SYNOPSIS

The double sulphates and selenates of the divalent metals, M^{II} and trivalent metals, M^{III} (including the rare earths) with monovalent cations, M^{I} (M^{I} = alkali metal, thallium, NH_4) having general empirical formulae, $M^{I}_2M^{II}(XO_4)_2 .nH_2O$ and $M^{I}M^{III}(XO_4)_2. nH_2O$ (X = S or Se) respectively, have been extensively studied. Recently, considerable interest has been shown in the synthesis of the double sulphates of rare earths with nonmetallic cations such as monomethylammonium[1] ,dimethylammonium[2], trimethylammonium[3], tetramethylammonium[4]. Similar work on the double selenates of rare earths is, however, not reported, though some work has been carried out on methylammonium sodium selenate[5] , methylammonium selenate alums, $CH_3NH_3M(SeO_4)_2 \cdot 12\ H_2O$ (M = Al, Ga, Cr)[6] and the mixed selenates of magnesium and nickel with tetramethylammonium cation[7]. It was therefore thought worthwhile to study the double selenates of rare earths with some non-metallic cations.

The work embodied in the present thesis involves the physico-chemical studies of the double selenates of the rare earths with monomethylammonium, dimethylammonium and trimethylammonium cations. The rare earth selenates are prepared by reacting the respective carbonates with selenic acid. The monomethylammonium selenate, dimethylammonium selenate and trimethylammonium selenate solutions are prepared by careful neutralization of the respective amine with a dilute selenic acid solution. The syntheses of the double selenates are carried out by mixing the selenates of rare earths and the non metallic cations in various ratios followed by precipitation by addition of ethanol.

The stoichiometries of the double selenates obtained are established by chemical analysis. The characterizations of the compounds are done using the X-ray powder

diffraction technique. The powder patterns are indexed in some cases to evaluate the lattice parameters. The infrared absorption spectral results are obtained to support the X-ray findings.

A few representative compounds are studied using thermogravimetry and differential thermal analysis so as to understand the mechanism of thermal decomposition. Attempts are made to obtain and characterize the intermediate products of decomposition.

The experimental findings and results are critically discussed by comparison with the available literature data on double sulphates and selenates.

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