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EDX and XRD studies of pure and doped Barium Nitrate crystals were grown by Slow Evaporation Technique.

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ABSTRACT

Slow evaporation technique is very useful to develop crystal, which has water soluble compound. In this research study we are grow Pure and doped Barium Nitrate crystals with slow evaporation technique. We are doping $Ba(NO_3)_2$ crystal with $Mg(NO_3)_2.6H_2O$, as 0.5N, 1.0N and 1.5N. Pure and doped Barium Nitrate crystals were grown in 5-6 weeks. Grown sample are transparent and has smooth surfaces. These grown crystals were characterized by Energy Dispersive X-Ray and X-Ray Diffraction.

Keywords: Slow Evaporation Technique, EDX, XRD

I. INTRODUCTION

Barium Nitrate (BaN) crystal has known as Raman Crystal and obeying Non Linear Optical Properties. Grown Pure and doped BaN crystals were prepared by slow evaporation technique at ambient temperature. Doped BaN crystals were synthesised with $Mg(NO_3)_2.6H_2O$ as 0.5N, 1.0N and 1.5N. Good quality and transparent crystal in nature were formed after 5-6 weeks. Many researcher were grow the Non Linear optical crystals γ –glycine with different additives Barium Nitrate (BaN), Potassium Nitrate (PN) and ammonium oxalate (AO) were grown by slow evaporation method[1]. The crystals were formed as transparent and their size and external shape are sensitive to the doped materials present in the solution during growth [2]. Reported elemental study of PureBaN crystals carried out by Energy Dispersive X-ray spectroscopy (EDX)[3].$Ba(NO_3)_2$ have cubic structure reported by me [4]. It has highest Raman Gain Coefficient among the whole artificial crystals worldwide [5-6]. In this paper we have to studies EDX and XRD characterisation of Pure and doped BaN crystals.

II. EXPERIMENTAL

2.1. Growth of Pure and Doped Barium Nitrate crystals

Barium Nitrate and Magnesium Nitrate hexahydrate (MgN) salts with purity (≤ 99%) used to grow pure and MgN doped Barium Nitrate crystals by slow evaporation technique at ambient temperature. $Ba(NO_3)_2$ salt taken to prepare solution in 300 ml double distilled water in beaker and stir well at room temperature. 10.35 gm salt of $Ba(NO_3)_2$ was soluble in 100ml double distilled water at room temperature. Madden saturated solution divide 100ml per beaker than add 0.5N, 1.0N and 1.5N solution of MgN prepared with double distilled water and stirrer well. To avoid dust and impurities care was taken; so cover the beaker by filter paper for slow

evaporation at ambient temperature. Good quality and transparent crystals were grown in 5-6 weeks.Grown BaN and $BaNMgN_X$ (X=0.5N, 0.1N and 1.5 N) crystals are shown in Fig.1.

Fig.1. Grown Crystals of Pure and Doped BaN

III. CHARACTERIZATION TECHNIQUES

3.1. Energy Dispersive X-Ray (EDX)

Presence of elements in powdered form of pure and doped BaN crystals were carried out with net counts and energy of beam 0-10 keV .

3.2. X-Ray diffraction (XRD)

The grown Pure and dopedBaN crystals prepared in powder form were studied X-Ray diffraction (XRD).The X-Ray diffraction (XRD) data of the prepared sample were collected on a RigakuMiniflexdiffractometer with CuKα radiation (λ = 1.5406 Å). The applied voltage was 30 kV with a 15 mA current and the scans were performed with 2θ of 2° / min.

IV. RESULT AND DISCUSSION

Elemental analysis of grown material was done by the Energy Dispersive X-Ray (EDX). Powder form of Pure BaN and $BaNMgN_X$ (X=0.5N, 1.0N and 1.5N) crystals were taken for the analysis. EDX of the prepared samples were shown in Fig.2-5.

