

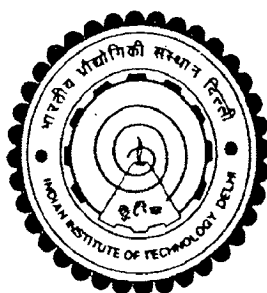
**DESIGN, SYNTHESIS AND STRUCTURAL ASPECTS OF
POLYFUNCTIONAL ORGANOSELENIUM SPECIES AND
THEIR APPLICATIONS**

By
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Department of Chemistry

Submitted

In fulfillment of the requirements of the degree of Doctor of Philosophy
to the



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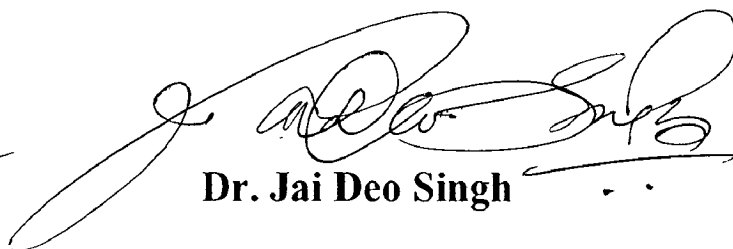
*Dedicated to my family,
whose support and guidance has helped me throughout...*

Certificate

This is to certify that the thesis entitled, 'Design, Synthesis and Structural aspects of Polyfunctional Organoselenium Species and Their Applications', being submitted by Ms. Monika Maheshwari, to the Indian Institute of Technology, Delhi, for the award of degree of 'Doctor of Philosophy in Chemistry', is a bonafide research work carried out by her. Ms. Monika Maheshwari has worked under my guidance and supervision and has fulfilled the requirements for the submission of thesis, which to my knowledge has reached the requisite standard. The results contained in this thesis have not been submitted in part or in full, to any other University or Institute for award of any degree or diploma.

Date:

May 03, 2007



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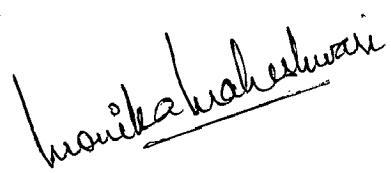
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Monika Maheshwari

ABSTRACT

The thesis entitled '**Design, synthesis and structural aspects of polyfunctional organoselenium species and their applications**' deals with the design and synthesis of new polyfunctional organic species and their potential applications in supramolecular chemistry. The reactions of some species with d^8 , d^9 and d^{10} metal ions have also been investigated with a view to understand the behavior of selenium in a multifunctional hybrid ligand framework.

Chapter I presents a brief overview of recent developments in the field of organoselenium chemistry and describes applications of selenium species in various fields of chemistry including supramolecular, coordination chemistry, materials science, catalysis and biological chemistry.

Chapter II deals with the synthetic strategies and experimental details involved in the preparation of starting materials. This chapter also contains the source of various chemicals used for this work and the physicochemical techniques for e.g. elemental analysis, spectral (IR, ^1H NMR, ^{13}C NMR, ^{77}Se NMR, ES-MS) and single crystal X-ray diffraction studies used throughout the investigation.

Chapter III describes the design and synthesis of bifunctional organoselenium species, with the view that these molecules may also provide conformational mobility and directionality to the donor sites on metal ion interactions. The coordinating molecules have shown their preorganized geometry and offered a simple topology for creating selenium based coordination polymers.

Chapter IV deals with the synthesis of trifunctional organoselenium supported systems. These molecular systems are conformationally rigid bearing central triazine core or

benzene core and trifurcated by arms with selenium as donor sites with limited flexibility. It was assumed that due to their acyclic nature they may exhibit unique properties in terms of both reactivity and structural complexity. However, the results achieved could not provide any immediate potential applications.

Chapter V deals with the synthesis of polyfunctional organic chalcogen compounds that can be well categorized as tri- and tetra-substituted derivatives with different functional nature and donor orientations. A reliable synthetic methodology for the synthesis of these molecular species in high yield under relatively milder conditions has been developed. The tetrasubstituted molecules proved their worth and trapping of Hg^{2+} with a detection limit of 10^{-5} M was an exciting achievement.

Chapter VI deals with the synthesis of highly elusive hexa substituted selenium derivatives which has been ably demonstrated in a straightforward manner by the reaction of RSe^- with hexakis(bromomethyl)benzene along with their applications. The receptivity of Hg^{2+} and discrimination of other metal ions such as Ag^+ , Cd^{2+} , Co^{2+} , Zn^{2+} , Pb^{2+} , Cr^{3+} , Ni^{2+} , Cu^{2+} , and Mn^{2+} was the prime achievement for this system. The exclusive recognition of Hg^{2+} in presence of first row transition metals has revealed their technological significance in the fabrication of ion selective electrodes for Hg^{2+} species. The molecules of present study have also shown their promising potential application in supramolecular organization process either through M-L coordination or via self-assembly process (Se...Se interactions) and the results obtained are discussed herein.

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