

Professor Harkesh B. Singh

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Date of Birth March 1, 1956. Basti (U.P.)

Education

1980-1983 Ph.D. Organometallic Chemistry
Research Advisor : Professor W.R. McWhinnie
Title: "Charge-Transfer in Organotellurium Chemistry"
Aston University, Birmingham, England

1976-1979 Ph.D. Organometallic Chemistry
Research Advisor : Professor T.N. Srivastava
Title: "Studies on Organotellurium Pseudohalides and
related Derivatives" Lucknow University, Lucknow
(Submitted in 1979, awarded in 1984)

1974-1976 M.Sc. Inorganic Chemistry, Lucknow University
(Stood second in order of merit)

1972-1974 B.Sc. Lucknow University, Lucknow

Awards/Fellowships

1. National Scholarship for Studies Abroad by Ministry of Education, New Delhi 1979.
2. BOYS CAST Award by Department of Science and Technology, 1988.
3. Awarded the Royal Society of Chemistry Journal Grants for International Authors 1997.
4. Plenary lecture on Organochalcogen Chemistry at the 8th International Conference on the Chemistry of Selenium and Tellurium (8-ICCST) Brazil, Aug., 6-11, 2000.
5. Dr. Singh's, 1st Chem. Commun. Paper (J. Chem. Soc., Chem. Commun. 1991, 952) has been cited in Applied Highlight Section of British Journal "Chemistry and Industry" (Page 804, 1991).
6. Elected Fellow of The National Academy of Sciences, (FNASc.) Allahabad, India, 1998

7. Elected Fellow of the Royal Society of Chemistry (CChem, FRSC), 1999.
8. UGC - Hari Om Trust's C. V. Raman award for 2001.
9. Chemical Research Society of India, Bronze Medal, 2003.
10. Advisory Board Member of Chemistry Letters published by Chemical Society of Japan since **2005-2008** and **2010-2018**.
11. Guest Editor, Proceedings of the Ninth International Conference on the Chemistry of Selenium and Tellurium (ICCST-9) published in Phosphorus, Sulfur, Silicon and the Related Elements, Vol 180, Numbers 3-4 (2005).
12. Awarded Ramanna Fellowship (DST) (**2006**) and (**2010**).
13. Elected Fellow of the Indian Academy of Sciences (FASc), 2007
14. Plenary lecture on Organochalocogen Chemistry at ICCST-10, 2007, Lodz, Poland
15. Dharamsi Morarji Chemical Co. Visiting Fellowship in Chemistry, 2007-2008, UICT Mumbai
16. The IIT Bombay Research Paper Award for the Year 2010
17. Institute Chair Professorship from June 2011-, Renamed as Biswas-Palepu Distinguished Chair Professor, Department of Chemistry, IIT Bombay
18. Awarded CRSI Silver Medal 2012
19. Selected for HAG scale in 2012 with effect from 18th August 2009
20. Elected Fellow of the Indian National Science Academy (FNA) New Delhi, India, 2012
21. Invited to join the Advisory Board of American Society Journal Organometallics, **2012-2015**
22. The IIT Bombay Review Paper Award for the Year 2011
23. Prof. S.C. Bhattacharya Award for Excellence in Pure Sciences 2012, IIT Bombay
24. J C Bose National Fellowship DST, New Delhi 2015
25. Invited for Sakura Exchange Program, Tokai University, JST Japan, October 3rd-24th, 2015
26. The IIT Bombay Review Paper Award for the Year 2015

Memberships/Committees

1. Member, Program Advisory Committee (PAC), Inorganic Chemistry, Department of Science and Technology (DST), New Delhi, since **1998-2004**.
2. Member, Program Advisory Committee (PAC), Inorganic Chemistry, Department of Science and Technology (DST), New Delhi, since **2007-2012**.

3. Member, Expert Committee of Fast Track Young scientists Scheme in Chemical Sciences Department of Science and Technology (DST), since **2005-2008**.
4. Member of the International Advisory Board and Chairman, organizing committee for International Conference on the Chemistry of Selenium and Tellurium (ICCST-9) since 2000 and Chairman, organizing committee for International Conference on the Chemistry of Selenium and Tellurium (ICCST-9) held at IIT Bombay, Feb'2004.
5. Member, Council of Chemical Research Society of India (March 2005-2008).
6. Convener, First SERC funded Winter-School on Main Group Chemistry organized at IIT Bombay, March 18 – 30, 2002.
7. Life Fellow of the Indian Chemical Society, Calcutta.
8. Member, Board of Studies, Chemistry Department, Bombay University, 1993-1995 and 2002-todate.
9. Member, Board of Studies, Applied Chemistry, Institute of Technology, Banaras Hindu University (1997-2000).
10. Member Advisory Committee, Special Assistance Programme (SAP), UGC, Department of Chemistry, University of Dharwad.
11. Member, Project Review Committee, DMSRDE, Kanpur.
12. Member, Board of Studies, M. S. University, Baroda, 2002-2005.
13. UGC nominee for Advisory Committee of Center of Advanced Studies –under Special Assistance Program (SAP), Department of Chemistry, University of Rajasthan, Jaipur (since 2005-2010).
14. UGC nominee for SAP, Department of Chemistry, University of Madras (2005).
15. UGC nominee for SAP, Department of Chemistry, University of Pune (2006-2009).
16. Member, Orientation cum Selection Camp in Chemistry 2008, HBCSE, Bombay.
17. Member, sub-committee, Basic Sciences, Chemistry, BRNS 2009-
18. Member, Academic Board, Department of Chemistry, University of Mumbai 2009-
19. Member, Syllabus committee, M. Sc. Green Chemistry Central University of Rajasthan Jaipur 2010.
20. Chairman MACP (Group-A) Board, IIT Bombay January 2012-
21. Member, Chemical Sciences Committee for Swarna-Jayanti Fellowship Award (DST) 2012,2017
22. Member, IRCC Advisory Committee, IIT Bombay 2013-2014
23. Member Advisory Committee, Special Assistance Programme (SAP), UGC, Department of Chemistry, University of Dharwad 2013-16

24. Member Sectional Committee-03 (Chemical Sciences) INSA 2014-2016
25. **Convener**, Sectional Committee-03 (Chemical Sciences) INSA 2016
26. **Member**, Empowered Committee of Science & Engineering Board (SERB), 2015-2019.
27. **Guest Editor** for Dalton Transactions for **Themed** issue on p-block elements 2019.
28. **Chairman** Task Force Committee for Empowerment and Equity Opportunities for Excellence in Science (EMEQ) 2019

PROFESSIONAL EXPERIENCE

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|---------------------------|---|
| 1980 (Jan.)-1983 (Oct) | Research/Demonstrator, Department of Chemistry, Aston University, Birmingham, England. |
| 1984 (Jan.)-1984 (July) | Pool Scientist, working with Professor B.L. Khandelwal, Indian Institute of Technology, Delhi. |
| 1984 (July) -.1987 (Nov.) | Lecturer, Department of Chemistry, Indian Institute of Technology, Bombay. |
| 1987 (Nov.)-1990 (Nov.) | Assistant Professor, Department of Chemistry, Indian Institute of Technology, Bombay. |
| 1988 (June)- 1988 (Dec.) | Visiting Research Scientist at Institute for Polymers and Organic Solids, Department of Chemistry / Physics (Professor Fred Wudl's Lab.), University of California, Santa Barbara, USA. |
| 1990 (Nov.)- 1995 (Aug.) | Associate Professor, Department of Chemistry, Indian Institute of Technology, Bombay. |
| 1995 (Aug.) | Professor, Department of Chemistry, Indian Institute of Technology, Bombay. |
| 2011 | Chair Professor and HAG scale |

TEACHING ACTIVITIES:

New UG Courses Developed:

Prof. P. Mathur and I have introduced a M.Sc.level course on Organometallic chemistry, (CH 547, Organometallic Chemistry).

As Instructor in-Charge of the B.Tech first year course I have updated and developed the course in 1998, (CH 102, Chemistry II) (Spring).

