Spectroscopic and Thermogravimetric Studies of Solid State Ligand to Metal Charge Transfer Complexes

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Charge transfer complexes form an important class of compounds, both from theoretical as well as applied point of view, in chemical and physical sciences. Intense visible colors covering the entire range of visible spectrum is one of the attractive properties of these complexes. Formation of charge transfer complexes have their origin in intraligand (π-π^*), intrametal (d-d), ligand to metal (L-M) or metal to ligand (M-L) electronic transitions.

Solution chemistry of charge transfer complexes is more extensively and intensively investigated but synthesis, characterization and structural investigations of stable charge transfer complexes in solid state is relatively less. In this respect, metal chelates of isomeric juglones (2-hydroxy and 5-hydroxy 1,4-naphthoquinones) with non-transition metals are found to constitute a very interesting class of solid state charge transfer complexes. These chelates possess intense visible colors which are stable in solid state for a long period (several years). They, however lose or largely reduce their colors in solution state. Typical examples of such complexes include alkaline earth metal juglonates and other juglonates with Zn(II), Ae(III), Sn(IV), Pb(IV) etc. indicating that their formation is likely to be accompanied by ligand to metal charge transfer.

Since juglones are biologically important ligands, their chelates with essential metals for life like Mg(II), Ca(II), Zn(II), which are also typical charge transfer complexes, are expected to find, some useful applications in biological sciences.

Some interesting results and conclusions of our recent work on synthesis characterization and structural investigations of alkaline earth juglonates using spectroscopic and thermogravimetric techniques will be presented through this communication.