STUDIES ON MULTIFUNCTIONAL ORGANOCHALCOGEN DONORS WITH VARIABLE DONOR ABILITY AND THEIR REACTIVITY

by

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Submitted

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to the

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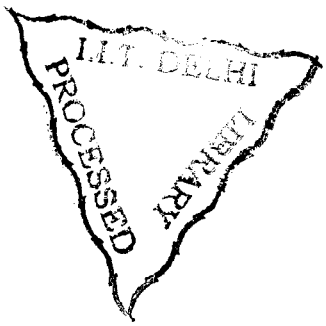
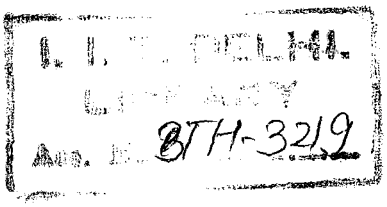
organochalcogen
chalcogen





Dedicated to my friend

Dear Kannu

I miss you but you will be alive in my Heart forever

Lt. Kanavdeep Singh, Popularly known as Lt. K, D. Singh amongst his colleagues, of 10 Sikh Light Infantry who sacrificed his life during an encounter with militants at Guraj sector in Jammu and Kashmir on September 23, 2003 (Tuesday). Lt. Kanavdeep Singh have posthumously been awarded Kirti Chakra, the nation's second highest peacetime gallantry award on the occasion of Independence day, August 15, 2004 for his dare-devil feats against militants in Jammu and Kashmir.

And

My Beloved Parents

Certificate

This is to certify that the thesis entitled "Studies on Multifunctional Organochalcogen Donors with Variable Donor ability and their Reactivity" by Mr. Sarbjot Singh Sokhi, to the Indian Institute of Technology, Delhi, for the award of degree of 'Doctor of Philosophy' in chemistry, is a record of bonafide research work carried by him. Mr. Sarbjot Singh Sokhi has work under my guidance and supervision and has fidfilled the requirements for the submission of the thesis, which to my knowledge has reached the requisite standard.

The results contained in the thesis have not been submitted in part or in full, to any other University or institute for the award of any degree or diploma.

Date March 01, 2005

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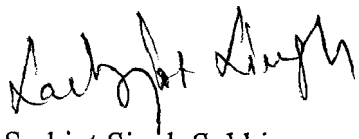

Sarbjot Singh Sokhi

ABSTRACT

The thesis entitled **'Studies on Multifunctional Organochalcogen Donors with Variable Donor ability and their Reactivity'** deals with the synthesis of rationally designed organochalcogen donors bearing heteroatoms of variable donor ability and capacity. Efforts has also been made to examine the reactivity of these donor molecules towards Cu(I), Ag(I), Cd(II), Hg(II), Pd(II) and Pt(II) species to establish structure-property relationships. Furthermore the designed molecules of the present studies also provide a unique opportunity of combining both organic and inorganic interactions in single molecular systems.

Chapter 1 discusses the recent advances made in the field of organochalcogen donors with special reference to design and synthesis of multifunctional organochalcogen donors with critical literature survey and important applications of organochalcogen species in diverse areas.

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 various physicochemical techniques for e.g. elemental analysis, spectral (IR, ^{1}HNMR, ^{13}CNMR and ES-MS) and single crystal X-ray diffraction studies used throughout the investigation and characterization of newly synthesized derivatives.

Chapter III deals with the design and synthesis of organochalcogen donors bearing variable donor (ENE) (E= Se or Te), (EN-EN) (E= S or Se) and (EN-N-EN) (E = S or Se) functionalities with a view to examine their coordination behavior towards M^{2+} species for understanding the design aspects.

Chapter IV deals with the design and synthesis of organochalcogen based trifunctional donors. It also deals with a new and versatile and high yielding method for the construction of an aryl-heteroatom (C-S) and (C-Se) bonds by preparing novel classes of 2,4,6-tris(arylchalcogeno)-1,3,5-triazines and 1,3,5-tris(arylchalcogeno)-2,4,6-trimethylbenzenes. The robust natures of these donors have also been demonstrated.

Chapter V deals with the design and synthesis of flexible tripodal ligands with potentially tetradentate ligands (heptadentate ?) bearing $N(NS)_3$ and $N(NSe)_3$ donor functionalities and their reactivites towards Cu(I), Ag(I) and Cd(II) metal ions. The structures of both ligands and complexes might be the subject of interest to examine the electron-transfer rates of copper (II/I) systems and may be used as a model compound.

In **Chapter VI**, deals with the synthesis of organochalcogen (S and Se) donors in the form of multifunctional arrays (tetra- and hexa functionalized in nature) as building blocks. Here we have also ably demonstrated the synthetic methodology for the formation of highly elusive multi-chalcogen aromatic compounds. We have also succeeded in obtaining metallosupramolecular species with Ag(I) and Hg(II) species. It can be suggested that the ligand design can be used to generate specific ring sizes controlling the extended metal coordination sphere and localised framework topology.

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