

Dr. Somaditya Sen

Associate Professor

Discipline of Physics, Centre of Astronomy
Metallurgy Engineering and Material Sciences

IIT INDORE

Khandwa Road, Simrol, Indore, India



Sept 2017	Present	Ming Chi University of Technology, New Taipei, Taiwan	Adjunct Associate Professor
Feb 2013	Present	Indian Institute of Technology Indore, India	Associate Professor
Dec 2015	Present	Atal Bihari Vajpayee Indian Institute of Information Technology and Management, Gwalior	Building Works Committee, Member, ABVIITMG
Jan 2016	31 st Dec 2017	Indian Institute of Technology Indore, India	Board of Governors Member, IIT Indore
Sept 2015	April 2017	Indian Institute of Technology Indore, India	Associate & Acting Dean Planning, IITI
Feb 2007	Jan 2013	University of Wisconsin Milwaukee, USA [Dept. of Physics]	Research Associate/Scientist
Jan 2006	Jan 2007	University of Wisconsin Milwaukee, USA [Dept. of Electrical Engg.]	Research Associate
Aug 2003	Jan 2006	University of Electro-Communication, Japan [Dept. of Electronics Engg.]	Research Scientist
Jan 2003	Aug 2003	National Taiwan University, Taiwan [Centre Cond. Matter Science]	Postdoctoral Fellow
Dec 1999	Aug 2003	PPH School, Kolkata, India	Science Maths Teacher
Mar 1998	Nov 1999	Indian Association For The Cultivation Of Sciences, India [Solid State Physics]	Senior Research Fellow
Mar 1996	Feb 1998	Indian Association For The Cultivation Of Sciences, India [Solid State Physics]	Junior Research Fellow
Jun 1995	Feb 1996	Jadavpur University, India [Electrical Engg. Dept.]	Junior Research Fellow

MATERIAL TYPES:

Magnetic Oxides Materials
Semiconducting Oxide Crystals
Semiconducting Oxide Glasses
Ferroelectrics
Multiferroics
Magnetoelectrics
Nanomaterials
Single Crystals
Thin Films

SYNTHESIS TECHNIQUES:

Sol-gel, Hydrothermal,
Co-precipitation,
Solid state reaction,
Floating Zone Single crystal growth,
Melt quenching,
Spin coating,
Vapour deposition,
E-beam deposition,
Chemical Vapour deposition, etc.

STRUCTURAL STUDIES:

XRD, XPS, EXAFS/XANES, FESEM,
HRTEM, SAED, EDX, AFM,
Raman Spectroscopy, IR, UV-vis,
PL/PLE, Fluorescence

PHYSICAL PROPERTIES:

Magnetic Properties,
Electrical conductivity,
Dielectric Properties,
Magnetoelectric/
Magnetoferroelectric/
Magnetodielectric properties,
Specific Heat, Thermogravimetric prop,
Thermo-optical prop.

Important Collaborators

Dr. Mahmud Khan	Physics, Miami University, USA
Dr. Sajal Biring	Electrical Engg., MCUT, Taiwan
Dr. SW Liu	Electrical Engg., MCUT, Taiwan
Prof. CY Chen	Materials Engg., MCUT, Taiwan
Prof. Chuan-Ming Tseng	Materials Engg., MCUT, Taiwan
Prof. Chia Hao Ku	Electrical Engg., MCUT, Taiwan
Dr. D Bhattacharya	BARC, Mumbai, India
Dr. Sinha	RRCAT, Indore, India
Dr. CP Vinod	NCL, Pune, India
Dr. Phase	IUC UGC DAE, Indore, India
Prof. Robert Klie	Nanoscale Physics Group, Univ. of Illinois at Chicago, USA
Dr. Yang Ren	Advanced Photon Source, Argonne National Lab, USA
Prof. Kartick Ghosh	Physics Dept., Missouri State University, USA

JOURNAL PUBLICATIONS (Last Five Years)