New PG Courses Developed:

CH 826/CH.578, Topics in Chemistry: As part of this course I have introduced a topic on 'Synthetic Metals' (13-14 lectures per semester). This topic deals with the recent developments in the area of Molecular Conductors and Superconductors.

New Laboratory experiments introduced:

I have been associated with modernisation of almost all Inorganic Laboratory Courses. In particular, I have introduced experiments on the preparation and characterisation of standard organometallic compounds to the M.Sc. students. These include, experiments on (a) allylpalladium chloride, ferrocene (CH 513L) and dichloro(1,5-cyclooctadien)palladium (II) (CH 432L). In addition, an experiment on the preparation and resolution of optically active cobalt complexes has been introduced to the M.Sc. final year students.

Main courses Taught: CH 101/102/103 (Chemistry 1), CH 206 (Principles of Analytical Chemistry), CH 437 (Chemistry of Transition Metals), CH 438 Chemistry of Main Group Elements), CH 547 (Organometallic Chemistry), CH 827 (Advanced Coordination Chemistry)

LABORATORY DEVELOPED:

I have developed a fairly good research laboratory for Synthetic Organometallic Chemistry. This has most of the commonly required facilities such as Controlled Atmosphere Box, N₂ /Vac double line etc. In addition, facilities for room temperature and low temperature solid state conductivity measurements, electrochemical synthesis, cyclic voltammetry and crystal growth have been generated. These include procurement of a good Electrometer, Programmable Current Source, Automatic Temperature Controller and Cyclic Voltammetry equipment.

RESEARCH AND DEVELOPMENT ACTIVITIES:

List of M.Sc., /B.Tech., Home Paper/Project supervised:

1. Ajit R. Pradhan, (1986), M.Sc. Thesis Title: "Charge- Transfer Complexes from Cyclic Tellurides and Ditellurides".
2. Rachna Malhotra (1992), M.Sc. Thesis title: "Synthesis of Organometallic Precursors for Metal-Organic Chemical Vapour Deposition (MOCVD) of Hg-Te".
3. Shashi Vyas (1997), M.Sc. Thesis title: "Organoselenium Compounds with Thiol Peroxidase Activity".
4. Sandeep Apte (1999), M.Sc. Thesis title: "Palladium Catalysed Cross-Coupling Reactions between Organoselenides and Alkenes".
5. Kunal Chakrapani (1999), M.Sc. Thesis title: "Catalytic Oxyselenenylation-Elimination Reaction using Diorgano Diselenides".
6. Rashmi Mashram (1999), M.Sc. Thesis title: "Studies on Redox Active Dichalcogenides as Glutathione Peroxidase Mimics".
7. Mohan Singh (2000) M.Sc. Thesis title: "New selenium electrophiles for oxyselenylation reactions".
8. Gomathy Chandrashekhara (2000) M.Sc. Thesis title: "Novel Organochalcogens for Cross-Coupling Reactions".
9. P. S. S. Babu (2001) M.Sc. Thesis title. "Novel Complexes of Organotellurium Reagents for Cross-Coupling Reactions".
10. Arnab Mukherjee (2003) M.Sc. Thesis title: "Synthesis of Organoselenium compounds with Se...X (X = Cl, S) Intramolecular Coordination"
11. Matibur Rahaman Zamadar (2005) "Synthesis of Organoselenium Compounds with Intramolecular Interaction".
12. Debasis Banerjee (2006) "Chemistry of Molecular Selenium and Tellurium"
13. Sayantani Das (2006) "The Chemistry of Selenadiazoles"
14. Goutam Mukherjee (2007) "The Chemistry of Selenadiazoles"
15. Shreyashi Goswami (2008) "The Chemistry of Telluradiazoles"
16. Chandrasekar Ganguri (2009) "The Chemistry of Selenadiazoles"
17. Bithika Sarkar (2010) Cyclometallated Derivatives of Azobenzene
18. Ganga Halder (2011) Studies on Redox Properties of Benzoselenadiazole and Pyridineselenadiazole

19. Sumit P. Mane (2012)
20. Nabhendu Pal (2014)
21. Kaushik Chokobarty (2014)
22. Bijoy Dey (2015)
23. Sudeep Chaurasia (2015)
24. Diptarka Mandal (2015)
25. Manideepa Dhar (2016)
26. Vinod Yadav (2016)
27. SAYANTAN DAS (2017)
28. SURAJIT DAS (2017)
29. BADAL BEHERA (2018)
30. MANISH KUMAR (2018)
31. ANKIT DHYAL (2019)
32. RAJESH MAURYA (2019)

Supervision of Candidates for M.Tech.

1. Rajveni Vindyal (July 1989-91) Jointly with Dr. R. Srinivasa of Mateial Science centre. M.Tech Thesis title: “Synthesis of Cadmium Telluride -Mercury Telluride Through Stoichiometric Organometallic Precursors”.

List of Ph.D. Thesis supervised:

1. Pawan K. Khanna (July 1984-Sept. 1989). Ph.D.Thesis Title: “Synthesis and Reactions of Ditellurides and Tellurides”.
2. N. Sudha (July 1985 - July 1989). Ph.D. Thesis Title: “Studies on Organotellurium Derivatives of Synthetic Importance: Aryltellurenyl Halides and Telluronium Salts”.
3. S. Kalyan Kumar (Jan 1986 - Dec. 1991).Ph.D. Thesis Title: “Synthesis and Characterisation of Organochalcogen π - Donors”.
4. A. Regini (Jan. 1987 - Jan. 1992). Ph.D. Thesis Title : “Synthesis of Organotransition Metal Complexes with Tellurium Ligands”.
5. K. Rani (Jan. 1988-1993). Ph.D. Thesis Title: “Synthesis and Characterisation of Square Planar Transition Metal Dichalcogenes”.

6. Rupinder Kaur (July 1991 to Jan. 1996). Ph.D. Thesis Title: "Intramolecularly Stabilized Organochalcogen (Se, Te) Ligands: Synthesis, Structure and Reactivity".
7. Saija C. Menon (July 1991 to July 1996) Ph.D. Thesis Title: "Synthesis, Structure and Reactivity of Novel Tellurium Ligands".
8. E.V.K. Suresh Kumar (July 1993 to Feb. 1998) Ph.D. Thesis Title: "Synthesis and Characterisation of Dithiaheterocycle-Annulated Tetrathiafulvalene Derivatives".
9. G. Mugesh (July 1994 to July 1998) Ph.D. Thesis Title: "Studies on Novel Organochalcogen Derivatives; Synthesis, Structure, Reactivity and Biomimetic Activity".
10. Arunashree Panda (Jan 1995 to Dec. 99 Ph.D. Thesis Title: "Novel Organochalcogen Derivatives : Ligands, Reagents and Thiol Peroxidase Mimics".
11. Sanjio, S. Zade, (Dec. 1999 - 2004) Title of Ph.D. Thesis: "Novel Organoselenium Ligands: Role in Organic Synthesis".
12. K. Kandasamy, (July 1999 - 2004) Title of Ph.D. Thesis: "Synthesis of Lanthanide Chalcogenolates as MOCVD Precursors".
13. Snigdha Panda, (July 1999 - 2004) Title of Ph.D. Thesis: "Studies on Chalcogen Containing Macrocycles".
14. Sangit Kumar, (July 1999 -2004) Title of Ph.D. Thesis: "Biomimetic Studies of Novel Organochalcogen Derivatives".
15. Upali Patel, (July 2000-2005) Title of thesis "Studies on Organochalcogen Macrocycles"
16. Sagar Sharma (July 2004-2009 Dec)
17. Kriti Srivastava (Jan 2005-2010 Jan)
18. K. Selvakumar (Jan 2005- May 2010)
19. Tapash Chakraborty (Jan 2005-May 2010)
20. Vijay Pal Singh (Jan 2006-May 2011)
21. Sudesh T. Manjare (July 2006-2011)
22. Prakul Rakesh (July 2006-2012)
23. Poonam Shah (July 2007-2013)
24. Shikha Das (July 2009-2015 Jan)
25. Sangeeta Yadav (July 2010-2015)
26. Anand Kumar Gupta (July 2010-2016)
27. K. Satheeshkumar (July 2011-17)
28. Varsha Tuteja (July 2011-17)
29. K. Venkateshwaran (July 2011-17)
30. S. Aravindhhan (July 2012-2017)

