

SUMMARY:

A thesis entitled “FABRICATION OF SOFT MATERIAL VIA SELF ASSEMBLY OF NOVEL AMPHIPHILE AND DEVELOPMENT OF NEW SENSORS” includes six chapters.

Chapter first includes the general introduction about supramolecular self assembly of amphiphiles through non covalent interactions mainly hydrogen bonding, π - π interactions and Vander Waals interactions to construct building blocks and form well defined nanomaterials which embedded in mostly in biological systems. Elaborated about interaction between natural amphiphiles and formation of discrete nanofibers and equate with synthetic amphiphiles. Also, elaborated about molecular sensors and their different applications. Mostly, the importance of aromatic compounds which escorts to constructs building blocks. Moreover, a brief introduction to naphthalenediimide (NDIs) derivatives and more relevant structural properties adequate for supramolecular self-assembly and molecular recognition and also amphiphilic examples of core substituted naphthalenediimides and their implementation in molecular sensors such as cation, anions and pH sensors in live cells.

In the chapter second described about synthetic methods and brief procedures for synthesis of naphthalenediimides, core substituted naphthalenediimide derivatives etc. Included description of characteristics spectral values of each derivative with spectra such as, FT-IR, ^1H NMR, ^{13}C NMR, ESI Mass, HRMS, and CHNS respectively.

Chapter third includes two sections, Section A and Section B; In section A described formation of self assembly materials in the form of microcups and vesicles type nanostructures in mixture of organic solvents methylcyclohexane (MCH) and chloroform (CHCl_3) organic solvent with specific concentration supports to form aggregation. Induced J-type aggregation and exhibits induced emission. The aggregation occurs due to effect of amide linkage to form hydrogen bonding, π - π stacking and polar nature of nitro functional group. The optical study, morphological, FT IR, and XRD, affirmed the formation of nanostructures.

In section B described the liquid crystalline properties of naphthalenediimide derivatives and illustrated the different long alkyl chains and effect of amide linkage which assisted for aggregation in solid film and solution state and observed different alignment of phase. The NDI derivatives with amide linkage exhibits nematic liquid crystal phase assured by liquid crystalline properties by photophysical properties, DSC, POM images and cyclic voltammeter.

Chapter four embedded four sections: Section A: introduce naphthalenediimide based amphiphilic based schiff base to recognize metal ion selectively and colorimetrically for iron (Fe^{3+}) and copper (Cu^{2+}) ions in DMSO solvent as well as mixture of solvent. The selectivity and colorimetric sensitivity of NDI based probe exhibits low detection of limit as followed by WHO. Also studied effect of other counter ions, time dependent and interference of other metal ion in presences of Fe^{3+} and Cu^{2+} ions. The detection of metal ions from the aqueous media admired favorable environment not only living mankind but also animals.

In Section B introduced importance of detection fluoride ion from the drinking water and remedies the dental diseases. Herein, synthesized dipyrrolyl bis sulfonamide based optical and colorimetric sensor to recognize selectively fluoride ion in chloroform as organic solvent supported by photophysical properties, ^1H NMR studies and colorimetric changes.

Whereas, section C and D well described the importance of core substituted naphthalenediimide, its influence in biological systems as pH sensors respectively. Core substituted naphthalenediimide containing free diamine which on acidification enhances the emission intensity which implemented in live cells such as endoplasmic reticulum to detect the pH. While section D includes the core substituted NDI based pH fluorescent sensor for the detection of autophagosomes cells.

Chapter fifth included complete synthetic procedures and spectral data of all synthesized molecules

Ultimately, chapter sixth as an annexure in which described controlled supramolecular self assembly of core substituted tetra alkylated naphthalenediimide via

solvophobic control. We synthesized three naphthalenediimide derivatives to explore its self assembly in mixture of organic solvents (Hexane, chloroform and methanol). The formation of nanostructures like ribbons, donut shaped morphology supported by optical properties, detailed solvent dependent morphological study.