# CURRICULUM VITAE

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**EDUCATIONAL QUALIFICATIONS**

# **Ph. D**., 2000, from **Indian Association for the Cultivation of Science (I. A. C. S.)**, Jadavpur, Calcutta-32 (Degree conferred by Jadavpur University, Kolkata, India.)

**Thesis Title**: "Some Aspects of II-VI Semiconductors in Nanocrystalline Thin Film Form".

(Supervisor: Late Prof. S. Chaudhuri)

# **M.Sc**. in PHYSICS (Ist class), 1995, Visva-Bharati, Santiniketan, India.

# **B. Sc**. with Hons. in Physics (Ist class), 1993, Visva-Bharati, Santiniketan, India.

# Higher Secondary (10 + 2) (Ist division), 1990, W. B. C. H. S.E. India.

# Secondary (10) (Ist division), 1988, W.B.B.S.E., India.

**AWARDS and SCHOLARSHIPS:**

# Received Prize in National Merit Scholarship Scheme, 1988.

# Qualified in the Graduates Aptitude Test in Engineering (**GATE**), a National Level Test for Research Fellowships and Post Graduate Studies in Engineering Science and Technology, conducted by Indian Institutes of Technology, in 'Physical sciences', 1996.

# Qualified in "National Eligibility Test (**NET**)" a National Level Test for Junior research Fellowship and Lecturership, conducted by the Council of Scientific and Industrial Research (CSIR), Govt. of India, 1996.

# Junior Research Fellowship, sponsored by Department of Science and Technology (DST), Govt. of India, Aug. 1996 - Aug 1997.

# Junior Research Fellowship, sponsored by the Council for Scientific and Industrial Research (CSIR-NET), Govt. of India, Sept. 1997 -Aug 1999.

# Senior Research Fellowship, sponsored by the Council for Scientific and Industrial Research (CSIR-NET), Govt. of India, Sept. 1999- July 2000.

# Postdoctoral Fellowship, **National Institute of Advanced Industrial Science and Technology** (**AIST**), Tsukuba, Japan.

# Postdoctoral Fellowship, **Inter-University Consortium for DAE Facilities** (**IUC-DAEF**), Kolkata, India.

# Postdoctoral Fellowship, RIE, Shizuoka Univ., Japan

# Postdoctoral Fellowship by **CNRS** in **Ecole Superieure de Physique et Chimie Industrielles de Paris (ESPCI)**, Paris, France.

# CSIR Pool Scientist, **Saha Insitutute of Nuclear Physics (SINP)**, Kolkata, India.

# MANA-Researcher, **National Institute of Materials Science (NIMS),** Tsukuba, Japan.

# Visiting Professor, **National Institute of Materials Science (NIMS),** Tsukuba, Japan (Dec. 2013).

# Received '**C. AMBASANKARAN MEMORIAL AWARD'** for the best paper entitled as 'Electro-optical properties of nanocrytalline ZnSe films' presented in 'National Symposium on Vacuum Science & Technology and Power Beams IVSNS-97', Bhabha Atomic Research Centre

(BARC), Mumbai, Nov 19-21, 1997.

# Received '**Best paper award'** for 'Structural and magnetic properties of $\gamma$-$Fe_2O_3$ nanoparticles coated on silica spheres' presented in 'National Seminar on Science & Technology of Nanomaterials', CGCRI, Jadavpur, Calcutta, March 6-7, 2003.

