Curriculum Vitae of Dr. Swadhin K. Mandal

Present Address

Dr. Swadhin K. Mandal

Assistant Professor (since 2007 July),

Department of Chemical Sciences,

Indian Institute of Science Education and Research-Kolkata

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Sex and Marital Status: Male and Married

Nationality: Indian

Category: General

Date of Birth: 15-08-1973

Research Keywords

Main Group Catalysis/ Organometallic Catalysis/ Nanocatalysis/Graphene metal nanoparticles composite/Organic spintronics/ Nanobiology.

Research and Carrier Objectives

To design and synthesize smart materials of catalytic, industrial, and medicinal importance. To integrate different branches of Science in solving problems of our society.

Awards and Honors

♦ ***YIM-Young Scientist Award -2012*** by YIM-Boston held during 6-8th October, 2012 at MIT, Boston, USA.

♦ Invited to join as ***Editorial Advisory board member*** of the journal '**Organometallics**' published by the American Chemical Society during 2013-2015.

Qualifications

Alexander von Humboldt Fellow in the synthesis and design of heterometallic catalysts for alkene polymerization with **Professor Herbert W. Roesky** at University of Goettingen, Germany (May-2006-June2007). ***Web:***: http://www.uni-goettingen.de/en/sh/46240.html

Post Doctoral Fellow in single component organic conductors and chemistry of single-walled carbon nanotubes (2002 Aug.-2006 Jan., University of California at Riverside, USA with **Professor Robert C. Haddon**) ***Web:*** http://www.chem.ucr.edu/groups/haddon/

PhD in Organometallic Chemistry (1996-2002, Indian Institute of Science, Bangalore, India under supervision of **Professor S. S. Krishnamurthy**) ***Web:***: http://ipc.iisc.ernet.in/ssk.html

Thesis Title: "*Palladium Complexes of P, P-, P, N-, and P, S- Donor Ligands Based on the P-N-P Motif*"

M. Sc. (69.3 %, 1996, Chemistry, University of Kalyani, West Bengal, India)*

B.Sc. (62.7 %, 1993, Hons. in Chemistry, University of Kalyani, West Bengal, India)**

H.S. (70.6 %, 1990, Phys, Chm, Math, Bng, Eng, and Bio (add), W.B.B.H.S.E, West Bengal, India)

10th Std (70.8 %, 1988, W.B.S.E., West Bengal, India)

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* Secured 1st rank in the University
**Secured 3rd rank in the University

Industry Experience

Worked for **Carbon Solutions, Inc.** California, USA (http://www.carbonsolution.com/, a company that is focused on the processing and dissolution of carbon materials for advanced application) as a part-time product development scientist.

Teaching Interest (courses taught):

Elements of Chemistry (basic chemistry course for BS students, taught three semesters)
Chemistry of Main Group Elements (For BS-MS students and Integrated PhD students, taught two semesters)
Organometallic Chemistry and Catalysis (advanced course for PhD students and masters students, taught two semesters)
Structural Elucidation by NMR (advanced course for PhD and Masters students, taught three semesters)
Different **Lab courses** for Chemistry undergraduate students.

** Received ***commendation letter*** **from the Chairman, Senate, IISER-Kolkata** as exceptional teacher (for teaching performance in ID4201 course taught in 2013).

Human Resource Development:

PhD:

Dr. Arup Mukherjee (PhD degree awarded)
Dr. Subhankar Santra (PhD degree awarded)
Mr. Tamal K Sen (PhD thesis in process, reviewers reports arrived, thesis defense awaiting)
Mr. Samaresh Sau (PhD ongoing)
Mr. Vijay Kumar (PhD ongoing)
Mr. Pavan Kumar (PhD ongoing)
Mr. Mrinal Bhunia (PhD ongoing)
Mr. Tanmoy Biswas (PhD ongoing)
Mr. Pradip K Hota (PhD ongoing)

Postdocs:

Dr. Sudipta Raha Roy (CSIR)
Dr. Arup Mukherjee (Industry Sponsored)
Dr. Sunanda Biswas (CSIR, presently relocated at Wacker)

Masters

Mr. Priyadarshi Ranjan (MS thesis completed, degree awarded)

Mr. Pradip K Hota (MS thesis completed)

Summer students:

A large number of summer students (approximately a dozen students) were trained

Research Interest:

Since July 2007, SKM started his independent carrier as an Assistant Professor at the Indian Institute of Science Education and Research (IISER)-Kolkata. His approach to scientific research is multidisciplinary. SKM is currently working on the development of catalysts for a number of very important homogeneous transformations such as hydroamination reaction, Suzuki coupling, Ullmann coupling, ring opening polymerization, and Sonogashira reaction. His group is now engaged in designing catalysts derived from green and rather inexpensive main group elements, in addition to transition metals. PI's group is working for the development of nanocatalysts based on single walled carbon nanotubes and graphene oxide aiming at synthesis of compounds having medicinal importance. Additionally, SKM is working for the development of copper based anti-cancer drugs . SKM's group has recently pioneered the design and development of materials potential for next generation storage device which works based on the spin of the electron. The special class of molecule designed at SKM's group can hold the free electron on injection from a ferromagnetic substrate and the spin state of the electron can be switched back and forth using the magnetic field as an external stimuli resulting in a magnetoresistance of 20% near room temperature. This findings demonstrate a molecular platform to develop storage element or a 'bit where the binary states of '0' or '1' are represented by the electron spin state in the molecule – 'spin-up' or 'spin down'. This finding can potentially lead to scalable molecular memory devices of next generation with superior storage capacity with 1000 times stronger storage ablity than today's best storage device.

