ABSTRACT

The present work mainly describes and discusses an investigation on x-ray analysis, microstructure, and electrical properties of thin PbTe films. All PbTe films were prepared under reduced vacuum of 10^{-4} Pa. The thickness of the films was determined using multiple-beam interferencee method.

The essential results are :

From x-ray analysis, the data of a freshly deposited PbTe films of different thicknesses from 120 nm to 185 nm shows that pbTe is polycrystalline in nature, increasing the intensity with the thickness, standard planes were in all thickness diffractions are namely (200), (220), (222) and (400).

The determined particle size from x-ray pattern increases with the thickness.

Increasing the particle size and the intensity after annealing were studied by x-ray analysis.

The electrical resistivity of pbTe films deposited on clean glass substrates was measured using a simple circuit technique.The measurements were carried out in air on annealed samples.The measurments were carried out at series of samples annealed at 473, 573, 673°K for 30 min. and at 473°K for one hour. The resistivity—thickness relationship was interpreted in terms of Fuchs models with P = 0. From the linear relation

between ρd (resistivity times thickness) against d (thickness), the values of l_i were deduced and compared with the previous data.

The variation of Log R with 1/T°K was studied for series of PbTe films at different thicknesses. This relation pronounced the property of semiconductors.

The value of the activation energy of the PbTe film was determined from the relation of Log R VS 1/T, and compared with the previous determined values.

The dependence of electrical resistance on current frequency has been studied in thin layers of PbTe at room temperature. The experimental data are given for frequencies ranged from 5Hz to 500 KHz by using impedance meter BM 507 technique. The thin layers were made by vacuum deposition on the glass substrates in a vacuum of $1o^{-4}$ pa. As shown by the experimental data, fitted well an equivalent circuit which contains, an RC element , the equivalent circuit contains a single RC element.

The decrease in electrical resistance with the increase of the frequency was studied.

In some very thin layers the A.C resistance diminishes continuously with increasing frequency tending towards a constant values