Where β is a Tauc constant, α is the coefficient of absorption, hν denote the incident light frequency, Eg is the direct band gap and x =1/2 yields linear dependence, which describe the linear transition depended on the nature of the material and the kinds of the transition. The energy band gap Eg can be obtaining from the interception of the axis of photon energy after extrapolated of the straight line of the curve of $(\alpha h\nu)^2$ versus (hν) plotting.

Figure 11 and Figure12 shows the amount of energy gap of ZnTe films at wavelengths 0.532 µm and 1.064 µm respectively for various laser energies.It can be observed that the energy gap of the films in the case of 0.532 µm laser wavelength reduced from [2.2 eV to 1.88eV] when the laser energy growth from 600 mJ to 900 mJ , while it is reduced from [1.75 eV to 1.62 eV] for the case of 1.064 µm laser wavelength when the laser energy growth from 600 mJ to 900 mJ this is because many levels of energies resulted in many imbrication in the energy of valence band and conduction band in the energy band gap of the prepared films. This imbrication in the bands due to the reduction of the energies of the several band gaps which can be observed in the lower band gap for increased laser energy is growth [10].

In addition to the above mentioned there are two reasons for the decrease in the energy band gap when the laser energy increases firstly; the increasing of laser-induced defects, which consequently narrows the energy band gap of the fabricated thin films. Secondly ; increase in the grain size of the films and this increase causes a decrease in the energy band gap.

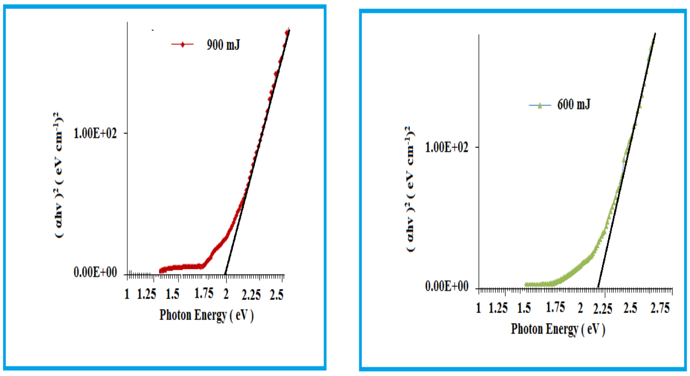

Figure 11. Band gap energy value of ZnTe films at wavelength 0.532 µm for various laser energies.

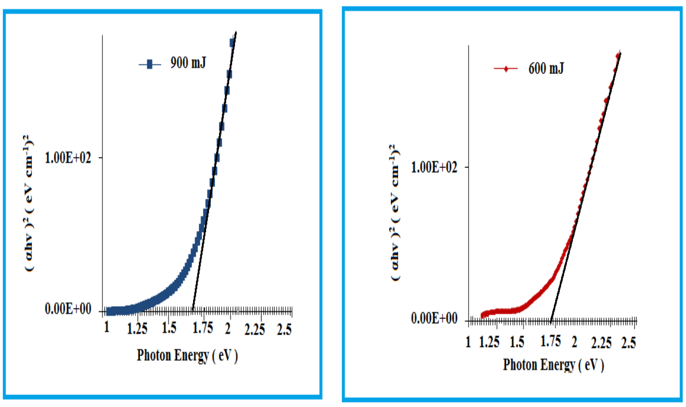

Figure 12. Band gap energy value of ZnTe films at wavelength 1.064 µm for various laser energies.

4. CONCLUSIONS

Polycrystalline and cubic structure ZnTe thin films were fabricated using pulsed laser deposition technique with different laser energies and wavelengths. The grain size of the fabricated Zinc telluride thin films enlarges greatly with an increases of the laser energies from 600 mJ to 900 mJ with 0.532 µm laser wavelength while becomes hazy with 1.064 µm laser wavelength due to the fast decomposition of the films on the substrates materials. The maximum value of the transmission is 60% for Zinc telluride thin films in the wavelength 0.532 µm while the value is greater than 90 % for Zinc telluride thin films in the wavelength 1.064 µm due to increasing in the densities of the films and because of the high transparent which making this material to be used in photovoltaic devices as solar cells and detectors. The energy band gaps of the films were decreased when laser energy increased from 600 mJ to 900 mJ for both laser wavelengths 532nm and 1.064 µm.

REFERENCES

[1] Hossain, M.S.; Islam, R. (2010). Structural, elemental compositions and optical properties of ZnTe:V thin films. Chalcogenide Letters Vol. 7.

[2] Tanaka, T.; Matsuno, Y.J.; Kume, Y.; Nishio, M.; Guo, Q.X.; and Ogawa, H.(2004). Characterization of Al doped ZnTe Layer Fabricated by Al Thermal Diffusion. Phys. Status Solidi B, 1, 1026.

[3] Bozzini, B.; Baker, M.A.; Cavallotti, P.L.; Cerri, E.; and Lenardi, C. (2000). Electro deposition of ZnTe for photovoltaic cells. Thin Solid Films, 388, 361,2.

[4] Kazmerski, L.L. (1980). Polycrystalline and Amorphous Thin Films and Devices. Academic Press, New York.

[5] Ishizaki, T.; Ohtomo, T.; and Fuwa, A. (2004) Journal of Physics D: Applied Physics, 37, p. 255, 5.

[6] Aqili, A.K.S.; Ali, Z.; and Maqsood, A. (2000). Optical and structural properties of two-sourced evaporated ZnTe thin films. Applied Surface Science, 167, 1.

[7] Gunshor, R.L.; Koladziejski, L.A.; Otsuka, N.; and Dutta, S. (1986). Surface Science. 174, 522.

[8] Bellakhder, H.; Outzourhit, A.; and Ameziane, E.L. (2001). Study of ZnTe thin films deposited by r.f. sputtering. Thin Solid Films, 382, 30.

[9] Ochoa-Estrella, F. J.; Vera-Marquina, A.; Mejia, I.; Leal-Cruz, A.L.; Pintor-Monroy, M.I.; and Quevedo-López, M. (2018). Structural, optical, and electrical properties of ZnTe:Cu thin films by PLD. Journal of Materials Science: Materials in Electronics.

[10] Tawari, P.; Wu, X.; Foltyn, S.; Lee, M.L; and Campbell, J. (1994). Applied Physics Letters, 64 .

[11] Narayan, J.; Biunno, N.; Singh, R.; Holland, O.; and Auchiello, O. (1987). Applied Physics Letters, 51 - 1845.

[12] Saenger, K. (1993) Proc. Adv. Mater. 2

[13] Graham K.H,. (1994). Pulsed laser deposition. MRS Bulletin No. 2, Vol. XVII.

[14] Aydinli, A.; Compaann, A. (1993). Advanced Materials for Optics and Optoelectronics 2, 69-86.