2017

Chih-Chien Lee, Chun-Jen Shih, Gautham Kumar, Sajal Biring, Somaditya Sen, and Shun Wei Liu, Highly efficient exciplex organic light-emitting devices employing a sputtered indium-tin oxide electrode with nano-pinhole morphology, *Journal of Materials Chemistry C*, vol. 5, pp. 12050-12056, 2017

Gaurav Bajpai, Tulika Srivastava, Sunil Kumar, Sajal Biring, Somaditya Sen, Enhanced red emission from Fe/Si co-doped ZnO nano-particles, *Scripta Materialia*, vol. 144, pp. 27, 2017

Anita Verma, Arun kumar Yadav, Nasima Khatun, Sunil Kumar, Chuan-Ming Tseng, Sajal Biring, Somaditya Sen, Size and strain dependent anatase to rutile phase transition in TiO₂ due to Si incorporation, *Journal of Materials Science: Materials in Electronics (JMSE)*, vol. published online, pp. published online, 2017

Mohd. Nasir, Rakibul Islam, Md. A Ahmed, Saniya Ayaz, Gautham Kumar, Sunil Kumar, C L Prajapat, Frederick Roussel, Sajal Biring, Somaditya Sen, Cu_{1-x}Fe_xO: Hopping Transport and Ferromagnetism, *Royal Society Open Science*, vol. 4, pp. 170339, 2017

Nasima Khatun, Anita, Parasmani Rajput, Dibyendu Bhattacharya, S.N. Jha, Sajal Biring, Somaditya Sen, Anatase to rutile phase transition promoted by vanadium substitution in TiO₂: A structural, vibrational and optoelectronic study, *Ceramics International*, vol. 43, pp. 14128-14134, 2017

Gaurav Bajpai, Tulika Srivastava, Mohd Nasir, Saurabh Tiwari, Shubhra Bajpai, EG Rini, Sajal Biring, Somaditya Sen, A comprehensive theoretical and experimental study on structural and mechanical properties of Si doped ZnO, *Scripta Materialia*, vol. 135, pp. 1-4, 2017

Tulika Srivastava, Gaurav Bajpai, Nidhi Tiwari, D Bhattacharya, S N Jha, Sunil Kumar, Sajal Biring, Somaditya Sen, OPTO-ELECTRONIC PROPERTIES OF Zn_(1-x)V_xO: GREEN EMISSION ENHANCEMENT DUE TO V⁴⁺, *J. Appl. Phys.* 122-3, vol. 122, pp. 025106, 2017

Arun Kumar Yadav, Anita, Sunil Kumar, Anjali Panchwatee, V. Raghavendra Reddy, Parasharam M. Shirage, Sajal Biring and Somaditya Sen, Structural and ferroelectric properties of perovskite Pb_(1-x)(K_{0.5}Sm_{0.5})_xTiO₃ ceramics, *RSC Advances*, vol. 7, pp. 39434 - 39442, 2017

Mohd. Nasir, N. Patra, Md. A. Ahmed, D. K. Shukla, Sunil Kumar, D. Bhattacharya, C. L. Prajapat, D. M. Phase, S. N. Jha, Sajal Biring and Somaditya Sen, Role of compensating Li/Fe incorporation in Cu_{0.945}Fe_{0.055-x}Li_xO: structural, vibrational and magnetic properties, *RSC Advances*, vol. 7, pp. 31970-31979, 2017

Sunil Kumar, Arun Kumar Yadav, Somaditya Sen, Sol-gel synthesis and characterization of a new four-layer $K_{0.5}Gd_{0.5}Bi_4Ti_4O_{15}$ Aurivillius phase, *Journal of Materials Science: Materials in Electronics*, vol. 04 May 2017, pp. 1-10, 2017

Tulika Srivastava, Aswin Sadanandan, Gaurav Bajpai, Saurabh Tiwari, Ruhul Amin, Mohd. Nasir, Sunil Kumar, Parasharam M. Shirage, Sajal Biring, $Zn_{1-x}Si_xO$: Improved optical transmission and electrical conductivity, *Ceramics International*, vol. 43, pp. 5668-5673, 2017