31. Rajesh Deka (July 2013-2018)
32. Ram Prakash Gokula (July 2015-April 2019)
33. R. Saravanan (July 2012-2019)

Ph. D. Students under supervision

34. Shakti Kumar Maurya (July 2015-)
35. Abhishek Tiwari (Jan 2016-)

Post-Doctoral Fellows /Research Assistants

1. Dr. S. Kalyankumar (1991)
2. Dr. Jai Deo Singh (1990-93)
3. Dr. N. Sudha (1994)
4. Dr. Saija C. Menon (1996-97)
5. Dr. G. Mugesh (1998-1999)
6. Dr. Arunashree Panda (Feb.2000-July 2000)
7. Dr. Santosh Kumar Tripathi (July 2001-Sep 2004)
8. Sandeep Apte (July 1999-May 2000)
9. Anna Mukharjee (Nov.1999-May 2000)
10. Urmila Patil (July 1999-May 2000)
11. Dr. Rajesh Baligar (August 2005- June 2007)
12. Goutam Mukherjee (May 2007-Dec 2007)
13. Dr. Sagar Sharma (March 2010-Sep 2010)
14. Dr. Kriti Srivastava (Sep 2010- Feb 2011)
15. Dr. K. Selvakumar (April 2010-October 2011)
16. Dr. Puspendra Singh (August 2010- April 2013)
17. Dr Ninad Ghavale (May 2011-March 2013)
18. Dr. Sudesh Manjare (October 2011- January 2013)
19. Dr. Kandasamy Gopal (October 2011-October 2013)
20. Diptarka Mandal (July 2015-June 2016)

21. Rajesh Deka (July 2019-)

22. Saravanan R. (December 2019-)

Sponsored Research Projects:

- 1 Title: New organic conductors and superconductors based on tellurium materials. Funding agency: BRNS, DAE. Grant - in - aid: Rs. 2,40,000/ (Jan. 1986 - Sept. 1989).
- 2 Title: Synthesis of low-dimensional conductors based on bis(ditellurole) metal anions where metal = Ni, Pd, Pt. Funding agency : CSIR , New Delhi Grant-in-aid: Rs. 3,59,800/- (Jan, 1986 - March 1989).
- 3 Title: Design, synthesis and characterisation of molecular conductors and superconductors. Funding agency : DST, Delhi Grant-in-aid: 5,74,706/- (June 1990 - June 94)
- 4 Title: Asymmetric catalysis: Role of tellurium ligands: Funding Agency: CSIR, New Delhi Grant-in-aid: 2,70,000/- (July 93 to Feb. 1997).
- 5 Title: Synthesis and characterisation of Gr. II-VI stoichiometric organometallics. Funding Agency: BRNS, DAE Grant-in-aid: 2,75,000/- (July 1994 to July 1998).
- 6 Title: Organochalcogen (Se/Te) Derivatives with Glutathione Peroxidase-like Activity, Royal Society of Chemistry, £500 (1997).
- 7 Title: Novel Ferrocene Derived Diselenides as Glutathione Peroxidase Mimics, Royal Society of Chemistry, £1000 (1998).
- 8 Title: Synthesis of Novel Organochalcogen Ligands and Their Applications in Organic Synthesis.Catalysis, DST, 15, 00, 000/- (July 1998 - 2002).
- 9 Title: Synthesis and Characterization of Single Source Precursors for the Preparation of Group II-VI semiconductor Materials Using MOCVD Technique, BRNS, 22, 00, 000/- (July 1999 - 2002).
- 10 Title: New Stable Reagents for the Synthesis of MOCVD Precursors Containing Metal-Chalcogen (Se/Te) Bonds, DMSRDE, Kanpur, 10, 00, 000/- (March 2000 onwards).
- 11 Title: “Synthesis of Novel Organochalcogens Stabilized by Intramolecular Chelation”, DST, 20 Lakhs (January 2003 –August 2006)
- 12 Title: “Synthesis and characterization of stable monomeric trivalent/divalent lanthanide chalcogenolates as a single source precursors for the preparation of lanthanide chalcogenides LnE_x (E = S, Se, Te)”, CSIR, 10 lakhs (February 2004- March 2007)
- 13 Title: Ramanna Fellowship , DST, 35 lakhs , (Jan 2007-Jan 2010)

- 14 Title: Synthesis, structure and stereochemical non-rigidity of organotellurium compounds with intramolecular coordination of hypervalent type; their use in synthesis of novel heterocycles” Indo-Russian Project, DST, 24 lakhs (March 2009- March 2011)
- 15 Title: Role of intramolecular coordination in isolation of novel organochalcogen and organomercury compounds: Selenium cations, telluroxanes and metallamacrocycles”, DST 33 lakhs, (March 2010- March 2013)
- 16 Title: Synthesis and Characterisation of L-Tellurocystein and related derivatives” Ramanna Fellowship DST ~ 35 Lakhs (Dec 2010-October 2013)
- 17 Title: “Cyclopalladated and -cuprated organochalcogen catalysts” IRCC IIT Bombay 5 Lakhs (March 2012)
- 18 Title: “Ligand chemistry of nitrenium ion” IRCC IIT Bombay 5 Lakhs (January 2013)
- 19 Title: ‘Organometallic Chemistry’ IRCC, IIT Bombay 5 Lakhs (April 2014)
- 20 Title: “ Organochalcogen Chemistry” J. C. Bose Fellowship DST 89 lakhs (July 2015-2020)

Industrial interaction on an individual basis

1. Project title: 2 Mercaptobenzothiazole. Funding agency: M/s. E. Merck (India) Ltd. Grant-in-aid: Rs. 10,000/- (April 1991 July 1991)
2. Project Title: Development of a complex chelate of a mixture of amino acids. Funding Agency: Refnol, Resins and Chemicals Limited, Ahmedabad. Grant-in-Aid: Rs. 21,472 (July 1993-Dec. 1993) (Co-PI, Dr. C.P. Rao).

Group efforts with colleagues and students in research, design development and consultancy, if any:

I am actively collaborating with the following groups:

1. MOCVD project: We are working on a long term collaborative research on MOCVD of Gr II-VI semiconductors with Dr. S. K. Kulshreshtha and Dr. R. P. Patel, BARC.
2. Molecular Materials: Our group is actively collaborating with Dr. J.V. Yakhmi of TPPED Division, BARC on Molecular Materials such as molecular metals, superconductors and ferromagnets.
3. X-Ray Crystallography: To study structure-property correlation in organochalcogen derivatives, I have very good interaction with Prof. R.J. Butcher, Howard University,

Washington, D.C., Gotthelf Wolmershäuser, Universität Kaiserslautern, Kaiserslautern, Germany and Dr. R.P. Patel, Chemistry Division, BARC and Prof U. P. Singh IIT Roorkee.

4. Biochemistry: To study glutathione peroxidase activity of organochalcogen compounds, our group has a strong interaction with Prof. N. S. Punekar, Biotechnology Centre, IIT, Bombay.
5. Theoretical Chemistry: Our group is actively collaborating with Prof R. B. Sunoj of Chemistry Department.

