HgBrCl, KTP, KBBF, etc. Stimulated Raman Scattering (SRS) demand crystals with bonds of sulfate ion which give large frequency shift vital forthird order nonlinear optical traits.One of the significant inorganic crystal is potassium aluminium sulfate (KAS) which is very less attended by researchers

in crystal growth field. Literatureanalysis shows that few reports are available on

KAS crystal [5]. In current study L-glutamic acid (LGA) has been doped in KAS crystal to perform comparative energy dispersive spectroscopy (EDS) and etching study to explore the

## 2. Experimental procedure

The solution of potassium aluminium sulfate (KAS) has been made in 100 ml of water and 1 mole of LGA has been added to the solution. The LGA added KAS solution was filtered by No.1 Whatmann filter paper and filtered solution was kept in constant water bath for slow evaporation process. The single crystals of pure and LGA doped KAS crystal were harvested within two weeks as show in Fig. 1.

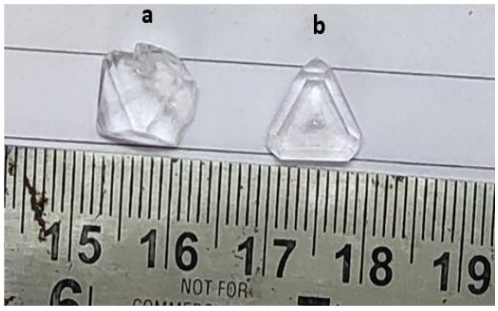


**Fig. 1.** Single crystal of (a) KAS and (b) LGA:KAS

## 3. Results and discussion

### *3.1. EDS analysis*

The EDS spectrum of LGA:KAS crystal has been performed by using Hitachi S4700 instrument. The energy spectrum has been recorded within the energy ranging up to 9.9 KeV as depicted in Fig. 2. The spectrum reveals the presence of K (21.71%), Al (33.61%), S (14.44%), O (21.06%) and C (9.18%). The presence of carbon indicates the successful incorporation of LGA in KAS crystal.

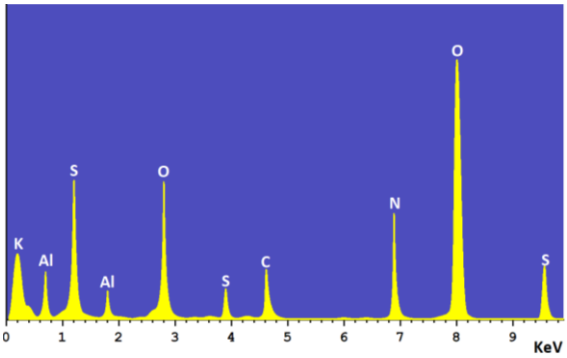


**Fig. 2.** EDS spectrum

*3.2. Etching analysis*

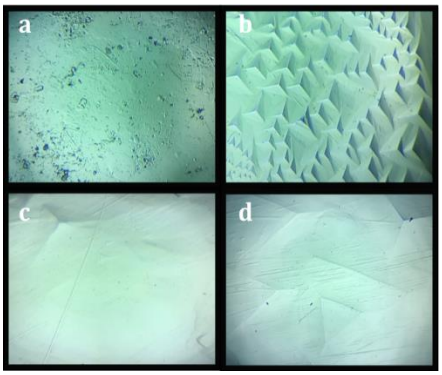


**Fig. 3.** Unetched (KAS (a), LGA:KAS (c) crystal) and etched (KAS (b), LGA:KAS (d) crystal)]

The surface growth habitat of pure and LGA:KAS crystal has been evaluated by etching characterization technique. Micron make optical microscope has been used to examine the surface profile of crystal at 40X zoom. The etch patterns of pure and LGA:KAS crystal are shown in Fig. 3. The crystal surface without etching reveals the unsymmetrical and unevenly distributed inclusions and striations as evident in Fig. 3a and 3c. The etched surface of KAS crystal (Fig. 3b) reveals the uniform distribution of hillocks throughout the surface however after doping LGA in KAS the hillock growth has been supressed making the crystal surface more smooth. This implies that

LGA can effectively optimize the growth habitat of KAS crystal.

## References

[1] M.S. Pandian, N. Pattanaboonmee, P. Ramasamy, P. Manyum J. Cryst. Growth 314 (2011) 207-212

[2] B. Anitha, S. Rathakrishnan, P. Malliga, A. Joseph Arul Pragasam J. Therm. Anal. Calorim. 119 (2015) 785-789

[3] D. Kalaiselvi, R. Mohan Kumar, R. JayavelCryst. Res. Technol. 43 (2008) 851-856

[4] M. Lawrencea, J. Thomas Joseph Prakash Spectrochem. Acta A 91 (2012) 30-34

[5] S.P. Ramteke, S. Kalainathan, Mohd Anis, G.G. Muley, M.I. Baig, H. AlgarniOptik 201 (2020) 163509-163511