Figure 4 shows a CTSe thin film—the X-ray powder diffraction (XRD) pattern of a thin CTSe film obtained prepared by through sequential deposition of thin films of CuSe and SnSe thin films, with using a preparation routine like one plotted shown in Fig. 3 and with evaporated masses of Cu and Sn of 0.01 and 0.07 g, respectively. The Figure 4 also shows shows the XRD patterns for films of CuSe and SnSe films. These XRD patterns were compared with the CTSe diffractogram in order to identify the reflections corresponding to secondary phases in the thin CTSe films, with a greater degree of accuracy the reflections corresponding to secondary phases in the thin CTSe films.

Cu$_2$SnSe$_3$ thin films were grown with using a method based on sequential evaporation of thin films of CuSe and SnSe thin films in a two-stage process. Characterization done performed by XRD gave evidence of the formation of a compound containing predominantly the Cu$_2$SnSe$_3$ phase, however, the sequence with-in which the binary precursors are evaporated and the preparation parameters, more significantly affects the phase formation as well as the structural, optical, and electrical transportation properties of the thin CTSe films. Moreover optical characterization performed by using spectral transmittance measurements revealed that the CTSe films have low transmittance and also poor crystallographic quality, probably associated to structural and native defects, indicating that further studies must be done performed to improve CTSe films properties. Furthermore, the results revealed demonstrated that characterization of the Cu$_2$SnSe$_3$ films could be potentially used for a done to get p-type conductivity semiconductor and with an energy band gap ($E_g$) of approximately somewhat 1.6 eV also.
Temperature-dependent conductivity measurements revealed that the conductivities of the CTSe films were predominantly affected by the transport of free carriers in states of the valence band. In high temperatures ranges (T > 550 K), the increase of σ could be attributed to an increase of the carrier density coming from deep acceptor impurities, whereas the change of σ observed in the low temperatures range (T < 350 K) can be attributed to changes of the carrier density of carrier coming from shallow acceptor impurities associated with secondary phases.