RESEARCH PUBLICATIONS OF H. B. SINGH

1. T. N. Srivastava, R. C. Srivastava and H. B. Singh, 'Organotellurium Derivatives: Telluracyclohexane Dihalides, Pseudohalides and Carboxylates'
Indian J. Chem., 18A, 71 (1979).
2. T. N. Srivastava, R. C. Srivastava, H. B. Singh and M. Singh, 'Organotellurium Derivatives: Part II- Telluracyclopentane Halides, Pseudohalides and Carboxylates'
Indian J. Chem., 18A, 367 (1979).
3. T. N. Srivastava, M. Singh and H. B. Singh, 'Complexes of Organotellurium Halides with N, P, O and S donors'
Indian J. Chem., 21A, 307 (1982).
4. H. B. Singh, W. R. McWhinnie, R. F. Ziolo and C. H. W. Jones, 'Donor-Acceptor Complexes of Organotellurium Compounds: Physical Studies ^{125}Te Mossbauer for the measure of Charge-transfer: Crystal and Molecular Structure of Dibenzotellurophene: 7,7,8,8-Tetracyanoquinodimethane
J. Chem. Soc., Dalton Trans., 1267 (1984).
5. H. B. Singh, W. R. McWhinnie, T. A. Hamor and R. H. Jones, 'Synthesis and Chemistry of 1,3-Dihydrotelluro(3,4-b)-quinoxaline and Derivatives: Crystal and Molecular of 1,3-Dihydro-2,2-diiodo-2,4-telluro(3,4-b)-quinoxaline: 2,3-Bis (iodomethyl)-quinoxaline (1:1)', **J. Chem. Soc. Dalton Trans.**, 23 (1984).
6. H. B. Singh and W. R. McWhinnie, 'The Electrochemical Oxidation of 3,4-Benzo-1-telluracyclopentane'
J. Organomet. Chem., **264**, 305 (1984).
7. A. E. McCarthy and H. B. Singh, 'The crystal and Molecular Structure of 3,4 quinoxaline-1-telluracyclopentane, $\text{C}_{10}\text{H}_8\text{N}_2\text{Te}$ '
J. Organomet. Chem, **275**, 57 (1984).
8. H. B. Singh and W. R. McWhinnie, 'Mercurated and Tellurated Schiff Bases and Phenylhydrazones'
J. Chem. Soc., Dalton Trans., 821 (1985).
9. B. L. Khandelwal, A. K. Singh, H. B. Singh, K. M. Prasad, N. S. Bhandari and W. R. McWhinnie, 'Triphenyltelluronium- β -Diketonates: Synthesis and Spectra'
J. Organomet. Chem., **291**, 185 (1985).
10. H. B. Singh, P. K. Khanna and S. Kalyan Kumar, 'Charge-Transfer Complexes : Synthesis of 3,5-Naphtho-1-telluracyclohexane, A New Electron Donor'
J. Organomet. Chem., **338**, 1 (1988).

11. H. B. Singh, P. K. Khanna, 'Synthesis of 1,2- Ditellurane'
J. Organomet. Chem., **338**, 9 (1988).
12. H. B. Singh and N. Sudha, 'Facile Reaction of Te-Arylbenzene- carbotellurolates, ArCOTeAr, with Methyl Iodide and Halogens'
Bull. Chem. Soc., Jpn., **61**, 3735 (1988).
13. E. W. Abel, M. A. Beckett, K. G. Orrell, V. Sik and D. Stephenson, H. B. Singh and N. Sudha, 'Interaction of the Diphenyldichalcogens, C₆H₅EEC₆H₅(E=S,Se and Te), with the Tetrameric Halogenotrimethylplatinums. The Formation and Characterisation of [{PtX(CH₃)₂C₆H₅EEC₆H₅] (X=Br and I) and a Dynammic Nuclear Magnetic Resonance Study of [{PtI(CH₃)₂C₆H₅EEC₆H_{5**Polyhedron**, **7**, 1169 (1988).}
14. H. B. Singh and F. Wudl, 'Reaction of Tellurium with Phenylacetylene: A Reinvestigation', **Tetrahedron Lett.**, **30**, 441 (1989).
15. H. B. Singh, R. H. Jacobson, K. Hinkelman and F. Wudl, 'Synthesis and Characterisation of the Bis(3,4-thimethyl-2,6-dithioacetylacetonate) complexes [MS₂C₃H(SCH₃)₂] (M=Ni, Pd, Pt): Crystal Structure of [NiS₂C₃H(SCH₃)₂]'
Inorg. Chem., **28** 4221 (1989).
16. H. B. Singh, N. Sudha, A. A. West and T. A. Hamor, 'Ortho-tellurated Derivatives of N,N-dimethylbenzylamine: Crystal and Molecular Structures of 2-N,N-Dimethylbenzylamine-C,N'tellurium (IV) tribromide and (2-N,N-Dimethylbenzylamine-C,N')-tellurium(Bu) dichloride.HCl'
J. Chem. Soc., Dalton Trans., 907 (1990).
17. A. Haaland, A. Hammel, H. Thomassen, H. V. Volden, H. B. Singh and P. K Khanna, 'The Molecular Structures of Hexamethyldistannane, (CH₃)₆Sn₂, and Dimethylditellurane (CH₃)₆Te₂ by Gas Electron Diffraction'
Z. Naturforsch. Teil B, **45**, 1143, (1990).
18. S. Kalyan Kumar, H. B. Singh, K. Das and U. C. Sinha, 'Synthesis and Structure of Di-2-benzo[b]thienyl Ditelluride'
J. Organomet. Chem., **397**, 161 (1990).
19. H. B. Singh and S. Kalyan Kumar, 'Synthesis of Novel Organoselenium-Sulphur Heterocycle: Dibenzo-1,2,5-dithiselenepin'
J. Chem. Res. (S) 332 (1990).
20. H. B. Singh and N. Sudha, 'Cyclotellurated Derivatives of 2-(3-Thienyl) pyridine',
J. Organomet., Chem., **397**, 153 (1990).

21. P. K. Khanna and H. B. Singh, 'Synthesis and Characterisation of Palladium Complexes with some Tellurium Heterocycles'
Trans. Met. Chem., **16**, 311 (1991).
22. S. Kalyan Kumar, P. K. Khanna and H. B. Singh, 'Study of the Donor Properties of some Cyclic Tellurides and 1,8-(Thiomethylnaphthalene)-1,3-dithiole-2-thione towards 2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (DDQ)'
Ind. J. Chem., **30A**, 720 (1991).
23. S. Kalyan Kumar, H. B. Singh, K. Das, U. C. Sinha and A. Mishnev, 'Bis-(Naphthalene)-1,8-diylbis(methylthio)-tetrathiafulvalene (BMMT-TTF) and bis(tetramethylenedithio)-tetrathiafulvalene (BMDT-TTF) : New Electron Donors'
J. Chem. Soc., Chem. Commun., 952 (1991).
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207. Rajesh Deka, Arup Sarkar, Ray J. Butcher, Peter C. Junk, David R. Turner, Glen B. Deacon, Harkesh B. Singh., “Exploring the Role of Strong Intramolecular Coordination of 2-(2'-pyridyl)phenyl Group in Heavy Main Group Halides: Insights from Synthesis, Structural, and Bonding Analyses” *Eur. J. Inorg. Chem.* **2020**, 22, 2143-2152.
208. Anand Gupta, Rajesh Deka, Harkesh B. Singh, and Ray J. Butcher “Structural characterization of the derivatives of bis[2,6-(dimethylamino)methylphenyl]selenide with Pd(II) and Hg(II)” *Acta Cryst.* **2020**, C76, 828-835.
209. Saravanan R., Ray J. Butcher, Harkesh B. Singh, “Isolation and structure of an 18-membered macrocycle containing two diselenide linkages and its precursor”, *Acta Cryst.* **2019**, C75, 336-341.
210. Saravanan R., Ray J. Butcher, Harkesh B. Singh, “Metallophilic interactions: observations of the shortest metallophilic interactions between closed shell ($d^{10}\cdots d^{10}$, $d^{10}\cdots d^8$, $d^8\cdots d^8$) metal ions [M \cdots M' M = Hg(II) and Pd(II) and M' = Cu(I), Ag(I), Au(I), and Pd(II)], *Dalton Trans.*, **2020**, 49, 9099-9117.
211. Anand Gupta, Rajesh Deka, Harkesh B. Singh, and Ray J. Butcher “Structure of a diorganotelluroxonium(IV) cation, {[2,6-(CH₂NMe₂)₂C₆H₃Te(μ -O)]₂}²⁺, with the tri-chlorido-(dimethyl sulfoxide)-palladium(II) anion, *Acta Cryst.* **2020**, E76, 1520-1524.
212. Rajesh Deka, Anand Gupta, Arup Sarkar, Harkesh B. Singh, R. J. Butcher, R. “Halogenation Reactions of Heteroleptic Diorganotelluride [2,6-(Me₂NCH₂)₂C₆H₃]TeⁿBu: Synthesis, Molecular and Electronic Structural Investigation of the First Examples of Intramolecular Chalcogen Bonding Stabilized Monoorgano Dihalotelluronium(IV) Cation”, *Eur. J. Inorg. Chem.* **2020**.