List of Publications

53. Sau, S. C.; Roy, S. R.; Mandal, S. K. "Integrating Organometallic Catalysis with Organocatalysis: A Consecutive Catalytic Approach in One-Pot" *communicated*, **2013**.
52. Mukherjee, A.; Sen, T. K.; Sivasankar, C.; Mandal, S. K.; "The First Heptanuclear Organozirconium Oxide" *communicated*, **2013**.
51. Mukherjee, A.; Sen, T. K.; Ghorai, P. K.; and Mandal, S. K. "Organozinc Catalyst on Phenalenyl Scaffold for Intramolecular Hydroamination of Aminoalkenes" ***Organometallics***, *in press* **2013**.
50. Santra, S.; Hota, P. K.; Bhattacharyya, R.; Bera, P.; Ghosh, P.; and Mandal, S. K.; "Palladium Nanoparticles on Graphite Oxide: Highly Recyclable Catalyst for the Synthesis Biaryl Cores" ***ACS Catalysis***, *in press*, **2013**.
49. Mukherjee, A.; Sen, T. K.; Ghorai, P.K.; and Mandal, S K.; "The Non-innocent Phenalenyl Unit: An Electronic Nest to Modulate the Catalytic Activity in Hydroamination Reaction." ***Scientific Reports***, **2013**, *3*, 2821; DOI:10.1038/srep02821.
48. Sau, S. C.; Roy, S. R.; Sen, T. K.; Mullangi, D.; and Mandal, S. K.; "An Abnormal N-Heterocyclic Copper(I) Complex in Versatile Click Chemistry" ***Adv. Synth. Cat.***, **2013**, *355*, 2982-2991.
47. Sen, T. K.; Sau, S. C.; Mukherjee, A., Hota, P.; Mandal, S. K.; Maity, B.; Koley, D. "Abnormal N-heterocyclic Carbene Main Group Organometallic Chemistry: A Debut to the Homogenous Catalysis" ***Dalton Trans.*** **2013**, *42*, 14253-14260.
46. Chakraborty, T.; Sen, T. K.; Mandal, S. K. and Mitra, C. "Experimental Realization of Thermal Entanglement in a Molecular chain" ***J. App. Phys.*** *In press*, **2013**.
45. Patra, A.; Sen, T. K.; Musie, G. T.; Mandal, S. K.; and Bera, M. A novel copper(II) coordination polymer with carboxylate and isoindol backbones of a bifunctional ligand " ***J. Mol. Struc.*** **2013,** *1047*, 317-323.
44. Patra, A.; Giri, G.; Sen, T. K.; Carrella, L.; Mandal, S. K.; Bera, M. "Bis(μ-alkoxo) bridged dinuclear $CuII_2$ and $ZnII_2$ complexes of an isoindol functionality based new ligand: synthesis, structure, spectral characterization, magnetic properties, and catechol oxidase activity" ***Polyhedron***, in press, **2013**.

43. Patra, A; Sen, T. K.; Ghorai, A.; Musie, G. T.; Ozarowski, A.; Mandal, S. K.; Ghosh, U.; Bera, M. "Synthesis, Structure, Spectroscopic Characterization and Protein Binding Affinity of New Water Soluble Hetero- and Homometallic Tetranuclear [CuII2ZnII2] and [CuII4] Clusters" ***Inorg. Chem.*** **2013**, *52*, 2880–2890.

42. Sen, T. K.; Mukherjee, A.; Modak, A.; Mandal, S. K.; Koley, D. "Substitution Effect on Phenalenyl Backbone in the Rate of Organozinc Catalyzed ROP of Cyclic Esters", ***Dalton Trans.*** **2013,** *42*, 1893-1904.

41. Mukherjee, A.; Sen, T. K.; Mandal, S. K.; Maity, B.; Koley, D. "Construction of Oxygen-bridged Multimetallic Assembly: Dual Catalysts for Hydroamination Reactions" ***RSC Advances***, **2013,** *3*, 1255–1264.

40. Raman, K. V.; Kamerbeek, A. M.; Mukherjee, A.; Atoderesei, N.; Sen, T. K.; Lazić, P.; Caciuc, V.; Stalke, D.; Reent, M.; Muenzenberg, M.; Mandal, S. K.*, Blügel, S.; Moodera, J. S. "Interface-engineered templates for molecular spin memory devices." ***Nature***, **2013**, *493*, 509–513.

    (*contributed to design the original research approach of this work and as one of the corresponding authors, Ref. please see *Authors Contribution Section* of the publication. Also this work has been featured by Nature's weekly **Press Release Coverage**, please see some selected news links provided below.).

39. Dey, S. K.; Honecker, A.; Mitra, P.; Mandal, S. K.; Mukherjee, A. "Magneto-structural studies of tetranuclear manganese [$Mn^{III}_2Mn^{II}_2$] complexes of 9-hydroxy phenalenone with weak π···π interactions" ***Eur. J. Inorg. Chem***., **2012**, 5814-5824.

38. T. Chakraborty, T. K. Sen, H. Singh, D. Das, S. K. Mandal, C. Mitra, "Comparative study of magnetic behaviour in three classic molecular magnets" ***Solid State Commun.***, **2012**,*152*,1945-1950.

37. Santra, S.; Ranjan, P.; Bera, P.; Ghosh, P.; Mandal, S. K. "Anchored palladium nanoparticles onto single walled carbon nanotubes: Recyclable heterogeneous nanocatalyst in the synthesis of *N*-containing heterocycles *via* copper free acyl Sonogashira reaction." ***RSC Advances***, **2012**, *2*, 7523–7533.

