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Optical Band Gap Characterization of Indium Telluride (In:Te) Crystal

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Abstract: The single crystal of indiumtelluried have been grown by zone melting method in growth condition. The energy band gap of indium telluried was 0 .28ev.the proportion of constitute material was confirmed by EDAX the infrared transmission of crystal in the regionfrom 400 to 4000cm-1 was determind by FTIR,which decrease with the increase of wavenumber due to the absorption.

Keyword: *Crystal, Growth from melt, Band gap*

I. INTRODUCTION

Semiconductor technology has always shown interest to grow binary material of III-VI compound in the field of detection.(1-4).Binary III-V materials like InSb,InAs,InBi etc. had been considering for the same. The photo detectors operating with low wave length used in medical diagnosis, pollution monitoring device etc.(5) it has been seen that the materials studied so far in systems are all Te rich quasi binary or ternary alloys. But less studied reported on Indium rich alloys.(6)Indium telluride is a chemical compound. It is an intermetallic compound, so it has properties intermediate from a metal alloy and a metal-nonmetal ionic crystal. As so, it has intermediate conductivity and is classified as a semiconductor. Hence this work on InTe is given importance.

II. EXPERIMENTAL PROCEDURE

The stoichiometric amount of indium and tellurium were weighted accurately. A melt stirring method was used.It consists of a resistance furnace with a cylindrical core. A ceramic tube was passed through the furnace core.A uniform temperature zone of about 10-12 cm length was obtained inside the tube. A quartz ampoule evacuated to about 10^{-4} Pa pressure was sealed & inserted in the ceramic tube for melting & stirring the charge.

The maximum temperature inside the furnace core was about 100^{o}C above the melting point. The rotation the quartz tube gives stirring effect to the molten charge. For thorough mixing of the charge, this treatment was continued for 2 to 3 days. The molten was then slowly cooled to room temperature .The ingot so prepared was subjected to crystal growth.

Single crystal of have been grown by various method like Bridgman, czochalski, zone melting etc. by various researcher. The study is mainly focus on the zone meltingmethod.Now in zone melting method gradients at the melting point of 35 c/cm given to a zone lenth of about 8mm to 10 mm to remove impurities,The single crystal had bright shining cylindrical surface was made.

III. RESULT AND DISCUSSION

Concentration distribution ofInTe which is sown in Fig.1, was determined by the X-ray energy dispersive spectroscopy(EDAX).

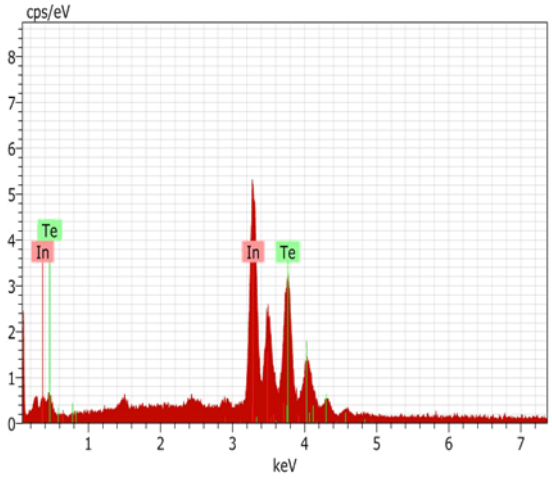

Fig.1

Table 1

Element	Series	[at.%]
Indium	L-series	57.07
Tellurium	L-series	43.03

The I.R. Spectrophotometer was used for measurement of optical absorption of the samples. The spectra were obtained in the wave number range 400 to 4000cm-1.in this procedure the material was taken in powder form with small converted in pellets of thickness about 1mm.this pellets used in FTIR spectrophotometer to get the data of absorbance versus photon energy.

The plots of $(\alpha h\upsilon)^2$ vshυ were used to evaluate the optical band gap of InTe.The plots are observed to be linear in the region of strong absorption near the fundamental absorption edge. Hence by extrapolating the linear portion to $(\alpha h\upsilon)^2 = 0$, the band gap was evaluated.(9-11).The valued of the band gap is obtained.2832

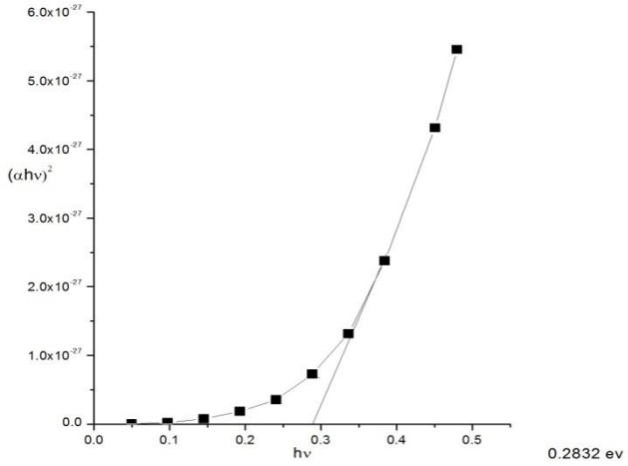

Fig.2

CONCLUSION

The zone melting method is very useful to grow In:.Te. The crystal of can be successfully grown by zone melting technique with the optical band gap found 0.2832

References

[1] A. J. Norieka,W.J.Takei, M. H. Francombe, J. Appl. Phys. 53(1982) 4932.
[2] T. F. Humpreys, P. K. Ching, S. M. Bedair, Appl. Phys. Lett. 53 (1988) 142.
[3] J. L. Ziko, J. E. Greene, J. Appl. Phys. 51 (1980) 1549.
[4] L. L. Lee, J. D. Kim, M. Razeshi, Appl. Phys. Lett. 70 (1997) 3266.
[5] D. S. Maske, P.S. More, M. D. Deshpande, R. Choudhary, D. B. Gadkari, Archives of Physics Reasearch, 2012, 3 (1): 15-20.
[6] M. stolzerm, M. stordeur, H sobotta, V riede, Physics Status solidi B1(138) (1986)259.
[7] Hasimoto, K., *J. Phys. Soc.* Japan **12 (**1957**),** 1423
[8] M.A. Berding,A.Sher,A.B.Chen,W.E.Miller,J.Appl.Phys. 63 (1988)107
[9] R.TovarBarradas, C Rincon, J. Genzalez, G.SancherPertez,Journel of Physics and Chemistry of Solida 45 (1984) 1185.
[10] Eva C. Freeman,WilliamPaul, Physics Review B 20 (1979)716.
[11] J.Mendolia, D.Lemone, Physics status solidi(a)97(1986)601.