CONFERENCE PAPERS :

1. K. Selvakumar and Harkesh B. Singh, "Strained Arylselenenyl bromide as a precursor for the synthesis of Ebselen analogues" Invited article for the two-days symposium in University of Perugia' Italy on December 9-10.celebrate 65th Birthday of Prof. M. Tiecco. <http://eses1.chimfarm.unipg.it/documents/3.singh.pdf>
2. G. Mugesh, A.Panda, S. D. Apte and H. B. Singh., "Glutathione Peroxidase Activity of Diorganyl Ditellurides". The 5th International Electronic Conference on Synthetic Organic Chemistry(ECSOC-5), September 1-30, 2001. <http://www.mdpi.net/ecsoc-5/>
3. E. V. K. Suresh Kumar S. A. Chavan, H. B. Singh and J. V. Yakhmi, " A New Bimetallic Ferromagnet Based on 1,2-propanediamine Ligand" Proceedings of the DAE Solid State Phys. Symp. (India) Vol. 39C, pp 89 (1996).
4. E.V.K. Suresh Kumar, H.B. Singh, S.A. Chavan, and J.V. Yakhmi, "Charge Transfer Behaviour of Bis(methylethylenedithio)tetrathiafulvalene (BMeEDT-TTF) Complexes", Proceedings of DAE Solid State Phys. Symp.(India) Vol. 38C .pp. 273. (1995
5. We in collaboration with Dr. J.V. Yakhmi, have prepared and characterised a known Organic Superconductor, k-(BEDT-TTF)₂Cu(NCS)₂ with a T_c of 7.76 K. The results were presented at Proceedings of the DAE Solid State Physics Symposium held at University of Rajasthan, Jaipur, December 27-31, (1994).
6. E.V.K. Suresh Kumar, H.B. Singh, S.A. Chavan, I.K. Gopalkrishna and J.V. Yakhmi, "Sonochemical Synthesis of k-(BEDT-TTF)₂Cu(NCS)₂ its superconducting properties", Proceedings of DAE Solid State Phys. Symp. (India) Vol. 37 C pp. 312 (1994).
7. One of our papers in the area of Organic Metals, published in the Journal of Chemical Society, Chemical Communications, 952, 1991", was cited in Applied Highlights section of "Chemistry & Industry" pp. 804, (1992).
8. Kochurani, H.D. Bhargava and H.B. Singh, 'Synthesis and characterization of New conductors based on M(DMIT)₂ Anion (H₂DMIT = 4,5-Dimercapto-1,3- dithiole-2-thione, M = Ni, Cu, Pd, Pt)', Synthetic Metals, 41-43, 2299 (1991).
9. H.B. Singh and V. K. Jain, Collected Lecture Notes of the DST sponsored first SERC School on Main Group Chemistry held at Department of Chemistry, Indian Institute of Technology Bombay, March 18-30, 2002. 0

NATIONAL AND INTERNATIONAL CONFERENCES

- 1) H. B. Singh, Organic Chemistry Symposium (OCS 2019), Sep. 13-14, 2019, Lucknow.
- 2) H B Singh, Plenary speaker, "Adaptive responses of sterically confined Intramolecular chalcogen bonds", at 8th workshop of the multidisciplinary group SeS Redox & catalysis-(WSeS-8) held at University of Perugia, Italy, 30th May-1st June, 2019.
- 3) H B Singh, Invited speaker, "Organotellurium cations, telluroxane and lanthanoid tellurolates stabilized by Intramolecular coordination", 14th International Conference on the

Chemistry of Selenium and Tellurium ICCST-14, held at Hotel Resort Flamingo, Santa Margherita di Pula (CA), Sardinia, Italy, 3rd June-7th June, 2019.

- 4) H B Singh, Chairperson, IIT Bombay Diamond Jubilee Chemistry Symposium, Feb. 28-5-28, 2019.
- 5) H B Singh, "Sterically Confined Intramolecular Chalcogen-Heteroatom Bonds" "Invited Endowment Lecture for Pran Nath Vohra Series (Vth), at Prof. Ram Chand Paul National Symposium" Organised by Department of Chemistry and Centre of Advanced Studies in Chemistry, Punjab University, Chandigarh Feb 22-23, 2018.
- 6) H B Singh, "Sterically Confined Intramolecular Chalcogen-Heteroatom Bonds" DAE-BRNS Symposium on Selenium Chemistry and Biology, November 9-11, 2017.(Invited Lecture)
- 7) H B Singh, "Gordon Research Conference" on Organometallics at Newport, RI, USA, July 09/07/2017-14/07/2017.
- 8) H B Singh, Organochalcogen and –mercury Chemistry: Role of Intramolecular Secondary Interactions" Department of Chemistry, IIT Madras, Nov 20th, 2015.
- 9) H B Singh, Organochalcogen and –mercury Chemistry: Role of Intramolecular Secondary Interactions" New Frontiers in Chemistry-From Fundamentals to Applications, BITS Pilani, K K Birla Goa Campus, Dec 18-19, 2015.
- 10) H B Singh "Organochalcogen and –mercury Chemistry: Role of Intramolecular Secondary Interactions" Tokai University, Japan, October 20, 2015.
- 11) H B Singh, "Chemistry of Telluroxanes", Tokyo Metropolitan University, Tokyo, Japan, October 15, 2015.
- 12) H B Singh, "Organochalcogen and –mercury Chemistry: Role of Intramolecular Secondary Interactions", Chiba University, Tokyo, Japan, October 13, 2015.
- 13) H B Singh, "Organochalcogen and –mercury Chemistry: Role of Intramolecular Secondary Interactions", Rikkyo University, Tokyo, Japan, October 12, 2015.
- 14) H B Singh "Isolation of molecular organotelluroxanes", Recent Trends in Chemistry, The American College, Madurai, Feb 27th, 2015.
- 15) H B Singh "Isolation of molecular organotelluroxanes", National Conference on the Chemistry of Chalcogens, DIAT, Pune, Jan 12-13, 2015.
- 16) H B Singh "Isolation of molecular organotelluroxanes", New Directions in Chemical synthesis-1 & II, Dec 8-11, 2014, Department of Chemistry, IIT Bombay.
- 17) H B Singh Recent Advances in Crystallography, November 17, 2014, Department of Chemistry, IIT Bombay.

- 18) H B Singh Golden Jubilee In-House Symposium October 16-17, 2014, Department of Chemistry, IIT Bombay.
- 19) H B Singh, poster presentations by Sangeeta Yadav, Anand Gupta and K Vekateshwaran 16th CRSI National Symposium in Chemistry (NSC 16) held at IIT Bombay Feb 7-9, 2014
- 20) H. B. Singh “Modern Trends in Inorganic Chemistry” Chairman of a session and poster presentation by Shikha Das and brief talk by Anand Gupta, held at IIT Roorkee, Dec 13-16, 2013.
- 21) H. B. Singh “Organochalcogen Chemistry: Isolation and Reactivity of Novel Chalcogen Derivatives Stabilized by Intramolecular Coordination” Plenary Lecture at 12th International Conference on the Chemistry of Selenium and Tellurium held at Cardiff University, U K July 22-26, 2013.
- 22) H. B. Singh “Tales of the Unexpected” Department Colloquium IIT Bombay April 5th, 2013.
- 23) H. B. Singh, “Organochalcogen Chemistry: Role of Intramolecular Coordination” School of Chemistry, University of Hyderabad, March 7th, 2013.
- 24) H. B. Singh, “Aspects of Organochalocogen Chemistry” IRCC seminar IIT Bombay March 4th 2013.
- 25) H. B. Singh, “2, 6-Disubstituted Arylchalcogen Compounds: Facile Synthesis of Chalcogen Heterocycles” Plenary Lecture at National Conference on Chalcogen Chemistry” at DIAT Pune Jan 14-15 2013.
- 26) H. B. Singh, Session Chairman at 6th international Meeting on Halogen Chemistry (HALOCHEM-VI) held at I I Sc Bangalore Dec 6-8, 2012.
- 27) H. B. Singh, Invited talk on “Organochalcogen and –mercury Chemistry: Role of Intramolecular Secondary Interactions” at Symposium on Inorganic Chemistry at Interface IIT Kharagpur, October 14th, 2012.
- 28) H. B. Singh “Stabilizing the unstable organochalcogens” IRCC award lecture IRCC auditorium IIT Bombay August 29th 2012.
- 29) H. B. Singh, Invited talk on “Organochalcogen and –mercury Chemistry: Role of Intramolecular Secondary Interactions” at CFM: Chemical Frontiers 2012 Goa, august 14-16, 2012
- 30) H. B. Singh, Award silver medal lecture on “Organochalcogen and –mercury Chemistry: Role of Intramolecular Secondary Interactions” at 14th National Symposium in Chemistry held at NIIST Trivandrm, Feb 3-5th, 2012.