36. Mukherjee, A.; Sen, T. K.; Ghorai, P. K. Samuel, P. P.; Schulzke, C.; Mandal, S. K. "Phenalenyl Based Organozinc Catalysts for Intramolecular Hydroamination Reactions: A Combined Catalytic, Kinetics and Mechanistic Investigation on the Catalytic Cycle" ***Chem. Eur. J.*** **2012**, *18*, 10530-10545. (**Highlighted with Frontispiece Graphics**)

35. Chakraborty, T.; Das, D.; Singh, H.; Sen, T. K.; Mandal, S. K.; Mitra, C. "Study of Entanglement in a Quantum Antiferromagnet" ***AIP Conf. Proceed.*** **2012**, 1447, 1145-1146.
34. Patra, A.; Sen, T. K.; Bhattacharya, R.; Mandal, S. K.; Bera, M. "Diversity of carboxylate binding in an unusual tetranuclear zinc cluster: Correlation between spectroscopic investigations and carboxylate binding modes." ***RSC Advances*** **2012**, *2*, 1774-1777.
33. Sen, T. K.; Mukherjee, A.; Modak, A.; Ghorai, P. K.; Kratzert, D.; Granitzka, M.; Stalke, D.; Mandal, S. K. "Phenalenyl Based Molecules: Tuning the Lowest Unoccupied Molecular Orbital to Design Catalyst" ***Chem. Eur. J.*** **2012**, *18*, 54-58.
32. Sau, S. C.; Santra, S.; Sen, T. K.; Mandal, S. K.; Koley, D. "Abnormal N-Heterocyclic Carbene Palladium Complex: Living Catalyst for Activation of Aryl Chlorides in Suzuki–Miyaura Cross Coupling." ***Chem. Commun.*** **2012**, *48*, 555-557. (**Listed among "Most Read Articles" published by Chemical Communications during the first week of its publication**.)
31. Mandal S. K. and Roesky, H. W. "Group 14 Hydrides with Low-Valent Elements for Small Molecules Activation." ***Acc. Chem. Res.*** **2012**, *45*, 298-307.
30. Das, D.; Chakraborty, T.; Sen, T. K.; Singh, H.; Mandal, S. K.; Mitra, C. "Experimental quantification of entanglement in quantum spin systems" ***AIP Conf. Proceed.*** **2011**, *1384*, 261–269.
29. Sen, T. K.; Sau, S. C.; Mukherjee, A.; Modak, A.; Mandal, S. K., Koley, D. "Introduction of Abnormal N-Heterocyclic Carbene as an Efficient Organocatalyst: Ring Opening Polymerization of Cyclic Esters." ***Chem. Commun.*** **2011**, *47*, 11972–11974.
28. Santra, S.; Dhara, K.; P. Ranjan, Bera, P.; Dash, J.; Mandal, S. K. "Supported Palladium Nanocatalyst for Copper free Acyl Sonogashira Reactions: One-Pot Multicomponent Synthesis of N-containing Heterocycles." ***Green Chem.*** **2011**, *13*, 3238 – 3247.
27. Mandal, S. K. and Roesky, H. W. "Designing Molecular Catalysts Based on Enhanced Lewis Acidity" ***Adv. Cat.*** **2011**, 54, 1-61, Editors: Bruce C. Gates (Series Editor), Helmut Knoezinger (Series Editor), Friederike C. Jentoft (Series Editor), academic press.
26. Santra, S.; Ranjan, P.; Ghorai, P. K.; Mandal, S. K. "Living Nanocatalyst for Effective Synthesis of Symmetrical Biaryls" ***Inorg. Chim. Acta*** **2011**, *372*, 47–52. (**In a special issue dedicated to Prof. S. S. Krishnamurthy**)
25. Mukherjee, A.; Sen, T. K., Mandal, S. K.; Kratzert, D.; Stalke, D.; Doering, A.; and Schulzke C. Phenalenyl Based Ligand for Transition Metal Chemistry:

Application in Henry Reaction, ***J. Chem. Sci.*** **2011**, *123*, 139–144. (Invited Article)

24. Gregor P. J., Santra, S; Mandal, S. K.; Sengupta, T. K. "Singlet Oxygen Mediated DNA Degradation by Copper Nanoparticles" ***J. Nanobiotechnology***, **2011**, *9*, 9 ***(*****listed among top 10 accessed articles for March-April 2011,** *http://www.jnanobiotechnology.com /a`rticles/top/browse.asp).*
23. Mukherjee, A.; Nembenna, S.; Sen, T. K.; Sarish, S. P.; Ghorai, P. K.; Ott, H.; Stalke, D.; Mandal, S. K.; Roesky, H. W. "Assembling Zirconium and Calcium Moieties through an Oxygen Center for Intramolecular Hydroamination Reaction: A Single System for Double Activation" ***Angew. Chem. Int. Ed.*** **2011**, *50*, 3968–3972 (selected as **Hot Paper** by *Angew. Chem.*).
22. Kalinina, I.; Worsley, K.; Lugo, C; Mandal, S.; Itkis, M.; Bekyarova, E.; Haddon, R. Synthesis, Dispersion and Viscosity of Water-Soluble Single-Walled Carbon Nanotube Materials Functionalized with Polyethylene-Glycols" ***Chem. Mat.*** **2011**, *23*, 1246–1253.
21. Mandal, S. K. and Roesky H. W. "Interstellar Molecules: Guides for New Chemistry" ***Chem. Commun.*** **2010**, *46*, 6016-6041 (**Highlighted on Front Cover**).
20. Mandal, S. K. and Roesky, H. W. "Assembling Hetero Metals Through Oxygen: An Efficient Way to Design Homogeneous Catalysts." ***Acc. Chem. Res.*** **2010**, *43*, 248–259. (20.83)
19. Mandal, S. K.; Gurubasavaraj, P. M.; Roesky, H. W.; Schwab, G.; Stalke, D.; Oswald, R. B.; Dolle, V. "Oxygen Bridged Hybrid Metallocene-Nonmetallocene Polymetallic Catalysts of Group 4 Metals for Bimodal Activity in Olefin Polymerization: Synthesis, Characterization, and Theoretical Investigation." ***Inorg. Chem.*** **2007**, *46*, 10158–10168.
18. Mandal, S. K.; Gurubasavaraj, P. M.; Roesky, H. W.; Oswald, R. B.; Magull, J.; Ringe, A. *"*Synthesis, Structural Characterization, and Theoretical Investigation of Compounds Containing an Al–O–M–O–Al (M = Ti, Zr) Core.*"* ***Inorg. Chem.*** **2007**, *46*, 7594–7600.
17. Worsley, K. A.; Ramesh, P.; Mandal, S. K.; Niyogi, S.; Itkis, M. E.; Haddon, R. C. "Soluble Graphene Derived from Graphite Fluoride." ***Chem. Phys. Lett.*** **2007**, *445*, 51–56.
16. Venkatakrishnan, T. S.; Mandal, S. K.; Raghuraman, K.; Krsihnamurthy, S. S.; Nethaji, M. "Chloro-, Hydrido- and Chloro-hydrido Ruthenium(II) complexes of Chiral and Achiral Diphosphazane Ligands and Catalytic Asymmetric Transfer Hydrogenation reactions using Chiral Diphosphazane Ligands." ***J. Organomet. Chem.*** **2007**, *692*, 1875–1891.
15. Beer, L.; Mandal, S. K.; Tham, F. S.; Donnadieu, B.; Reed, R.W.; Oakley, R. T.; Haddon,

R. C. "The First Electronically Stabilized Phenalenyl Based Radical: The Effect of Chalcogen Substituents on Solid State Structures." ***Cryst. Growth & Des.*** **2007**, *7*, 802–809.