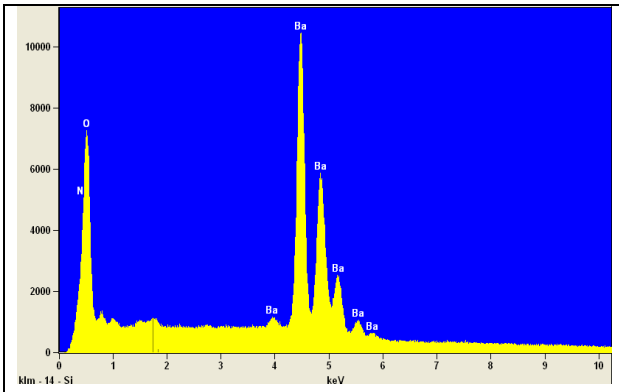

Fig.2. EDX of Pure BaN

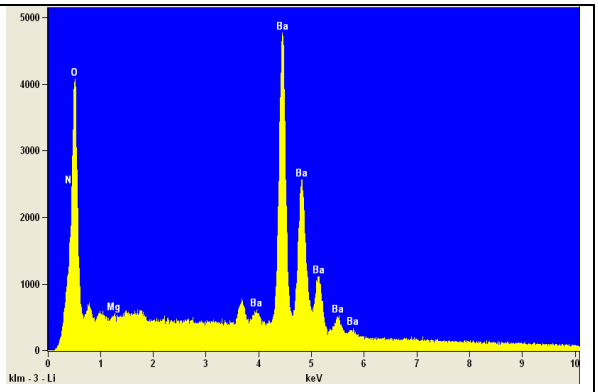

Fig.3. EDX of $BaNMgN_{0.5}$

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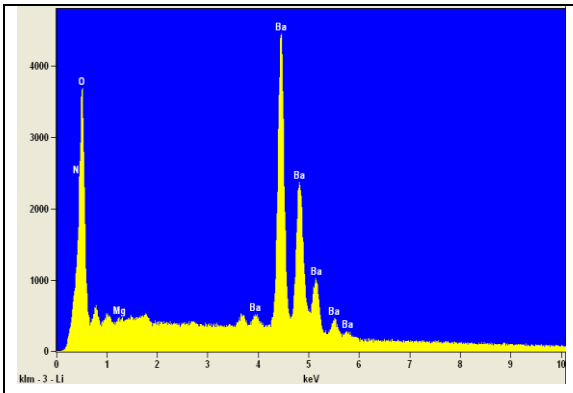

Fig. 4. EDX of $BaNMgN_{1.0}$

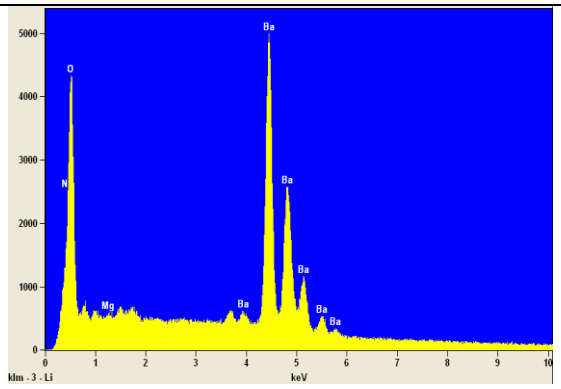

Fig.5. EDX of $BaNMgN_{1.5}$

A ascendant increase of intensities Of Mg spectra lines are consistent with preparation procedure. The measured Mg spectra line shows more intense in prepared sample obtained with increase with concentration of MgN in BaN crystals. It is also necessary that line EDX analysis in different sample shows chemical homogeneity of BaN crystals. It is also known from scientific literature that intensities of any spectral lines in EDX analysis are proportional to element abundance.[7] EDX characterisation confirmed that the Weight% increases as 0.14 to 0.18 and atom% 0.21 to 0.27 in $BaNMgN_X$ (X=0.5N, 0.1N and 1.5 N) crystals.

The quality of the powder diffraction pattern is usually decided by the nature and energy of incident X–ray, resolution of the XRD instrument used and by the physical and chemical conditions of the sample. When the X–ray diffraction data for a sample is collected properly and processed, a huge deal of information regarding the internal structure could be obtained [8-9].Powder XRD is useful to structural study of Pure and doped BaN crystals. XRD data of BaN and $BaNMgN_X$ (X=0.5N, 0.1N and 1.5 N) crystals were collected by RigakuMiniflex X-Ray diffractometer with Cu kα (λ= 1.5406 Å) radiation. XRD spectra of pure and doped BaN crystals are shown in Fig.6-9.