**SKILLS:**

**Synthesis and developments of various deposition techniques**

- **Chemical Synthesis of nanostructures/nanowires/nanotubes**
- d.c and r.f sputtering system
- single / multi-source evaporation technique
- e-beam evaporation
- emulsion technique
- dc plasma CVD
- RF plasma CVD
- Inductively coupled plasma- CVD
- sol-gel method
- electrochemical deposition

**Characterization techniques**

- Scanning Tunneling Microscopy (STM) and Spectroscopy (STS)
- Atomic Force Microscopy (AFM)
- Scanning Electron Microscopy (SEM)
- Transmission Electron Microscopy (TEM)
- Fluorescent Optical Microscopy
- UV-VIS-NIR spectrophotometer
- Photoluminescence (PL) measurement
- I-V and C-V measurement
- ac and dc conductivity
- Mössbauer Spectroscopy
- Ellipsometry
- Electron Paramagnetic Resonance (EPR)
- Photo-conductivity
- X-ray diffraction

**RESEARCH EXPERIENCES:**

**Postdoctoral period (Jan. 2000- onwards)**:

# Postdoctoral Fellow at **National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, JAPAN**.

# Postdoctoral Fellow at RIE, Shizuoka University, **JAPAN**.

# Postdoctoral Fellow at **Ecole Superieure de Physique et Chimie Industrielles de Paris (ESPCI)**, **Paris, FRANCE.**

# Postdoctoral Fellow at **Inter University Consortium for DAE facilities (IUC-DAEF), Calcutta, India.**

# CSIR SRA (pool), **Saha Institute of Nuclear Physics (SINP)**, India**.**

# MANA-Researcher, **National Institute of Materials Science (NIMS), Tsukuba, JAPAN**.

**Ph.D. period: June, 1996 – December 1999**

# As a Junior Research Fellow (**CSIR-NET**) with Supervisor Prof. S Chaudhuri, Department of Materials Science, Indian Association for the Cultivation of Science (IACS), Calcutta, India, Aug 1996 - Aug 1999.

# As a Senior Research Fellow (**CSIR-NET**) with Supervisor Prof. S Chaudhuri, Department of Materials Science, Indian Association for the Cultivation of Science, Calcutta, India, Sept 1999 - July 2000.

**Employment:** Permanent faculty as Assistant Professor in Dept. of Physics, Visva-Bharati, Santiniketan since Nov.04, 2004.

**Research Projects:**

1. Template based synthesis of metal nanowires: structural and physical properties, funded by CSIR, Govt. of India, New Delhi, period: 2006-2009 (completed).
2. Chemical synthesis and physical properties of multiferroic nanostructures, funded by CSIR, Govt. of India, New Delhi, period: 2010-2013 (completed).
3. Switching of spin-states in spin-crossover molecular thin films, funded by CSIR, Govt. of India, New Delhi, period: 2016-2020 (completed).

**Ph. D. student supervisions:** 05 (five)

**Patent:** Synthesized Carbon Nanotubes and its process of manufacture, Grant No. 270285, Year: 2015

## LIST OF PUBLICATIONS

**In International Referred Journals:**

**1.** Methanol sensing characteristics in undoped and (Zn, Mn) doped $Fe(phen)_2(NCS)_2$ spin-crossover thin films, Saroj Saha and **Swapan K. Mandal,** Materials Today: Proceedings **66**, 3387 (2022).

**2.** Spin state bistability in (Mn, Zn) doped $Fe(phen)_2(NCS)_2$ molecular thin film nanocrystals on quartz, Saroj Saha, Paramesh Chandra and **Swapan K. Mandal,** Physica B: Condensed Matter **642**, 414128 (2022).

**3.** Frequency and temperature-dependent dielectric characteristics of lead-free Br doped perovskites $(CH_3NH_3)_3Bi_2Cl_9$ and $(CH_3NH_3)_3Bi_2Br_xCl_{9-x}$, Paramesh Chandra, Saroj Saha and **Swapan K. Mandal**, Materials Today: Proceedings **66**, 3302 (2022).

**4.** A dielectric study of Br doped lead-free methylammonium bismuth chloride $(CH_3NH_3)_3Bi_2Br_xCl_{9-x,}$ Paramesh Chandra, Saroj Saha and **Swapan K. Mandal**, Appl. Phys. A (Springer) **128**, 541 (2022).