†14. Gurubasavaraj, P. M.; Mandal, S. K.; Roesky, H. W.; Oswald, R. B.; Pal, A.; Noltemeyer, M. "Synthesis, Characterization, Catalytic Properties, and Theoretical Study of Compounds Containing an Al–O–M (M = Ti, Hf) Core." ***Inorg. Chem.*** **2007**, *46*, 1056–1061. (**Listed in Most cited articles in Inorganic Chemistry for the year –2007.**)

13. Jorge, G. A.; Kim, K. H.; Jaime, M.; Chi, X.; Lawes, G.; Hellman, F.; Itkis, M. E.; Mandal, S.; Haddon, R. C. "Dimerization Transition in Phenalenyl-based Neutral Radicals Measured at High Magnetic Fields." ***AIP Conf. Proceed.*** **2006**, *850*, 1315– 1316.

12. Nembenna, S.; Roesky, H. W.; Mandal, S. K.; Oswald, R. B.; Pal, A.; Herbst-Irmer, R.; Noltemeyer, M.; Schmidt, H.-G. "Soluble Molecular Compounds with the Mg–O–Al Structural Motif -A Model Approach for the Fixation of Organometallics on a MgO Surface." ***J. Am. Chem. Soc.*** **2006**, *128*, 13056–13057.

11. Mandal, S. K.; Venkatakrishnan, T. S.; Sarkar, A.; Krishnamurthy, S. S. "Steric and Electronic Factors in the Stability of Palladium Allyl Complexes with Diphosphazane Ligands." ***J. Organomet. Chem.*** **2006**, *691*, 2969–2977.

10. Mandal, S. K.; Samanta, S.; Dell, J.; Itkis, M. E.; Donnadieu, B.; Tham, F. S.; Reed, R. W.; Oakley, R. T.; Haddon, R. C. "The Resonating Valence Bond Ground State in Oxygen Functionalized Phenalenyl-Based Molecular Conductors." ***J. Am. Chem. Soc.*** **2006**, *128*, 1982–1994.

‡9. Zhao, B.; Hu, H.; Mandal, S. K.; Haddon, R. C. "A Bone Mimic Based on the Self Assembly of Hydroxyapatite on Chemically Functionalized Single-Walled Carbon Nanotubes." ***Chem. Mat.*** **2005**, *17*, 3235–3241.

8. Mandal, S. K.; Itkis, M. E.; Chi, X.; Samanta, S.; Lidsky, D.; Tham, F. S.; Reed, R. W.; Oakley, R. T.; Haddon, R. C. "New Family of Amino-Phenalenyl-Based Neutral Radical Molecular Conductors: Synthesis, Structure, and Solid State Properties." ***J. Am. Chem. Soc.*** **2005**, *127*, 8185–8196.

7. Hu, H.; Ni, Y.; Mandal, S. K.; Montana, V.; Zhao, B.; Haddon, R. C.; Parpura, V. "Polyethylenimine Functionalized Single-Walled Carbon Nanotubes as a Substrate for Neuronal Growth." ***J. Phys. Chem. B*** **2005**, *109*, 4285–4289.

6. Mandal, S. K.; Gowda, G. A. N.; Krishnamurthy, S. S.; Stey, T.; Stalke, D. "Chiral "P-N-

P" Ligands, $(C_{20}H_{12}O_2)PN(R)PY_2$ (R = $CHMe_2$, Y = C_6H_5, OC_6H_5, OC_6H_4-4-Me, OC_6H_4-4-OMe or OC_6H_4-4-^{t}Bu) and their Allyl Palladium Complexes." ***J. Organomet. Chem.*** **2005**, *690*, 742–750.

5. Mandal, S. K.; Gowda, G. A. N.; Krishnamurthy, S. S.; Nethaji, M. "Palladium(II) Allyl Complexes of Chiral Diphosphazane Ligands: Ambident Coordination Behaviour and Stereodynamic Studies in Solution." ***Dalton Trans.*** **2003**, 1016–1027.

4. Mandal, S. K.; Gowda, G. A. N.; Krishnamurthy, S. S.; Zheng, C.; Li, S.; Hosmane, N. S. "Diastereomerism in Palladium(II) Allyl Complexes of P,P–, P,S– and S,S–donor Ligands, $Ph_2P(E)N(R)P(E')Ph_2$ [R = $CHMe_2$ or (S)-CHMePh; E = E' = lone pair or S]: Solution Behaviour, X-ray Crystal Structure and Catalytic Allylic Alkylation Reactions." ***J. Organomet. Chem.*** **2003**, *676*, 22–37.

3. Mandal, S. K.; Krishnamurthy, S. S.; Nethaji, M. "Palladium-Carbon σ-Bonded Complexes Bearing Diphosphazane and Diphosphazane Monosulfide Ligands." ***Ind. J. Chem.*** **2003**, *42A*, 2422–2426.

2. Raghuraman, K.; Mandal, S. K.; Venkatakrishnan, T. S.; Krishnamurthy, S. S.; Nethaji, M. "Organometallic Chemistry of Chiral Diphosphazane Ligands: Synthesis and Structural Characterisation." ***Ind. Acad. Sci., Chem. Sci.*** **2002**, *114*, 233–246.

