Chapter 3

Conclusions:

Zone-melting method can be successfully used to grow single crystals of $InBi_{1-x}Te_x$ (x=0.00,0.05,0.010 and 0.15) with following important conclusions that can be drawn from this study:

1. The InBi crystals possess high crystalline nature as confirmed from the XRD analysis. The lattice parameter *a* remained almost constant while *c* showed monotonic decrease with the increase in concentration of the dopant Te.
2. The process permits proper stoichiometric doping of the Te at Bi site in the grown crystals as confirmed by EDAX analysis.
3. The synthesized crystals were observed to be free from any major surface defects as examined using FESEM images.

Chapter 4

Conclusions:

- There are no observable indirect transitions in the crystals. The band gaps of $InBi_{1-x}Te_x$ (x= 0.05, 0.10, 0.15) are about 0.195, 0.213 and 0.232 eV (all direct), respectively.
- The negative sign of Hall coefficient and thermal EMF show that all the crystals are of n-type having carrier concentration of 10^{24} m^{-3}, respectively.
- The Fermi energy of $InBi_{1-x}Te_x$ (x= 0.05, 0.10, 0.15) is about 0.023, 0.030 and 0.035, respectively.

Chapter 5

Conclusions:

- Microhardness of $InBi_{1-x}Te_x$ (x= 0, 0.05, 0.1, 0.15) crystals increases with concentration of Te.
- Microhardness of these crystals is dependent on load in the low load range.
- There is applied load dependence of hardness observed but the bulk micro hardness is found to be quite independent of the applied load.
- In the cold-worked crystals, the load independent hardness value significantly increases over that of the as-cleaved samples. In the annealed sample, the load independent hardness value is less than that of the as-cleaved sample.
- The annealing treatment very significantly improves perfection of all the crystals.