Department of Chemistry, IIT Madras
Research Proposal Seminar

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Insight into the Characteristics of Aggregation-induced Emission and Emission Enhancement in π-Conjugated Hydrocarbon and Heteroatomic Fluorophores

Conjugated organic luminescent molecules, impregnated with hydrocarbon and heteroatomic fluorophores are emerging class of attractive molecular systems with unique photophysical characteristics. These features enable them for a wide range of applications in optoelectronics, sensing and developing devices which are stimuli responsive.[1] The processing and applicability of such molecular systems exclusively depend upon the crucial selection of fluorophores, allowing pivotal modulations of both electronic and optoelectronic properties, which are prerequisite to make the resultant conjugates emissive in aggregated/solid state. However, rigid, planar and polycyclic fluorophores are highly emissive in dilute solutions but their luminescence efficiency is greatly suppressed in concentrated solutions or in solid state. This is due to spontaneous aggregation where severe face-to-face emplacement amongst the molecules induces delocalization of electrons by several intermolecular interactions and/or dipole-dipole interactions that ultimately lead to excimers or exciplexes, implementing the thorny effect of aggregation caused quenching (ACQ).[2] This damaging effect of ACQ seriously limits the real world applications of π-conjugated organic luminogens until *Tang et al.* and *Park et al.* developed aggregation-induced emission (AIE) and emission enhancement (AIEE) based molecular systems which rather than quenching undergo emission/enhanced emission upon aggregation by mostly exploiting restriction of intramolecular rotation (RIR) mechanism.[3] Although the consequences of AIE-gens have already been well established, endeavour to fluorish an unique self-assembly strategy which can potentially develop the novel AIE-gen from well known ACQ-phores is still unexplored. Therefore it was hypothesized that, attachment of two ACQ-phores with a suitable π-bridge should ignite the ACQ-to-AIE transformation by allowing the resultant geometry for sufficient non-planarity.[4] Again, most of the reported AIEgens disclose the sensory response towards a particular analyte. Hence, it would be highly desirable to hypothesize an unprecedented smart AIEgen, possessing dual stimuli response with high selectivity, sensitivity and rapid response time for the high-tech applications. Subsequently, in this presentation, the mechanistic aspects and overview of AIE/AIEE, based on widespread π-conjugated fluorophores will be discussed in plausible details accomplished with the obtained results established from our laboratory.

References

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