1. Mandal, S. K.; Gowda, G. A. N.; Krishnamurthy, S. S.; Zheng, C.; Li, S.; Hosmane, N. S. "Allylpalladium Complexes of Mixed-Donor Diphosphazane Ligands Bearing a Stereogenic Phosphorus Centre: Structure and Stereodynamics." ***Eur. J. Inorg. Chem.*** **2002**, *8*, 2047–2056. (3.12)

Patents Filed

1. Mandal, S. K. and Santra, S. "Method of Synthesis of Molecules Using Catalyst and Composites Thereof" Indian Patent Application No: 463/KOL/2013 (Filed on April **2013**)

2. Mandal, S. K. and Santra, S. "Method of Synthesis and Composite Thereof" Indian Patent Application No: 463/KOL/2013 (Filed on April **2013**)

3. Mandal, S. K. and Sau, S. Ch. "Abnormal N-heterocyclic Carbene Copper(1) Complexes, Synthesis and Applications Thereof" Indian Patent Application No: Application No. 1042/KOL/2013 (Filed on September **2013**)

Press Releases/ Magazine Coverage

News Coverage on our recent work:

The work entitled "*Interface-engineered templates for molecular spin memory devices*" (*Nature*, **2013,** *493*, 509-513**)** has been briefed by following media coverage:

"Hope for molecule memory- Bengal-made compound for pocket-size storage"
http://www.telegraphindia.com/1130124/jsp/nation/story_16479071.jsp#.UQDogR04vZI

"Spinning electronics on its head to boost computer memory"
http://www.deccanherald.com/content/307327/spinning-electronics-its-head-boost.html

"Molecule bed for future memory chips"
http://www.nature.com/nindia/2013/130124/full/nindia.2013.9.html

"You can store over 1,000 films in this device"
http://freepressjournal.in/you-can-store-over-1000-films-in-this-device/

"New molecules could bring super-dense, solid-state hard disk alternatives"
http://www.computerworld.com/s/article/9236088/New_molecules_could_bring_super_dense_solid_state_hard_disk_alternatives

"Storing data in individual molecules: Molecular memory near room temperature"
http://phys.org/news/2013-01-individual-molecules-molecular-memory-room.html

"Storing data in individual molecules"
http://web.mit.edu/newsoffice/2013/storing-data-in-individual-molecules.html

"New Molecules Could Bring Super-Dense, Solid-State Hard Disk Alternatives"
http://www.computerworld.in/news/new-molecules-could-bring-super-dense-solid-state-hard-disk-alternatives-63562013

"New Method of Producing Nanomagnets for Information Technology"
http://www.sciencedaily.com/releases/2013/01/130123133618.htm

"New Molecular Memory May Produce Cheaper Storage Options"
http://www.thegurureview.net/tag/cloud-storage

"Exciting New Data Storage Tech Can Cut Down On Waste, Conserve Resources"
http://www.colocationutah.net/tag/molecular-memory/

"New Possibilities in Molecular Data Storage with Advent of Special Molecule"
http://hybridhostingcloud.com/new-possibilities-in-molecular-data-storage-with-advent-of-special-molecule/

"Scientists find storage in molecules"
http://newindianexpress.com/cities/bangalore/article1435869.ece\

“Molecular Memory Promises Another 1,000-Fold Increase In Storage Density”
http://www.infiniteunknown.net/category/technology/page/2/

“Molecular Layers of Data: the Next Frontier of Storage?”
http://www.infiniteunknown.net/category/technology/page/2/

“Storing data in individual molecules near room temperature”
http://www.tumblr.com/tagged/graphene

“Molecular Memory Makes Waves in a Lab at MIT”
http://californiahosting.net/molecular-memory-makes-waves-in-a-lab-at-mit/

“Organic molecular level spin memory works at room temperature”
http://www.uni-goettingen.de/en/422378.html

“Specially Created Molecule Opens Doors in Molecular Memory Research”
http://www.cloudhosting.cm/specially-created-molecule-opens-doors-in-molecular-memory-research/

“New Possibilities in Molecular Data Storage with Advent of Special Molecule”
http://hybridhostingcloud.com/

“Molecular Memory Breaks New Ground in a Lab at MIT”
http://www.saascloudhosting.com/molecular-memory-breaks-new-ground-in-a-lab-at-mit/

“**Newly Created Molecule Breaks New Ground Molecular Memory Research**”
http://www.pcicloudhosting.com/newly-created-molecule-breaks-new-ground-molecular-memory-research/

“Molecular Memory Means An Improved Solution to Storing Data in Data Centers”
http://www.dellcloudhosting.com/tag/molecular-memory/

“An Exciting New Way to Store Data: Molecular Memory”
http://www.utahcollocation.com/2013/01/an-exciting-new-way-to-store-data-molecular-memory/

“Molecular storage devices have become easier”
http://techtechboom.com/molecular-storage-devices-have-become-easier.html

“Magnetic “Sandwich” Could Boost Superfast Computers Development”
http://www.irb.hr/eng/Izdvojeno/Magnetic-Sandwich-Could-Boost-Superfast-Computers-Development

“Personal molecule: a data store of the future”
http://techn4all.com/technology-gadgets-mobile-phones/personal-molecule-a-data-store-of-the-future/

More links:
http://prerefinement3.rssing.com/chan-3380036/all_p443.html
http://tutorfreebr.blogspot.in/2013/01/nanomagnetos-dados-sao-gravados.html
http://www.secretsofthefed.com/memory-boost-molecular-memory-1000-fold-increase-in-data-storage-capacity/
http://www.storagenewsletter.com/news/miscellaneous/storing-data-in-individual-molecules
http://in.news.yahoo.com/hope-molecule-memory-220041673.html
http://news.idg.no/cw/art.cfm?id=1DAED35B-966A-78E2-A3BF6FB65FE403BD
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http://talesfromthelou.wordpress.com/2013/01/24/storing-data-in-individual-molecules/
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http://www.digimars.net/computer-science/storing-data-in-individual-molecules.html
http://hutchisoneffect.ca/wordpress/?p=65609
http://www.infiniteunknown.net/tag/science/

Assembly of Hydroxyapatite on Chemically Functionalized Single-Walled Carbon Nanotubes." (*Chem. Mat.* **2005**, *17*, 3235–3241) had received following media coverage:

Discover Magazine: This work has been selected as one of the top 100 science stories (placed as No. 8 among the list of 100 most important discoveries) for the year 2005 by ***Discover Magazine*** and published in "Year in Science" issue of Discover Magazine (published in 2006-January.).