- 31) H. B. Singh, invited talk on "Organochalcogen Chemistry: Isolation and Reactivity of Novel Selenenium Cations, Selenylcyanates, Selenenyl azides and Chalcogenones, at International Conference and Humboldt Kolleg held at University of Lucknow, January 3-6, 2012.
- 32) Participated in Anniversary General Meeting of INSA held at Tezpur University Dec 28-30, 2011.
- 33) Chairman of a session and member National Organising Committee, Modern Trends in Chemistry-XIV held at University of Hyderabad, December 10-13, 2011.
- 34) H. B. Singh invited talk on Homometallic and Heterometallic Metal...Metal Interactions at Celebration of Chemistry@IITK, Dec 03-05, 2011
- 35) H. B. Singh, invited talk, "2, 6- Disubstituted Arylchalcogen Compounds: Facile synthesis of Chalcogen Heterocycles" at Indo-European Symposium on Frontiers in Chemistry, November 10-12, 2011
- 36) Participated in 3rd Indo-German Symposium on Frontiers in Chemistry held at IIT Bombay September 27-28, 2011
- 37) Chairman of a session at National Symposium on New Horizons in Chemistry held at IIT Bombay, October 3-4, 2011
- 38) Chairman of a session at Chemistry of Functional Materials held at Goa, August 12-14, 2011
- 39) Presented a poster at the Gordon Research Conference held at New Port, RI, USA July 10-15 2011
- 40) Chairman of a session and member of the National Advisory Committee "International Symposium on Frontiers in Inorganic Chemistry" held at IACS Kolkata Dec 11-13, 2010
- 41) Chairman of a session and member of the National Advisory Committee "3rd International Symposium on Materials Chemistry" held at BARC, December, 7-11, 2010
- 42) H. B. Singh Invited Lecture "Aspects of Organochalcogen Chemistry" National Symposium on Frontiers in Main Group and Organometallic Chemistry, November 20, 2010, I. I. Sc Bangalore.
- 43) H. B. Singh Invited Lecture "Synthesis of novel heterocycles containing Se-O/Se-N linkage: role of intramolecular coordination" ICCST-11, August 1-6th, 2010, Oulu, Finland.
- 44) H. B. Singh invited Lecture "Synthesis of novel heterocycles containing Se-O/Se-N linkage: role of intramolecular coordination" July 28th, 2010, University of Hyderabad.

- 45) H. B. Singh Invited Lecture "Organochalcogen and –mercury chemistry: Role of intramolecular secondary interactions" Seminar on Frontiers in Inorganic Chemistry held at IIT Kanpur April 4th 2010.
- 46) H. B. Singh Invited Lecture "Organochalcogen and –mercury chemistry: Role of intramolecular secondary interactions" Seminar on Organometallic Chemistry" in memory of Prof. T. N. Srivastava, held at Lucknow University March 31st 2010.
- 47) H. B. Singh Invited Lecture on "Organochalcogen and –mercury chemistry: Role of intramolecular secondary interactions" In-house symposium on frontiers in Chemistry' Department of Chemistry, IIT Bombay Feb 27th 2010.
- 48) H. B. Singh, Invited Lecture on "Organochalcogen and –mercury chemistry: Role of intramolecular secondary interactions" Symposium on Modern Trends in Inorganic Chemistry MTIC-XIII Dec 07-10, 2009 I. I. Sc. Bangalore.
- 49) H. B. Singh, Invited Talk on "Organochalcogen based materials: organic metals and single-source precursors for II-VI semiconductors" National Conference on high Tech Materials: Synthesis, Characterization and Applications" 14-16 Dec, 2009, DIMAT Raipur.
- 50) H. B. Singh "The Fourth Symposium on Advanced Biological Inorganic Chemistry (SABIC 2009) and Training School on Advanced Biological Inorganic Chemistry" Nov 2-7, 2009 TIFR Bombay.
- 51) H. B. Singh "12th International Symposium on Inorganic Ring Systems" (IRIS 12) August 16-21, 2009, IIT Bombay held at Goa.
- 52) H. B. Singh "Aspects of organoselenium chemistry " International Conference held at Russian Federal University Rostov-on-Don, Russian Federation, June 1-5, 2009.
- 53) H. B. Singh "Homometallic and Heterometallic Metal...Metal Interactions" Singapore-India Collaborative and Cooperative Chemistry Symposium 5 held at University of Hyderabad Feb 20-21, 2009.
- 54) H. B. Singh "Homometallic and Heterometallic Metal...Metal Interactions" In-House Symposium IIT Bombay Sep 27th 2008.
- 55) H. B. Singh "Homometallic and Heterometallic Metal...Metal Interactions" IPC Department, IISc Bangalore July 30th, 2008.
- 56) H. B. Singh, "Frontiers in Chemistry" held at NIIST Trivandrum, March 8th, 2008
- 57) H. B. Singh, "Organochalcogen and Organomercury Chemistry; Role of Intramolecular Secondary Interactions" National Symposium on Frontier Areas in Chemistry held at The American College Madurai-2 Jan 10-11, 2008.

- 58) H. B. Singh, 10th CSRI National Symposium in Chemistry held at I. I. Sc Bangalore, Feb 1-3, 2008.
- 59) H. B. Singh, 20th Research Scholars Meet (RSM-2008) held at V. G. Vaze College Mumbai 400081.
- 60) H. B. Singh, "Organochalcogens as Selenoenzyme Mimics" Winter School in Bioinorganic Chemistry held at IIT Bombay, Nov 27th, 2007.
- 61) H. B. Singh, Organochalcogen and Organomercury Macrocycles IIT Guwahati, October 26th, 2007.
- 62) H. B. Singh, "Organochalcogen and Organomercury Chemistry; Role of Intramolecular Secondary Interactions" 73rd Annual Meeting of The Indian Academy of Sciences held at Trivandrum, Nov 1-4, 2007.
- 63) H. B. Singh, "Glutathione Peroxidase-like activity of Organochalcogen Compounds" Professor R. C. Paul 3rd Annual Symposium on Recent Trends in chemistry, Punjab University, Chandigarh, March 1-2, 2007.
- 64) H. B. Singh, "Aspects of Intramolecularly Coordinated organochalcogen derivatives" Plenary lecture at 10th International Conference on the Chemistry of Selenium and Tellurium held at Lodz, Poland June 22-27, 2007.
- 65) H. B. Singh, "Intramolecularly coordinated organochalcogen ligands: Facile cleavage of C-Te and Te-Te bonds" Poster presentation at 75th Gordon research Conference on Organometallic Chemistry held at Newport, RI, USA, July 8-13, 2007.
- 66) H. B. Singh, "Aspects of Intramolecularly Coordinated Organochalcogen derivatives" Recent Trends in Inorganic and Analytical Chemistry, Department of Chemistry, University of Pune, Sep 1-2, 2006.
- 67) 76th Annual Session of The National Academy of Sciences, India, Oct. 6-8, 2006. (Member organizing committee) held at IIT Bombay.
- 68) DAE-BRNS International symposium on Materials, Chemistry division, BARC, Mumbai, Dec 6-8, 2006. (Member organizing committee).
- 69) 9th CSRI National Symposium in Chemistry, Department of Chemistry, university of Delhi, Feb, 1-4, 2007 (Council Member).
- 70) H. B. Singh, "Aspects of Intramolecularly Coordinated Organochalcogen derivatives", First Prof. T. N. Srivastava Memorial Lecture at Silver jubilee conference, Indian Council of Chemists, Birla College Kalyan, Dec 2-29, 2006.
- 71) H. B. Singh, "Aspects of Intramolecularly Coordinated Organochalcogen derivatives" In-House Symposium, Department of Chemistry, IIT Bombay August 19th 2006.