**5.** Evolution of magnetic and transport properties in the Cu-doped pyrochlore iridate $Eu_2(Ir_{1-x}Cu_x)_2O_7$, Sampad Mondal, M. Modak, B. Maji, **Swapan K. Mandal**, B.

Ghosh, Surajit Saha, M. Sardar, and S. Banerjee, Phys. Rev. B **105**, 155113 (2022).

**6.** Morphology controlled $(CH_3NH_3)_3Bi_2Cl_9$ thin film for lead free perovskite solar cell, Parmesh Chandra and **Swapan K Mandal**, Physica B:Condensed Matter **625**, 413536 (2022).

**7.** Role of f-d exchange interaction and Kondo scattering in the Nd doped pyrochlore Iridate $(Eu_{1-x}Nd_x)_2Ir_2O_7$, Sampad Mondal, M. Modak, B. Maji, M. K. Ray, S. Mandal, **Swapan K. Mandal**, M. Sardar and S. Banerjee, Phys. Rev. B. **102**, 155139 (2020).

**8.** Spin transition properties of metal (Zn, Mn) diluted $Fe(phen)_2(NCS)_2$ spin-crossover thin films, Saroj Saha and **Swapan K. Mandal**, Eur. Phys. J. Appl. Phys. **91**, 20301 (2020).

**9.** Frequency dependent charge transport and spin state switching characteristics of $Fe(phen)_2(NCS)_2$ in polymer, Chaitali Mondal, M. L. Nanda Goswami and **Swapan K. Mandal,** J. Nanosci. Nanotechnol. **20**, 2803 (2020).

**10.** Magnetocaloric as a sensitive tool to study magnetic phase in $Ca_4Mn_3O_{10-\delta}$, Sampod Mondal, M. Modak, Mayukh Ray, **Swapan Kumar Mandal**, Sangam Banerjee and Manas Sardar. J. Magn. Magn. Mater. **448**, 292 (2018)

**11.** Probing spin-state switching in $Fe(phen)_2(NCS)_2$ thin film nanocrystals on different substrates by electrical conductivity measurements, Chaitali Mondal, Suvra Pal and **Swapan K. Mandal,** J. Nanosci. Nanotechnol. **18,** 347 (2018).

**12.** Electrically controllable molecular spin crossover switching in $Fe(phen)_2(NCS)_2$ thin film, Chaitali Mondal and **Swapan K. Mandal**, Eur. Phys. J. Appl. Phys. **75**, 30201 (2016).

**13.** Multiferroicity in ZnO nanodumbbell/$BiFeO_3$ nanoparticle heterostructures, D. Mahesh and **Swapan K. Mandal**, Int. J. Mod. Phys. B **30**, 1650074 (2016).

**14.** Observation of pronounced electric polarization and magnetization in Mn doped $BiFeO_3$ nanocrystals, D. Mahesh, M. L. Nanda Goswami and **Swapan K. Mandal**, Adv. Sci. Eng. Med. **7**, 952-957 (2015).

**15.** UV emission from self-assembled ZnS nanowires on DNA templates, **Swapan K. Mandal**, Eur. Phys. J. Appl. Phys. **70**, 20401 (2015).

**16.** Size effect on the magnetic properties of oleic acid stabilized substrate free $BiFeO_3$ nanocrystals, D. Mahesh, **Swapan K. Mandal**, B. K. Mahato and A. Barman, Eur. Phys. J. Appl. Phys. **70**, 10601 (2015).

**17.** Semiconductor-metal-semiconductor transition in Bi and Bi-Ag nanowires, **Swapan K. Mandal** and L. Kabir, J. Phys. D.: Appl. Phys. **47**, 325302 (2014).

**18.** Pronounced Multiferroicity in Oleic Acid Stabilized $BiFeO_3$ Nanocrystals at Room Temperature, Dabbugalla Mahesh, **Swapan K. Mandal**, Bipul K. Mahato, Bivas Rana, and Anjan Barman, J. Nanosci. Nanotechnol. **13**, 4090 (2013).