"**Carbon Nanotubes Burst Out of the Lab**"
(http://discovermagazine.com/2006/jan/technology/)

Press release published by "***American Chemical Society***" *–Health and Medicine Section* **"Nanotubes Inspire New Technique for Healing Broken Bones"**, **(**http://www.medicalnewstoday.com/articles/27118.php**)**

Press release by "***University of California, Riverside***" "**Carbon Nanotubes Could Aid Human Bones on the Mend"**, (http://newsroom.ucr.edu/news_item.html?action=page&id=1123)

Press release by '***ScienCentralNews'*** **"Nano Bones"** and
(http://www.sciencentral.com/articles/view.php3?language=english&type=article&article_id=21

8392609)

Press release by '***Wired Magazine***' **"Nanotubes May Heal Broken Bones"**.

(http://www.wired.com/medtech/health/news/2005/08/68512)

Invited Talks in National, International Seminars and Conferences

29. "*Main Group Organometallics: From Cost Effective Catalysts to Spintronics"* scheduled at Indo-French collaborative meeting on "Functional metal-organics: Applications in materials and catalysis" scheduled at NISER Bhubaneswar, 24-26th February, **2014** (Invited Lecture)

28. "*From Molecular Organometallics to Spintronics*" symposium on Modern Trends in Inorganic Chemistry, (MTIC-XV) scheduled at Indian Institute of Technology, Roorkee during 13-16th Dec. **2013**. (Invited Lecture)

27. "*Main Group Organometallics: From Cost Effective Catalysts to Spin Electronics"* at Shiv Nadar University, Noida, Delhi, scheduled on 20th Sept, **2013** (Invited Lecture)

26. "*Main Group Organometallics: From Molecular Catalysts to Spin Electronics*" at IIT Bombay, on 27th August, **2013** (Invited Lecture)

25. "*Development of Cost-effective Organometallic Catalysts"* BASF, India, Mumbai, on 26th August, **2013** (Invited Lecture)

24. "*The Non-innocent Phenalenyl Unit: From Organometallic Catalyst to Spin Based Device***"** Research Core for Interdisciplinary Science, Okayama University, Japan, 20th June, **2013** (Invited Lecture)

23. "*The Cationic State of Phenalenyl: From Organometallic Catalyst to Molecular Spintronics*" at Electron Spin Science & Technology: Biological and Materials Science Oriented Applications (1st AWEST 2013), June 16 – 18, **2013**, Awaji Yumebutai International Conference Center, Awaji Island, Hyogo, Japan. (Invited Lecture)

22. "*Integrating Organometallic Catalysis with Organocatalysis: A Consecutive Catalytic Approach* " at National Symposium on Recent Advances in Chemistry(NSRAC-2013), University of Pondicherry, Pondicherry, 22nd-23rd March, **2013**. (Invited Lecture)

21. *"Playing with Nonbonding Orbital of Phenalenyl:Organometallic Catalyst to Spintronics"* at IISER-Pune, Pune, on 12th March, **2013** (Invited Chemistry Colloquium Lecture)

20. "*The Non-bonding Orbital of Phenalenyl: A Safe Nest for Electron***"** at International Conference on Functional Metallorganics, Vedic Village, Kolkata, 7th-10th Feb., **2013**. (Invited Lecture)

19. "*Abnormal N-Heterocyclic Carbene: An Excellent Building Block to Design Catalyst"* at Catlyst-2013, Dr. Reddys Chemistry Conclave, Hyderabad, 9-10th Jan., **2013**. (Invited Lecture)

18. *"Development of Cost Effective Organometallic Catalysts Producing Compounds of Pharmaceutical Interest"* at Invictus Oncology-Vyome Biosciences, Delhi, 8th Nov. **2012**. (Invited Lecture)

17. "*Growing with IISER-Kolkata: An Experience to Remember*" YIM-Young Scientist Award Lecture, MIT, Boston, USA, 6-8th October, **2012**. (Award Lecture)

16. "*Phenalenyl: A perfect system for spin injection*" at Magnet Bitter Francis Lab, MIT, Boston, USA on 22nd June, **2012**. (Invited Lecture)

15. "*New Face of abnormal N-heterocyclic Carbene: Sometime Abnormal is Better than Normal*?" At National Symposium on "Recent Trends in Chemical Science and Technology" during March 3-4, **2012** at IIT Patna.

14. "*IISER-Kolkata: New Destination for Science Education*" At Regional teacher's training meet to guide teachers from Jawahar Navodaya School (MHRD funded Central School) at Kalyani in front of representative teachers of 180 Jawahar Navodaya Schools from Bihar, Jharkhand and Westbengal on 24th January, **2012**. (Special Invited Lecture).

13. "*New Face of N-Heterocyclic Carbene: Better than Earlier?"* At National Symposium on Chemical Sciences organized by Pondicherry University on 22nd December, **2011** (Invited Lecture, Opening Lecture of the symposium).

12. "*Phenalenyl Based Molecules: Tuning the Lowest Molecular Orbital to Design a Catalyst"* on 20th December, **2011** at IPC Department, IISc, Bangalore (Invited Lecture).

11. "*Abnormal N-heterocyclic Carbene: An Excellent Building Block to Design Catalyst"* at IISER-Thiruvananthapuram on 16th December, **2011** at inter IISER-Chemistry meet (December 15-16, **2011** at IISER-T).