- 72) Upali Patel, H. B. Singh, Ray J. Butcher and Gotthelf Wolmershauser, "Metallophilic mercuraza macrocycles" P-185 at 8th CRSI National Symposium in Chemistry, IIT Bombay Feb 3-5, 2006.
- 73) H. B. Singh, Upali Patel and Ray J. Butcher, "The first Encapsulation of Ag(I) Ion by a Metallamacrocycle" P-201 at MTIC, IIT New Delhi Dec 8-10, 2005.
- 74) H. B. Singh, "Aspects of Selenium Biochemistry" DST sponsored workshop on Bioinorganic Chemistry, Inorganic and Physical Chemistry Department, Indian institute of Science, Bangalore, October 20-21, 2005.
- 75) H. B. Singh, "Aspects of Intramolecularly coordinated Organochalcogens", Department of Chemistry, Punjab University, Chandigarh, Sep 29th, 2005.
- 76) H. B. Singh, "Aspects of Intramolecularly coordinated Organochalcogens", Department of Chemistry, University of Madras, Sep 22nd, 2005.
- 77) H. B. Singh, "Aspects of Intramolecularly coordinated Organochalcogens", Department of Chemistry, Sri Sathya Sai Institute of Higher Learning, Puttaparthi, Sep 25th 2005.
- 78) H. B. Singh, "Stability of complexes and 18-electron rule' Workshop on "Spectroscopy & Select Topics in Chemistry", Vaze College of Arts, Science and Commerce, Mulund, Mumbai, Sep 23rd, 2005.
- 79) H. B. Singh, "Intramolecularly Coordinated Organoselenium derivatives; Recent Developments" DST sponsored Workshop on Organometallic Chemistry, Chemistry Division, BARC, April 20th, 2005.
- 80) H. B. Singh, "Aspects of Intramolecularly Coordinated Organochalcogens" IIT Kanpur, 22nd August, 2002.
- 81) H. B. Singh, "Aspects of Intramolecularly Coordinated Organochalcogens" Indian Institute of Science, Bangalore, 21st August, 2003.
- 82) H. B. Singh, "Organometallic Chemistry: Synthesis, structure and applications of organochalcogens (S, Se and Te), Bronze Medal Lecture, Fifth CRSI National Symposium, CLRI, Chennai, 8th February, 2003.
- 83) H. B. Singh, "Aspects of Intramolecularly Coordinated Organochalcogens" GND University, Amritsar, 30th August, 2002.
- 84) H. B. Singh, "Aspects of Intramolecularly Coordinated Organochalcogens" Bharthidasan University, Thiruchirapalli, 26th November, 2002.
- 85) H. B. Singh, "Aspects of Intramolecularly Coordinated Organochalcogens" Lucknow University, 18th December, 2002.

- 86) H. B. Singh, "Intramolecularly Coordinated Organochalcogen as Glutathione Peroxidase Mimics" invited seminar, Chemistry Department, IIT Guwahati, 7th May, 2002,.
- 87) H. B. Singh, "Intramolecularly Coordinated Organochalcogen as Glutathione Peroxidase Mimics" an invited seminar, Chemistry Department, M. S. University, Baroda, 3rd November, 2001,.
- 88) S. D. Apte, Sanjio. S. Zade, H. B. Singh and R. J. Butcher, "Contrasting behaviour of bis[2-(4,4-dimethyl-2-oxazolinyl)phenyl]chalcogenides(Se/Te) towards mercuric chloride" An invited poster presentation, MTIC-(IX), Dec 12-14, 2001, IACS, Calcutta.
- 89) H. B. Singh, "Role of intramolecularly coordination in Glutathione Peroxidase-like activity of Organochalcogens" An invited lecture at Indian Council of Chemists, 2001, Mysore Dec 22-24, 2001.
- 90) A plenary lecture on Organochalcogen Chemistry at the 8th International Conference on the Chemistry of Selenium and Tellurium (8ICCST) Brazil, Aug., 6-11, 2000.
- 91) Invited session lecture at symposium on "Modern Trends in Inorganic Chemistry" IISc, Bangalore, Jan. 18th-20th, 2000.
- 92) Invited lecture at "Synthesis, structure and Reactivity of Intramolecularly coordinated organochalcogen Derivatives." Chemistry Department, "Sri Sathya Sai Institute of Higher Learning" (SSSIHL), Jan. 21-23, 2000.
- 93) H. B. Singh, "Intramolecularly coordinated organoselenium derivatives: synthesis, structure and reactivity" Lucknow University, 3rd Dec. 1998.
- 94) H. B. Singh, "Intramolecularly coordinated organoselenium derivatives: synthesis, structure and reactivity" Professor C. Natarajan Endowment Lecture in Inorganic Chemistry at Madurai Kamaraj University, 7th Oct. 1998.
- 95) G. Mugesh, A. Panda, N. S. Punekar, H. B. Singh, R. J. Butcher, "Glutathione Peroxidase Activity of Some Diaryl Diselenides " Poster presentation at the Symposium on Frontiers in Inorganic Chemistry at IISc Bangalore, 8-10 July 1998.
- 96) H. B. Singh, "Intramolecularly coordinated organoselenium derivatives: Synthesis, structure and reactivity" IIT Kanpur, 15th Apr. 1998.
- 97) H. B. Singh, "Intramolecularly coordinated organoselenium derivatives: synthesis, structure and reactivity" IIT Madras, 28th Feb. 1998.
- 98) G. Mugesh, H. B. Singh, "Intramolecularly Stabilized Organoselenenyl Halides". Poster presentation at the Symposium on Modern Trends in Inorganic Chemistry at Indian Institute of Technology, Kanpur, during December 3-6, 1997.

- 99) H. B. Singh, "The role of intramolecular coordination in the preparation of novel organochalcogen ligands/reagents" University of Wales, Swansea, UK, 28th Nov. 1997.
- 100) H. B. Singh, "The role of intramolecular coordination in the preparation of novel organochalcogen ligands/reagents" Aston University, Birmingham, UK, 24th Nov. 1997.
- 101) H. B. Singh, "Synthesis and characterisation of dithiaheterocycle-annelated tetrathiafulvalene derivatives: A structure-property correlation study" Aston University, Birmingham, UK, 26th Nov. 1997.
- 102) H. B. Singh, "Role of intramolecular coordination in the preparation of glutathione peroxidase mimics and group II-VI MOCVD precursors" Aston University, Birmingham, UK, 28th Nov. 1997.
- 103) H. B. Singh, "Synthesis and Structural Characterisation of Some Novel Intramolecularly Coordinated Organoselenium and Organotellurium Compounds", (Invited Lecture) at Modern Trends in Inorganic Chemistry held at University of Hyderabad, August 17-19, 1995.
- 104) H. B. Singh, "New Organotellurium Ligands and Related Derivatives" (Invited Lecture) at the International symposium on Metallo-organic Chemistry, held at University of Rajasthan, Jaipur, January 1-4, 1994.
- 105) H. B. Singh, "Science in India and International Cooperation" (brief talk) at Young Scientists Session, 81st Indian Science Congress, University of Rajasthan, Jaipur, January 5th, 1994.
- 106) H. B. Singh, "New π -Electron Donors and their charge-transfer complexes", (Invited Lecture) at symposium on Recent Trends in Chemistry, held at Punjab University, Chandigarh, February 21-22, 1994.
- 107) H. B. Singh, "Synthesis and Characterization of New π -Electron Donors and Acceptors (Invited Lecture) at Fourth NOST symposium, held at I.I.P. Dehradun, March 13-17, 1994.
- 108) H. B. Singh, "New Organotellurium Ligands and Related Derivatives" (Invited Lecture) at Winter School-cum-Workshop on Organometallic Chemistry, held at I.I.T. Delhi (December 1993).
- 109) H. B. Singh, "Synthesis of Some Novel Organotelluriums" (Invited lecture) at The discussion meeting on Organic Synthesis and Catalysis via Metallo-organics held at NCL, Pune, September 23-24, 1993.

