**Conclusion:**

Superionic conductors have been prepared and studied using electrical conductivity measurements, DSC, XRD and SEM. It has been observed that conductivity has increased to 2-3 folds in the composites systems as compared to pure materials. Maximum conductivity were observed in the composition range $x = 0.3 - 0.5$ mole-fraction of the dopant. A general phenomenon behind this seems to be the role played by the interface region which itself is a disordered region where defect formation and migration enthalpies are notably reduced. These disordered regions induce the concentration profile of point defects near the interface region leading to high ionic conductivity.

Impedance plots also provide similar results. The relaxation time shows a downward trend with the composition throughout the study, which also confirms the enhancement of ionic conductivity.

X-ray diffractograms give an idea about the types of phases present in the system. For instance, titania is found to be in the anatase phase whereas alumina is in the cubic phase. However, thallium iodide is in the $\beta$-orthorhombic phase and cesium iodide and cadmium iodide are in the cubic and rhombohedral phase respectively at room temperature, as confirmed by ASTM files. It also provides information regarding the type of transition from one phase to another.

The DSC curves show the type of transition involved when the systems are heated in the temperature range 25–650°C. The melting of the base material (ionic salt) didn’t show any shift, when it was doped with different mole fractions of dispersoid, confirmed the formation of composites in which interface layer played an important role.
Surface morphology and the shape of the palletized sample were studied using SEM technique. It also gives the particles size of the ionic salt and the added oxide, which is in the range of 200–400 nm.

Scope of the work:

Composite solid electrolytes with their particle size in the nano range can be prepared, which may offer some extra properties. As nano technology is the recent emerging field, it should be pooled with the current technique to produce new materials with some desirable properties for specific applications. If these materials are used in the nano range, their properties will be quite different than the properties observed in the micro range.

Composite solid electrolytes can also be used in micro devices for medical and environmental fields.

Impedance spectroscopy of composite solid electrolytes should be studied at different temperatures in order to know their relaxation times at different temperatures.

It can also be used in synthesizing sensors, which can be used as a tool for modern drug discovery and some other applications. These sensor devices have a number of key features including direct, label, free and real time electrical signal transduction, ultra high sensitivity, exquisite sensitivity and potential for integration of addressable arrays on a massive scale.