

SUMMARY

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[60]Fullerene (C_{60}) has attracted considerable attention since it was discovered in 1985. Highly hydrophobic [60]fullerene is moderately soluble in non-polar solvents, only sparingly soluble in polar solvents and insoluble in water. The hydrophobic nature of C_{60} and its unique shape render this molecule very interesting for its potential use in superconductors, ferromagnets, lubricants, photoconductors, catalysts, medical materials etc. However, a wider application of [60]fullerene is limited by its poor solubility in aqueous media, especially for biological applications/activities such as enzymatic inhibition, anti-HIV activity, neuroprotection, antibacterial activity, anti allergic, DNA-cleavage and photodynamic therapy.

Formation of host-guest complexes and solubilization by surfactants are one of the most useful approaches to make [60]fullerene water-soluble.

Among the supramolecular structures with noncovalent binding, the guest–host chemistry of fullerenes, specifically [60]fullerene has been a topic of interest for more than a decade. A number of host molecules have been found to form supramolecular structures with [60]fullerene. This thesis contains a study of synthesis of various water-soluble supramolecular complexes of [60]fullerene. With this in view the following synthetic water-soluble host-guest supramolecular systems of [60]fullerene have been studied.

(A) Lysozyme-[60]fullerene adduct

(B) Reverse micelles of [60]fullerene and its microemulsion study

(C) [p-(N, N-Diallylaminomethyl)] Calix[8]arene-[60]fullerene complex

(D) α , β -Cyclodextrin-[60]fullerene Complex

These work is summarized in main four chapters and are as follows.

Chapter 1 gives a brief introduction to the supramolecular chemistry and supramolecular interaction of [60]fullerene with various water-soluble hosts. This chapter also gives information on lysozyme, calixarenes and cyclodextrin which are the host molecules used in this study including micelles is also covered. Some previous studies related to this area of research are also described.

Chapter 2 mainly deals with the experimental work about the synthesis of various water-soluble hosts as well as method for the synthesis of supramolecular complexes of [60]fullerene with lysozyme, water-soluble p-sulfonato calix[8]arene, [p-N, N, diallylamino methy]calix[8]arene and cyclodextrin molecule. Microemulsion study of [60]fullerene is also discussed. It also describes various instrumental techniques used for characterization of the synthesized complexes such as FT-IR, UV-Visible, ¹H-NMR, ¹³C NMR, LC-MS and fluorescence spectroscopy.

Chapter 3 describes the results of the experimental findings and the interpretation of the findings. This discussion also includes evaluation of the results obtain experimentally.

Chapter 4 covers the conclusion related to this study undertaken.

In the last all references collected and studied during the course of the work on the thesis are summarized.