10. A popular lecture on "*A Glimpse in Chemical Science Research from IISER-Kolkata*" at Jawahar Navodaya School (MHRD funded Central School) at Kalyani in front of nearly 400 school students (these school kids are topper from various Jawahar Navodaya Schools in West Bengal, Bihar, and Jharkhand) in their regional Science Congress Meet, November, 12, **2011**. (Special Invited Lecture).

9. "*Designing Simulataneous and Dual Catalysts for Intramolecular Hydroamination Reaction*" University of Delhi, on 24th October, **2011** (Invited Lecture).

8. "*Design and Synthesis of Heterobimetallic Catalysts: Olefin Polymerization, Copolymerization and Tandem Catalysis*" Fast Track Young Scientist scheme: Group monitoring workshop held at University of Lucknow on 14th October, **2011**.

7. "*Nontraditional Metal for Catalytic Homogenous Organic Transformation*" on 2nd March, **2011** at IISER-Pune, India. (Invited Lecture)

6. "*Catalytic Organic Transformation through Non-Traditional Metals"* National Seminar on Recent Advances in Synthesis and Catalysis: 10-12 February, **2011** University of Dibrugarh.

5. "*Phenalenyl based Molecules: Transforming Molecular Conductors into Homogeneous Catalysts"* national seminar on 29th May, **2010** at Department of Chemistry, University of Kalyani.

4. "*The Phenalenyl: From Organic Conductors to Inorganic Catalysts*" at 13th National Symposium on Modern Trends in Inorganic Chemistry, (MTIC-XIII) held at Indian Institute of Science, Bangalore during 7-10th Dec. **2009**.

3. "*Neutral Radical-Based Molecular Conductors*" national seminar during 20 to 22thFebruary, **2009** at Department of Chemistry, University of Burdwan.

2. "*Designing Molecule-Based Conductors*" at National Seminar on Current Trends in Chemistry-III (NSCTC-III) organized by the Department of Chemistry, University of Kalyani, on 20-21 March, **2009**.

1. "*The Phenalenyl Based Neutral Radical Conductors*" at Inter IISER chemistry meet on 22nd December, **2008** at IISER-Pune.

Other Lectures:

1. Formation of Indo German Graduate School between University of Goettingen and IISER-Kolkata, on 30Th June, **2010** at Department of Physics, University of Goettingen, Germany.
2. Introduction to International Research Training Group (IRTG) Introductory lecture, on 14th December, **2010** at bilateral workshop between University of Goettingen and IISER-Kolkata held between 14th December to 19th December, 2010 at Goettingen, Germany
3. Phenalenyl Molecules: Playing with nonbonding orbital on 14th December, **2010** at bilateral workshop between University of Goettingen and IISER-Kolkata held between 14th December to 19th December, 2010, at Goettingen, Germany.

Seminar Talk Delivered inside the Institute

Delivered Institute's Saturday colloquium on 19.04.08.

Title of the Talk: *Activation of Molecular Hydrogen Breaking the Marriage and Returning the Couple*.

Poster presented in National/International Seminar and Conferences

1. S. K. Mandal and H. W. Roesky "*Heterobimetallic Catalyst for Polymerizatiuon Reactions.*" Poster presented in Modern Trends in Inorganic Chemistry, December 6-8, **2007**, IIT Madras.

2. S. K. Mandal "*Phenalenyl Based Molecular Conductors*" Poster Presented in the India-UK Frontiers of Science Symposium, March 4-7, **2008,** Hotel Sitara, Ramoji Film City, Hyderabad.

3. S. Santra and S. K. Mandal "*Effective Synthesis of Symmetrical Biaryls through nanocatalysis*" Poster presented in Modern Trends in Inorganic Chemistry, December 7-10, **2009**, IISc-Bangalore.

4. S. Santra, G. P. Jose, T. K. Sengupta and S. K. Mandal "*Copper Nanoparticles: Anti-bacterial and Anti-cancer Activities*" Poster presented in Modern Trends in Inorganic Chemistry, December 28-29, **2009**, IISER-Kolkata.

5. T. K. Sen, A. Mukherjee, and S. K. Mandal "*The Phenalenyl: From Organic Conductors to Inorganic Catalysts with Enhanced Lewis Acidity*" Poster presented in 2nd Inter IISER chemistry meet, December 30-31, **2009**, IISER-Kolkata.

6. S. Santra and S. K. Mandal "*Living Nanocatalysts for Effective Syntheses of Symmetrical Biaryls*" Poster presented in 2nd Inter IISER chemistry meet, December 30-31, **2009**, IISER-Kolkata.

7. S. K. Mandal and A. Mukherjee "*Interstellar Molecules: New Guide to the Emerging*

Main Group Chemistry" Poster presented in Science Day, 6th March-**2010**, IISER-K.

8. A. Mukherjee and S. K. Mandal "*Phenalenyl Based Organozinc Complexes: Towards Living Intramolecular Hydroamination Catalysis*" Poster presented in National Symposium on Frontiers in Main-Group and Organometallic Chemistry (NSFMOC) , IPC, IISc, Bangalore on 20. 11.**2010**.

9. T. K. Sen and S. K. Mandal "*The Phenalenyl Ligands: Transformation from Organic Conductors to Polymerization Catalysts*" Poster presented in International Symposium on Frontiers in Inorganic Chemistry (FIC-**2010**), IACS, Kolkata during 11.12.10-13.12.10.

11. S. Santra, P. Ranjan, K. Dhara, P. Bera, J. Dash and S. K. Mandal "*Recyclable Palladium Nanocatalyst for Copper Free Acyl Sonogashira Reactions*" Poster presented in 1st in house symposium of IISER-Kolkata during 30-31st December, **2010.**

12. S. C. Sau, T. K. Sen, S. Santra and S. K. Mandal "*Interstellar Molecules for Homogeneous Catalysis*" Poster presented in 1st in house symposium of IISER-Kolkata during 30-31st December, **2010**.

13. S. C. Sau and S. K. Mandal " Abnormal N-Heterocyclic Carbene Palladium Complex: Living Catalyst for activation of aryl chloride in Suzuki-Miyaura cross coupling" International symposium Recent Trends of Research in Chemistry held at Midnapore College on 31st-1st Nov. 2011.

