Summary

In the present thesis, we have developed some low dimensional fluorescent organic materials and AIEE active fluorescent chemosensors based on fluorophore containing Schiff bases for selective determination of biologically and environmentally relevant analytes, such as 2,4,6-Trinitrophenol (TNP) and Al^{3+}, Zn^{2+} in mixed aqueous medium. The major emphasis has given on their synthesis, characterization, photophysical properties and sensing as well AIEE properties. The thesis consists of seven chapters which are summarized below.

Chapter I gives a short introduction on organic low dimensional materials and their synthesis, the fluorescent chemosensors and their signal transduction mechanisms and pathways for selective determination of some cations and explosive of interest. Mostly, the discovery and proposed mechanism of AIEE phenomenon of organic luminogens are well discussed.

Chapter II presents a brief literature survey on AIE/AIEE based low dimensional materials and their potential use as fluorescence chemosensors for some selective analytes. Fluorescence sensing of various nitroaromatics using AIE/AIEE based as well other fluorescent probe and the mechanism of fluorescence sensing have been thoroughly discussed in this chapter. In addition, a brief overview of dual chemosensor for Al (III) and Zn (II) ions has also been presented in this chapter.

Chapter III presents that efficient phosphorescence emission from aggregated hydrosol of Benz(a)anthracene (**P^1**) at room temperature. The large stoke shifted structured emission from aggregated hydrosol of **P^1** has been explained due to phosphorescence emission of **P^1** at room temperature. In the crystalline state, rigidification effect makes the chromophore phosphorescent at room temperature. Computational study also reveals that the neighboring **P^1** molecules are present in parallel slipped conformation in its aggregated crystalline form.

In ***Chapter IV*** demonstrates solvatochromic effect of N,N′-bis(3-pentyl)perylene-3, 4, 9, 10-bis(dicarboximide) [**P^2**] in THF-DMF mixture. The fluorescence spectra of **P^2** in THF show structured emission band and aggregated hydrosol exhibits E-type & Y-type excimer emission. The intense fluorescence

emission property of **P²** is used for sensing the presence of nitroaromatics in the medium. Among the different nitroaromatics, picric acid (PA) strongly quenches the fluorescence emission intensity of **P²**.The mechanism of this quenching has been explained due to ground state complexation between **P²** and PA.

In ***Chapter V*** describes a heteroatom containing antipyrine-based schiff base 4-[(2-Hydroxy-naphthalen-1-ylmethylene)-amino]-1,5-dimethyl-2-phenyl-1,2 dihydro-pyrazol-3-one (**P³**) has been synthesized using one step condensation method. Compound, **P³** is weakly emissive in solution state but strong emission is observed in its aggregated state. This phenomenon is known as aggregation induced emission enhancement (AIEE). The 'turn off' luminescent property of aggregated **P³** hydrosol is used for the selective detection of trace amounts of picric acid in aqueous medium and the fluorescence quenching is explained due to ground state complexation between **P³** and picric acid.

Chapter VI describes novel aggregation induced emission enhancement (AIEE) characteristics of 2-Phenylquinoline (**P⁴**) in its aggregate/solid state. It also allows reversible fluorescence switching in acidic and basic media. The ''turn off'' luminescence property of the aggregated **P⁴** hydrosol in the presence of 2,4,6-trinitrophenol (TNP) is used for the selective detection of trace amounts of TNP in water and the super-amplified fluorescence quenching has been explained as due to ground state complexation between **P⁴** and TNP.

Chapter VII describes the synthesis of simple antipyrine based fluorescent probe, 4-[(2-Hydroxy-3-methoxy-benzylidene)-amino]-1,5-dimethyl-2-phenyl-1,2-dihydro-pyrazol-3-one (**P⁵**) using one step condensation method. It exhibits dual sensing property toward Al^{3+} and Zn^{2+} in presence of other relevant metal ions and also displays novel aggregation induced emission enhancement (AIEE) characteristics in its aggregate/solid state. The 'turn on' luminescent property of **P⁵** is used for the selective detection of trace amounts of Al^{3+} and Zn^{2+} and a significant turn on fluorescence enhancement over ~100-fold is triggered via chelation-enhanced fluorescence (CHEF) through complex formation. The 1:1 stoichiometry of the each sensor metal ion complex is observed from Job's plot.