CHAPTER - II

SCOPE & OBJECTIVES OF THE PRESENT INVESTIGATION
Despite the varied interests and manifold objectives, polymer science is a single field with characteristic, closely interwoven special problems, tasks and methods of approach. At different times in the history of this intimately related field, some special topics have caught the fancy of the polymer scientists & have occupied the centre stage of attention. In the last two decades, study of conducting polymers has become a field of intense research interest. From commercial standpoint, too, conducting polymers are considered to be a new class of materials which promise to offer a viable alternative to the traditional inorganic semiconductors in many applications, particularly in electronics industry.

Potential advantages of conducting and semiconducting polymers lie in their light weight and in the versatility with which their synthesis and fabrication can be accomplished.

However, most conducting polymers have at least one of the following undesirable characteristics:

1) Poor environmental stability due to the presence of extended electronic conjugation which is considered to be the main requirement for preparing a conducting polymer.
2) Poor processibility
3) Poor physical and mechanical properties.
To overcome these disadvantages, we have chosen a non-conventional, non-conjugated polymeric backbone having a pendant heterocyclic group which acts as the active centre for doping and in the second approach, this polymer is blended with other commercial polymers for achieving better stability and processibility.

In the present investigation, Poly(vinyl mercaptobenzothiazole) has been chosen for study as the non-conjugated polymeric material having pendant mercaptobenzothiazole group, which is the active centre for doping. We have investigated the electrical, thermal and other physical properties of PVMBT in both the undoped and doped state. This polymer has good thermal stability, is soluble in DMSO in the doped state and can be easily blended with other commercial polymers. It has a low Tg value and behaves as an insulator like other polymeric materials in the undoped state but when doped with bromine, iodine or TCNQ, shows semiconducting properties.

We have also examined the possibility of determination of glass transition temperature using conductivity measurements as a new approach in this field. It is known that in the solid state above glass transition temperature, the conductivity of polymeric system is increased rapidly due to the increase of mobility of ionic impurities. Thus, from the measurement of conductivity we were able to estimate the glass transition
temperature of the matrix polymer at least with a reasonable degree of accuracy. As PVMBT is a conducting polymer in the doped state, the overall conductivity of a blend system of PVMBT with another polymer will also be in the semiconducting zone. In the present study, we have used iodine-doped PVMBT as the probe and generator of ionic impurities for the determination of glass transition temperature (T_g)