14. T. K. Sen and S. K. Mandal "*Phenalenyl Based Molecules: Tuning the Lowest Unoccupied Molecu lar Orbitals to Design Catalyst*." Poster presented in, December 10, **2011**, IISER-Kolkata.

15. S. C. Sau and S. K. Mandal "*Living Catalyst for Room Temperature Activation of Aryl Chlorides in Suzuki–Miyaura Cross Coupling*." Poster presented in National Symposium on Modern Trends in Inorganic Chemistry, December 10-13, **2011**, University of Hyderabad.

16. A. Mukherjee and S. K. Mandal "*Designing Dual Catalyst for Intramolecular Hydroamination Reaction*" Poster presented in National Symposium on Modern Trends in Inorganic Chemistry, December 10-13, **2011**, University of Hyderabad.

17. S. Santra and S. K. Mandal "*A Supported Palladium Nanocatalyst for Copper Free Acyl Sonogashira Reactions: One-pot Multicomponent Synthesis of N-Containing Heterocycles*." Poster presented in National Symposium on Modern Trends in Inorganic Chemistry, December 10-13, **2011**, University of Hyderabad.

18. T. K. Sen and S. K. Mandal "*Introduction of Abnormal N-Heterocyclic Carbene as*

Organocatalyst in Ring Opening Polymerization of Cyclic Esters." Poster presented in National Symposium on Modern Trends in Inorganic Chemistry, December 10-13, **2011**, University of Hyderabad.

19. S. C. Sau, G. Jose, T. K. Sengupta, "Abnormal N-heterocyclic carbene copper(I) complex: Applications spanning from catalysis to cytotoxic effect on cancer cells" in Frontiers in Modern Biology at IISER-Kolkata on 4-5th February, **2012**.

Outreach Activities

1. Coordinated the visit of 120 school kids from various Jawahar Navodaya Schools (MHRD funded Central School) on 14.11.09 (these school kids are topper from various schools in West Bengal, Bihar, and Jharkhand) to IISER-K research laboratories in C V Raman Building. The school kids were from 8th standard to 12th standard.

2. Served as member of organizing committee to celebrate the first IISER-K science day "ExScite 2010" on 6th March-2010.

3. Served as a local organizing committee member to organize a public awareness outreach meeting on the Large Hadron Collider (LHC). The meeting was held in collaboration with Harish Chandra Research Institute (HRI), Allahabad, Indian Institute of Science Education and Research (IISER)-Kolkata and Science City, at Science City, Kolkata on 30th October 2009.

4. Served as a member of local organizing committee to organize the 2nd inter IISER-K symposium on 30-31 Dec. 2009.

5. Served as a National Organizing Committee member to organize the International Conference "Of Molecules and Materials" on 28-29 December -2009 at IISER-Kolkata.

6. Organized Saturday lecture by Dr. Jitendra K Bera, IIT Kanpur on 20th December, 2008.

7. Organized Saturday lecture by Prof. Swapan K Pati, JNCASR, Bangalore on 26th December-2009.

8. Organized Institute Colloquium by Prof. Herbert W. Roesky, University of Goettingen, Germany on 7th February, 2011.

School Lecture and Public Awareness

SKM has actively involved in celebrating the 150th birth anniversary of Acharya Prafulla Chandra Ray on behalf of Department of Chemical Sciences, IISER-K. He visited and delivered an experimental Chemistry lecture in several schools and University to excite the early carrier students in Chemistry. He was involved for setting up a Science Stall on behalf of IISER-Kolkata at Jagualia S. N. Bose Science Fair during January 2-12, 2011. Fascinating chemical experiments were performed in front of general public in the fair for two days.

Popularizing Chemistry and Natural Sciences among Young School Students

As a part of year long celebration of 150th birth anniversary celebration as well as celebration International Year of Chemistry-2011, SKM acted as event coordinator to organize a chemistry experimental lecture by Herbert W. Roesky on 9th February, 2011 at Science City, Kolkata.
The experimental lecture was delivered in front of 1600 spectators and majority of them were school students (nearly 1400) of class VI to XII from various schools in and around Kolkata.

Administrative Activities and Other Responsibilities

1. Served as Chairman of Central NMR Facility of IISER-Kolkata since 2009 to 2012 July.
2. Serving as Chairman of Central Management Committee of Several Gas procurement for IISER-Kolkata since 2011.
3. Served as Proctor of IISER-Kolkata from July-December, 2012.
4. Serving as a member in the Purchase Committee of IISER-Kolkata since 2007.
5. Served as in-charge of Grievances Cell, IISER-Kolkata from 2011 to 2012 .
6. Served as a member of Library committee of IISER-Kolkata from 2007 to 2012.
7. Serving as coordinator for academic exchange between IISER-Kolkata and University of Goettingen, Germany.
8. Served as convener for the Department of Chemical Sciences from 2009-2011.
9. Served as Chairman in-charge for DCS in the month of December-2011.
10. Served as a member of Standing committee on all student-related matters such as admission, time-table, course work.
11. Served as a member of the committee for the development of IISER-Kolkata course contents.
12. Served as a member in the course work committee for Chemistry PhD students.

13. Served as a member of the Committee for Counseling of the Incoming students during admissions for the academic year 2008 – 2009.
14. Served as a member of the committee for selecting candidates for the PhD program of IISER-Kolkata.
15. Served as a member of building committee of CV Raman building.
16. Served as building in-charge of CV Raman Building.
17. Served as a junior Hostel Warden in IISER-Kolkata Salt Lake campus from 2007-2008.
18. Served as a member of research committee for IISER-Kolkata.
19. Served as a member of students advisory committee of IISER-Kolkata.
20. Served as a member of departmental advisory committee.
21. Served as a member of short listing committee for the post of technical assistant.
22. Served as a member of committee to look after the needs of all the research laboratories in the Anatomy Building at Haringhata assignment, appointment of Student Advisors.

22. Served as a member of committee looking after Central Instrumentation Facility (CIF), Haringhata- Phase I of new campus.