**19.** Structural and Optical Properties of Single Crystalline Bismuth Nanoparticles in Polymer, Lutful Kabir and **Swapan K. Mandal**, Int. J. of Mod. Phys.: Conference Series **22**, 654 (2013).

**20.** Ordered Monomolecular Layer as a Template for Regular Arrangement of Gold Nanoparticles, Marina Makarova, **Swapan K. Mandal**, Yuji Okawa, and Masakazu Aono, Langmuir **29**, 7334 (2013).

**21.** High ferromagnetic transition temperature in PbS and PbS:Mn nanowires, **S. K. Mandal**, A. R. Mandal and S. Banerjee, ACS Appl. Mat. Interfaces **4**, 205 (2012).

**22.** Controlled chain polymerization and chemical soldering for single-molecule electronics, Y. Okawa, M. Akai-Kasaya, Y. Kuwahara, **S. K. Mandal** and M. Aono, Nanoscale **4**, 3013-3028 (2012).

**23.** Chemical Wiring and Soldering toward All-Molecule Electronic Circuitry, Yuji Okawa**, Swapan K. Mandal,** Chunping Hu, Yoshitaka Tateyama, Stefan Goedecker, Shigeru Tsukamoto, Tsuyoshi Hasegawa, James K. Gimzewski and Masakazu Aono**, J. Am. Chem. Soc.** 133**,** 8227 **(2011).**

**24.** Rate Determining Factors in the Chain Polymerization of Molecules Initiated by Local Single-Molecule Excitation, **Swapan K. Mandal**, Yuji Okawa, Tsuyoshi Hasegawa and Masakazu Aono, ACS Nano **5**, 2779 (2011).

**25.** Methanol sensing characteristics of conducting polypyrrole-silver nanocomposites, L. Kabir and **S. K. Mandal**, Eur. Phys. J. Appl. Phys. **58**, 20402

(2012).

**26.** Fabrication of Luminescent Silver Doped PbS Nanowires in Polymer, **Swapan K. Mandal**, Arup Ratan Mandal, Anjan Barman and Ujjal K. Gautam, J. Nanosci. Nanotechnol. **11**, 10234 (2011).

**27.** DNA-tagged nano gold- A new tool for the management of the armyworm- Spodoptera litura Fab. (Lepidoptera: Noctuidae), A. K. Chakravarthy, Atanu Bhattacharyya, P. R. Shashank, Timothy T. Epidi, B. Doddabasappa and **Swapan K. Mandal**, African Journal of Biotechnology **11**, 9295 (2012).

**28.** Connecting single conductive polymers to a single functional molecule, Y. Okawa, **S. K. Mandal**, C. Hu, Y. Tateyama, S. Goedecker, S. Tsukamoto, T. Hasegawa and M. Aono, Nanotechnology (IEEE-NANO), 940–943 (2010).

**29.** Electron spin resonance in silver doped PbS nanorods, A. R. Mandal and **S. K. Mandal**, J. Exp. Nanosci. **5**, 189 (2010).

**30.** Polymer stabilized Ni-Ag and Ni-Fe alloy nanoclusters: Structural and magnetic properties, L. Kabir, A. R. Mandal and **S. K. Mandal**, J. Magn. Magn. Mater. **322**, 934 (2010).

**31.** Low frequency divergence of dielectric constant and signature of Meyer-Lendel rule in the ac conductivity of PbS and PbS:Mn nanorods in polymer, A. R. Mandal, L. Kabir and **S. K. Mandal**, J. Appl. Phys. **103**, 064311 (2008).

**32.** Humidity sensing properties of conducting polypyrrole-silver nanocomposites, L. Kabir, A. R. Mandal and **S. K. Mandal,** J. Exp. Nanoscience **3**, 297 (2008).

**33.** Negative capacitance and δ-relaxation in DNA molecules confined in nanopores, **S. K. Mandal**, African Physical Review **2** (special issue), 151 (2008).

