2.1 Plan of the work

Recently, nanoparticles of inorganic compounds activated by rare earth ions have received much attention due to their broad applicability and high technological promise. These fluorescent nanomaterials have intriguing optical properties, which are expected to outdo their bulk counterparts. They have been used in luminescent devices such as fluorescent lamps, cathode ray tubes, components of telecommunications etc. An ardent quest for highly luminescent materials has made inorganic host compounds an interesting field for research. Such applications are highly dependent on the host matrix and the rare earth ion employed. These materials have more than one component: one component being the host matrix and the lanthanide doping element being responsible for the radiation. Some of the most widely studied ceramics as host matrix for phosphors are tungstate and molybdate families which is usually a blue/blue-green emitting luminescence material.

The rising need for high-performance phosphors renewed the interest in this luminescent material with more than a century of history. Improvement of the luminescence properties of scheelite based phosphors has become a primary focus in the luminescent materials science. These host materials have broad and intense absorption bands due to charge transfer (CT) from oxygen to metal in the near-UV region.

Also, as a self-activating phosphor, tungstate and molybdate complexes have additional advantages, viz. high chemical stability, high X-ray absorption coefficient, and high average refractive index, which present efficient energy transfer from the tungstate host
matrix to the localized states of the doping ions. Consequently, rare-earth doped tungstate materials may serve as efficient phosphors.

A variety of preparation techniques have been proposed so far to produce nano-sized lanthanide doped tungstates and molybdates. They include microemulsion reaction, hydrothermal process, molten salt reaction, pechini sol–gel method, sonochemical route and the peptide-induced precipitation method. But all these techniques require high temperature conditions and there is dearth of reports on low temperature synthesis methods of lanthanide doped tungstates and molybdate phosphors. Moreover, most of the preparation techniques have employed long chain hydrocarbons, surfactants, catalyst etc. and use of these bulky groups could result in decreased luminescence of the prepared nanoparticles.

Therefore, keeping all these factors in mind, in the present work, we shall attempt

- to synthesize rare-earth earth doped nano-sized particles using appropriate solvents which can serve the purpose of capping agent as well as reaction medium, such as ethylene glycol, dimethyl sulphoxide, water, etc.
- to study the effect of heat treatment on the as-prepared nanoparticles with special emphasis on phase change, particle size and luminescence enhancement.
- to study the effect of concentration of the dopant ion on the luminescence intensity and thermoluminescence properties of some selected samples
- to study the dispersible properties of the prepared nano-sized particles in some selected polar solvents and PVA film formation