BOOKS/MONOGRAPHS/LECTURES NOTES/CURRICULUM DEVELOPMENT MATERIALS:

1. Contributed a research article for the Proceedings of Workshop on Organometallic Chemistry (DST sponsored) held at BARC 18-20 April 2005.
2. Chairman for the IXth International Conference on the Chemistry of Selenium and Tellurium held at Department of Chemistry, IIT Bombay from 23-27, February, 2004. Guest Editor for the Proceedings of IXth International Conference on the Chemistry of Selenium and Tellurium to be published in Phosphorous, Sulfur, Silicon and related Elements.
3. Convener for a DST Group Monitoring Workshop held at Department of Chemistry, IIT Bombay, March, 2002.
4. Coordinator for a DST Sponsored Winter School on Main Group Chemistry held at Department of Chemistry, IIT Bombay, from 18-30 March, 2002. Compiled Edited and contributed a chapter for the lecture notes on "Main Group Chemistry" given by the Resource Persons.
5. CH 831 Advanced Laboratory Techniques: Professor. D. K. Chakravarthy, S. S. Talwar and I have written notes for experiments on IR, NMR, Atomic Absorption Spectroscopy and Flame Photometry for the above course.
6. Laboratory Safety: I have also compiled a brief laboratory safety manual.
7. I am contributing to a monograph on "Organotellurium Chemistry" along with Prof. V. I. Minkin (USSR), Dr G. K. Mehrotra for Gordon Breach, New York.

EDITORIAL OR REVIEW WORK FOR LEARNED JOURNALS AND PROCEEDINGS OF CONFERENCES, SYMPOSIUM

1. I regularly review several research papers submitted to the Indian Journal of Chemistry (A) published by CSIR, Journal of Indian Chemical Society, Journal of American Chemical Society, Organometallics, Inorganic Chemistry, Chemical Reviews (American Chemical Society), Journal of Organometallic Chemistry, European Journal of Inorganic Chemistry, European Journal of Organic Chemistry, Inorganic Chemistry Communications Tetrahedron, New Journal of Chemistry, Angew. Chemie..

2. In addition I have refereed several research proposal submitted to DST and CSIR, BRNS and DRDO.
3. I have evaluated Ph. D. Thesis of several Universities and Institutions.

PARTICIPATION IN ADMINISTRATION, STUDENT WELFARE, SOCIAL SERVICE AND OTHER ACTIVITIES.

I was Associate Warden of Hostel-5 from April 1993-95.

INVOLVEMENT IN CONTINUOUS EDUCATION PROGRAMME:

I have given several lectures on Organometallic Chemistry to college teachers at Refreshers courses held at

1. University of Bombay
2. University of Madras
3. NEHU, Shillong
4. University of Pune
5. GND University, Amritsar
6. Bharathidasan University, Thiruchirapalli
7. University of Hyderabad
8. Central University Rajasthan
9. IISER Pune

RESEARCH OBJECTIVES/ACHIEVEMENTS

My long term research objectives are centered around design, synthesis and structural studies of novel organometallic derivatives of sulphur, -selenium and -tellurium and their applications.

1) The work on organosulfur compounds deals with **molecular metals and superconductors.**

The realization of superconductivity in the family of ion-radical salts derived from π -donors, tetramethyltetraselenafulvalene (TMTSF) and bis(ethylenedithio)tetrathia-fulvalene (BEDT-TTF), has generated wide-spread interest in design and synthesis of organochalcogen π -donors. To understand structure-property relationship in these class of donors, we have undertaken a long term research programme on the design, synthesis and characterisation of potential molecular conductors and superconductors based on novel organochalcogen π -donors and π -acceptors.

Initially, our work focussed on the study of charge-transfer in organotellurium donors. We have unambiguously established that the donors in which the hetero-atom is not directly linked with the π -system, usually behave as n-donors towards π -acceptors.

To establish **structure-property relationship in the BEDT-TTF family** of conductors, we have prepared a range π -donors incorporating the C_6S_8 core but varying the size of the exocyclic ring. The C_6S_8 core in bis(butylenedithio)tetrathiafulvalene with eight-membered exocyclic ring, is almost planar. Bis(methylethylenedithio)-tetrathiafulvalene has almost identical structure to that of BEDT-TTF and has given one new organic metal.

More recently, we have succeeded in preparing first example of hydroxy functionalised BEDT-TTF derivatives. These will be used as precursors for the synthesis of oligomeric TTFs. Recently, we are pursuing our studies towards the synthesis of novel amino functionalised TTFs. **Single crystal X-ray diffraction studies of 4 TTFs** has led to better correlation in structure and conductivity in this class of compounds. The observations have been further corroborated **by theoretical calculations.**

2) The work on organoselenium and -tellurium compounds deals with the synthesis of **Novel Organochalcogens Stabilized by Intramolecular E...X (E = Se, Te ; X = N, O) Interactions** and their applications in the following areas:

a) Ligand chemistry and catalysis:

The ligand chemistry of tellurium has attracted considerable current interest. Our major research efforts are directed in this direction. Initially, we studied coordination abilities of known ligands such as cyclic tellurides and ditellurides. Recently, we have made significant contribution in the area of **'hybrid' multidentate, achiral and chiral ligands** containing both 'soft' tellurium and

'hard' nitrogen. First examples of tellurium containing macrocyclic Schiff's base have also been prepared and characterised. More recently, we have reported the first examples of metallophilic metallamacrocycles, which encapsulate d^{10} metal ions. Examples of chiral group 12 selenolates, where chirality is due to helicity, have also been isolated and characterised. The ligating properties and the fluorescence behaviour of the metallamacrocycles are being currently explored.

b). New Chiral and Achiral Reagents for Organic Synthesis:

Organoselenium and organotellurium compounds are becoming increasingly important as versatile reagents in organic synthesis. In particular, diaryldichalcogenides (R_2E_2 ; $E = Se, Te$) and aryltellurenyl/selenyl halides (REX) find application in forming carbon-carbon double bond under mild experimental conditions. We have prepared and characterised a number of these type of compounds by the ortholithiation route. More recently we have studied catalytic conversion of olefins to allyl ethers by the use of bis(2-dimethylaminomethyl)diselenide and Cu(II) salts.

c). Organometallic precursors for chemical vapour deposition of Group II-VI semiconductors:

The synthesis and characterisation of **single source stoichiometric precursors** to group 12-16 (II-VI) semiconductors have been the subject of intense recent interest. In our approach to the problem, we have designed chalcogenolates containing additional donor functionality viz., 1- $Me_2NCH_2C_6H_4-2-Se^-$ and succeeded in isolating and characterising monomeric mercury selenolates. As desired, the selenolates are stable, monomeric, volatile and on thermal decomposition afford HgSe. Recently we have isolated the corresponding Cd and Zn chalcogenolates. Very recently we have isolated the first air stable novel mercury tellurolate.

d). Developments of Synthetic Compounds with Glutathione Peroxidase Activity

The importance of selenium/tellurium has been recognized in the biological processes involving the enzyme glutathione peroxidase which catalyse the reduction of superoxide and hydroperoxides that are detrimental to life. Recently, some synthetic organoselenium/tellurium compounds have been reported to have glutathione peroxidase like activity. It has been suggested that the presence of intramolecular Se...N and Se...O coordination is crucial for the biomimetic activity of these compounds. To further understand the role of intramolecular coordination in the biomimetic activity we have initiated a study on the glutathione peroxidase activity of some new organochalcogens having Se...N and Se...O intramolecular interactions. These studies have resulted in isolation of novel selenenate esters and selen derivatives which are stabilized by intramolecular coordinations.