**34.** Polymer assisted preferential growth of PbS and PbS:Mn nanorods: structural and optical properties, A. R. Mandal and **S. K. Mandal,** J. Exp. Nanosci, **2**, 257 (2007).

**35.** Fluorescent magnetic emulsion droplets: Potential material for multiplexed optical coding of bio-molecules, **S. K. Mandal**, J. Magn. Magn. Mater. **311**, 88 (2007).

**36.** Strong confinement effect in ZnS and ZnS:Mn nanorods embedded in polycarbonate nanopores, **S. K. Mandal**, A. R. Mandal, S. Das and B. Bhattacharjee, J. Appl. Phys. **101**, 114315 (2007).

**37.** Electron spin resonance in DNA doped polypyrrole, **S. K. Mandal**, J. Phys. D: Appl. Phys. **39**, 1944 (2006).

**38.** DNA in nanopores: δ-relaxation and negative capacitance at high frequency, **S. K. Mandal**, J. Nanosci. Nanotechnol. **6**, 1453 (2006).

**39.** Direct electrical transport in DNA molecules confined in nanopores, **S. K. Mandal**, Appl. Phys. Lett. **89**, 193102 (2006).

**40.** Encapsulation of Magnetic and Fluorescent Nanoparticles in Emulsion Droplets, **S. K. Mandal,** N. Liqueux, B. Rotenberg, M. Tramier, J. Fattaccioli, J. Bibette and B. Dubertret, Langmuir, **21**, 4175 (2005).

**41.** Electrodeposited carbon nanotube thin films, A. K. Pal, R. K. Roy, **S. K. Mandal**, S. Gupta and B. Deb, Thin Solid Films **476**, 288 (2005).

**42.** Cobalt doped γ-$Fe_2O_3$ nanoparticles: Synthesis and magnetic properties, S. Chakrabarti, **S. K. Mandal,** D.Ganguli and S. Chaudhuri, Nanotechnology **16**, 506 (2005).

**43.** Growth mechanism of carbon nanotube in electrodeposition technique, **S. K. Mandal**, S. Hussian and A. K. Pal, Ind. J. Pure & Appl. Phys. **43**, 765 (2005).

**44.** Synthesis of DNA-Polypyrrole nanocapsule, **S. K. Mandal** and P. Dutta, J. Nanosci. Nanotech. **4** (8), 972 (2004).

**45.** Electronic conduction processes in DNA-doped polypyrrole nanocomposite films, P. Dutta and **S. K. Mandal,** Nanotechnology **15**, 250 (2003).

**46.** Charge transport in chemically synthesized DNA doped polypyrrole, P. Dutta and **S. K. Mandal**, J. Phys D: Appl. Phys. **37**, 2908 (2004).

**47.** Structural and magnetic properties of γ-$Fe_2O_3$ nanoparticles coated on silica spheres, S. Chakrabarti, D. Ganguli**, S. K. Mandal**, and S. Chaudhuri, Ind. J. Phys. **78**A(2), 247 (2004).

**48.** Wet chemical synthesis of iron pyrite and characterization by Mössbauer spectroscopy, S. Kar, **S. K. Mandal**, D. Das and S. Chaudhuri, Materials Letters, **58**, 2886 (2004).

**49.** Effect of interfacial alloying on the optical properties of Au-Ag multilayer nanocrystalline thin films, R. K. Roy, **S. K. Mandal** and A. K. Pal, Eur. Phys. J. B. **33**, 109 (2003).

**50.** An ellipsometric investigation of $Ag/SiO_2$ nanocomposite thin films, R. K. Roy, **S. K. Mandal,** D. Bhattacharyya and A. K. Pal, Eur. Phys. J. B **34**, 25 (2003).