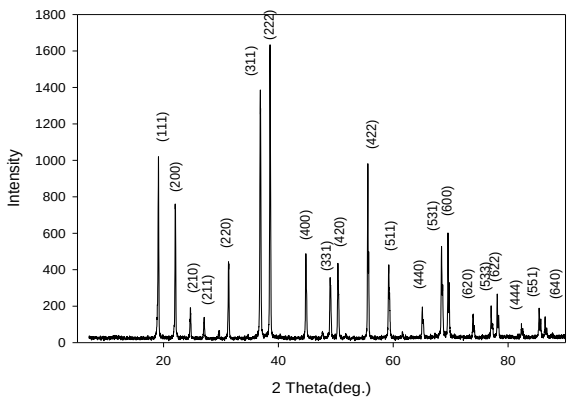

Fig.6. XRD spectra of Pure BaN

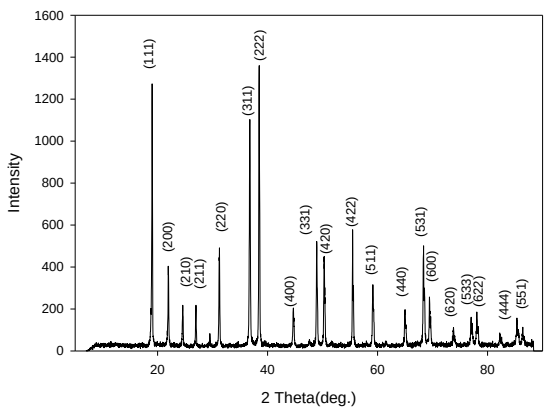

Fig.7. XRD spectra of $BaNMgN_{0.5}$

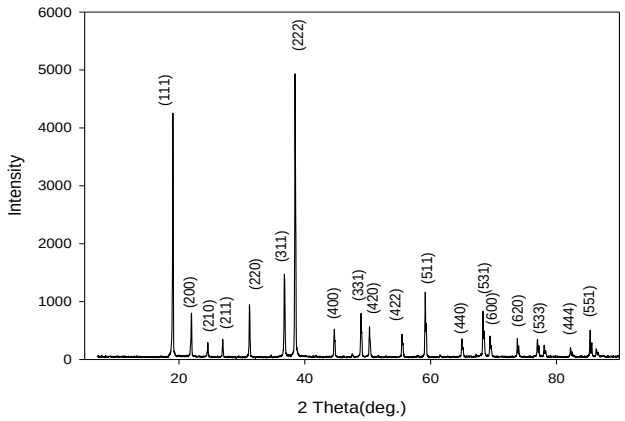

Fig.8. XRD spectra of $BaNMgN_{1.0}$

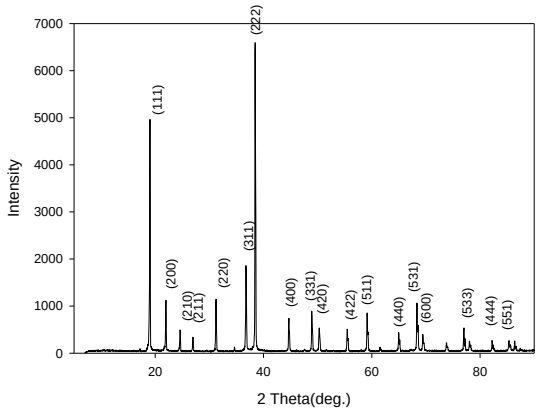

Fig.9. XRD spectra of $BaNMgN_{1.5}$

Fig.6 to 9 shows the XRD pattern of the pure BaN and $BaNMgN_X$ (X=0.5N, 0.1N and 1.5 N) crystals. At ambient conditions, the XRD pattern shows peaks at particular 2θ values to gives information about the plane. All observed peaks are labelled and attributed to the formation of cubic (JCPDS card # 04-0773).The unit cell parameter are a=b=c=8.1184 Å . The values of α=β=γ=90̊ and average volume of the unit cell is 535.07 Å . Grown BaN and doped $BaNMgN_x$ (X=0.5N, 0.1N and 1.5 N) crystalswere crystallize in cubic system with the space group P_a3.

V. CONCLUSION

Pure and doped Barium Nitrate crystals are successfully synthesized by using Slow Evaporation Technique. Good quality, transparent and has smooth surfaces BaN and $BaNMgN_X$ (X=0.5N, 0.1N and 1.5 N) crystals were grown in 5-6 weeks. EDX characterisation shows that the Weight% increases as 0.14 to 0.18 and atom% 0.21 to 0.27 in $BaNMgN_X$ (X=0.5N, 0.1N and 1.5 N) crystals. XRD studies for prepared sample confirmed that the grown Pure and doped BaN crystals are synthesised with cubic crystals structure. XRD results shows that 0.5N, 1.0N and 1.5N of MgN doping made no effect in BaN crystal structure.

REFERENCES

[1.] M.N.Ravishankar, M.A.Ahlam, R.Chandramani&A.P.GhanaPrakash, Indian Journal of Pure & Applied Physics, Vol. 51, January 2013, pp. 55-59.

[2.] M.B. Jessie Raj et al./ Elixir Crystal Growth 47 (2012) 9129-9130

[3.] Vanish.H.Tandel, I.B.Patel, HiteshPatel, IJSART, vol.2 , Issue.9, Sept.2016

[4.] Vanish.H.Tandel, I.B.Patel and Anil.S.Pillai, IJRCS, Volume-1, Issue-08, Oct-2017

[5.] J. Simons, H. Pask, P. Dekker, J. Piper, Opt. Commun. 229(2004), 305.

[6.] Shuanghong Ding, Xingyu Zhang , Qingpu Wang , PengJia , Chen Zhang , Buo Liu , Optics Communications 267 (2006) 480–486.

[7.] R.Dimitrijevic, O.Cvetkovic, Z.Miodragovic, M.Simic, D.Manojlovic, V.Jovic, J.Min.Metall. Sect. B-Metall. 49(1) B (2013) 91-95.

[8.] Jenkins, R. and Snyder, R. L., Introduction to X–Ray powder diffractometry. John Wiley & Sons, NY, 1996.

[9.] Pecharsky, V. K. and Zavalij, P. Y., Fundamentals of Powder Diffraction and Structural Characterization of Materials, Springer, 2005.