ABSTRACT

Rare-earth molybdates, $R_2(MoO_4)_3$, (R = trivalent rare-earth ion), are very important materials because of their interesting piezoelectric, pyroelectric, ferroelectric and ferroelastic properties which make them suitable for various useful devices. Most of the physical properties exploited for practical applications are very sensitive towards the preparative conditions and the quality and quantity of impurities and to small variation from the stoichiometry. These molybdates have several polymorphs and the most important form is the β' form in the orthorhombic modification of the space group Pba?.

Furthermore, a significant change in the transition temperature (T_c) and other physical properties has been observed on substitution of different rare-earth ions at the cation lattice sites. It is, therefore, interesting to investigate the formation condition, phase transition and some other ferroelectric and related properties of these molybdates in its pure as well as mixed (i.e. with different small concentration of other homovalent rare-earth ions) forms for better understanding of their transition mechanism and occurence of some interesting physical properties in them.

The present thesis is mainly concerned with the structural, thermal and electrical properties of some of these rare-earth molybdates in their pure and mixed forms.

The room temperature structural studies (i.e. symmetry, point group and space group etc.) of the pure and mixed compounds have been undertaken using powder diffraction technique in wide range of Bragg angles to confirm the reported ferroelectric orthorhombic space group Pba2. By substituting various small concentration of the other homovalent rare-earth ions in the cation lattice sites of the host lattice, we find that there is not much distortion in the lattice and hence the final structures are invariant.

Studies of thermal properties of the proposed compounds in the wide temperature range using various techniques like, TG, DTA and DSC have provided very useful information about the phase transition and thermal stability of the compounds.

Systematic and exhaustive studies of electrical propertie (dielectric constant and electrical conductivity) of the above compounds have provided an important information about the ferroelectric/ferroelastic phase transition. Finally structure-property relations have been made to understand the ferroelectric ferroelastic behavior of the proposed compounds.