**51.** Synthesis of $\gamma$-$Fe_2O_3$ nanoparticles coated on silica spheres: Structural and magnetic properties, S. Chakrabarti**, S. K. Mandal**, B. K. Nath, D. Das, D. Ganguly and S. Chaudhuri, Eur. Phys. J. B. **34**, 163 (2003).

**52.** Electrical and optical properties of $ZnS_{0.05}Se_{0.95}$ nanocrystalline films, A.Ganguly, **S. K. Mandal**, S. Chaudhuri and A. K. Pal, J. Appl. Phys. **90**, 5652 (2001).

**53.** Surface plasmon resonance in nanocrystalline silver particles embedded in $SiO_2$ matrix, **S. K. Mandal**, R.K. Roy and A. K. Pal, J. Phys. D: Appl. Phys. **35**(17), 2198 (2002).

**54.** Effect of particle shape distribution on the surface plasmon resonance of $Ag\text{-}SiO_2$ nanocomposite thin films, **S. K. Mandal**, R. K. Roy and A.K. Pal, J. Phys. D: Appl. Phys. **36**, 261 (2003).

**55.** Optical properties of $Cd_{1-x}Zn_xS$ nanocrystals embedded in sol-gel silica matrix, B. Bhattacharjee, **S. K. Mandal**, K. Chakrabarti, D. Ganguly and S. Chaudhuri, J. Phys. D: Appl. Phys. **35**, 2636 (2002).

**56.** Photo-induced tunneling current in single-wall carbon nanotubes investigated by scanning tunneling spectroscopy, S. Kazaoui, **S. K. Mandal** and N. Minami, AIP Conf. Proc. **633**, 318 (2002).

**57.** Au/CdS Schottky Diode: Fabricated with nanocrystalline CdS layer, **S. K. Mandal**, A. B. Maity, J. Dutta, R. Pal, S. Chaudhuri and A. K. Pal, Phys. Stat. Sol. (a) **163**, 433 (1997).

**58.** Hopping conduction in nanocrystalline ZnSe films prepared by high pressure d.c. magnetron sputtering, **S. K. Mandal**, S. Chaudhuri and A. K. Pal, Nanostr. Mater. **10** (4), 607 (1998).

**59.** Nanocrystalline CdTe films deposited by high pressure sputtering: carrier transport at low temperatures, **S. K. Mandal**, S. Chaudhuri and A. K. Pal, Thin Solid Films **357**, 102 (1999).

**60.** Morphology of thin silver film grown by d.c. sputtering on Si (001), S. Kundu, S. Hazra, S. Banerjee, M. K. Sanyal, **S. K. Mandal**, S. Chaudhuri and A. K. Pal, J. Phys. D: Appl. Phys. **31**, L73 (1998).

**61.** Electron transport process in discontinuous silver films, **S. K. Mandal**, A. Ganguly, S.

Chaudhuri and A. K. Pal, Vacuum **52**, 485 (1999).

**62.** Optical properties of nanocrystalline ZnS films prepared by dc magnetron sputtering, **S. K. Mandal**, S. Chaudhuri and A. K. Pal, Thin Solid Films **350**, 209 (1999).

**63.** Nanocrystalline ZnSe films: Preparation and Properties, **S. K. Mandal**, S. Chaudhuri and A.K. Pal, Ind. J. Phys. **74A** (2), 143 (2000).

**64.** Some aspects of II-VI semiconducting films in the nanocrystalline thin film form, **S. K. Mandal**, D. Bhattacharya, S. Chaudhuri and A. K. Pal, 'Physics of Semiconductor Nanostructures', Narosa Publishing House (New Delhi, India), 37, 1997.

**Book:**

**1.** Book chapter on 'On-surface synthesis of single conjugated polymer chains for single-molecule devices', Y. Okawa, **Swapan K. Mandal**, M, Makarova and M. Aono, Springer International Publishing, Switzerland (Chapter 8, ISBN: 978-3-319-26598-8), Editor: Andre Gourdon, p. 167-180, **2016.**