Arun Kumar Yadav, Parasmani Rajput, Ohud Alshammari, Mahmud Khan, Anita, Gautham Kumar, Sunil Kumar, Parasharam M Shirage, Sajal Biring, Structural distortion, ferroelectricity and ferromagnetism in $Pb(Ti_{1-x}Fe_x)O_3$, *Journal of Alloys and Compounds*, vol. 701, pp. 619-625, 2017

Saurabh Tiwari, Gaurav Bajpai, Tulika Srivastava, Srashti Viswakarma, Parasharam Shirage, Somaditya Sen, Sajal Biring, Effect of strain due to Ni substitution in CeO_2 nanoparticles on optical and mechanical properties, *Scripta Materialia*, vol. 129, pp. 84-87, 2017

Gaurav Bajpai, Mohd Nasir, Rini E G, Pritpal Sandhu, Siddharth Malu, Sunil Kumar, Parasharam M. Shirage and Somaditya Sen, Structural and Mechanical characterization of Si doped ZnO, *Journal of Nano Science and Nanotechnology (JNN)*, vol. 17, pp. 1806-1812, 2017

Prateek Bhojane, Alfa Sharma, Manojit Pusty, Yogendra Kumar, Somaditya Sen and Parasharam Shirage, , Synthesis of Ammonia-Assisted Porous Nickel Ferrite ($NiFe_2O_4$) Nanostructures as a Electrode Material for Supercapacitors, *Journal of Nanoscience and Nanotechnology (JNN)*, vol. 17, pp. 1387-1392, 2017

Tulika Srivastava, E.G Rini, Ashutosh Joshi, Parasharam Shirage, Somaditya Sen, Structural distortion and bandgap increment in nanocrystalline wurtzite Si-substituted ZnO, *Journal of Nanoscience and Nanotechnology*, vol. 17, pp. 1356-1359, 2017

Md Nasir, Gautam Kumar, Parasharam Shirage and Somaditya Sen, Synthesis, morphology, optical and electrical properties of $Cu_{1-x}Fe_xO$ nanopowder, *Journal of Nanoscience and Nanotechnology (JNN)*, vol. 17, pp. 1345-1349, 2017

Arun kumar Yadav, Anita, Sunil Kumar, Parasharam M. Shirage, Sajal Biring, Somaditya Sen, Structural and dielectric properties of $Pb_{(1-x)}(Na_{0.5}Sm_{0.5})_xTiO_3$ ceramics, *Journal of Materials Science*, vol. 1, pp. 1, 2017

2016

Mohd Nasir, N. Patra, D. K. Shukla, D. Bhattacharya, Sunil Kumar, D. M. Phase, S. N. Jha, S. Biring, Parasharam M. Shirage, Somaditya Sen, X-ray structural studies on solubility of Fe substituted CuO, *RSC Advances*, vol. 6, pp. 103571-103578, 2016

Amit Kumar Rana , Rajasree Das, Yogendra Kumar , Somaditya Sen , Parasharam M. Shirage , Growth of transparent Zn_{1-x}Sr_xO (0.0 ≤ x ≤ 0.08) films by facile wet chemical method: Effect of Sr doping on the structural, optical and sensing properties, *Applied Surface Science*, vol. 379, pp. 23-32, 2016

Nasima Khatun, Somaditya Sen, Magnetic and Dielectric properties of V doped TiO₂ nano-particles, *Nanotechnology for better living.*, vol. 3, pp. 170, 2016

Prateek Bhojane, Somaditya Sen and Parasharam Shirage, Enhanced electrochemical performance of Mesoporous NiCo₂O₄ as an excellent supercapacitive alternative energy storage material, *Applied Surface Science*, vol. 377, pp. 376-384, 2016

Nasima Khatun, E. G. Rini, Parasharam Shirage, Parasmani Rajput, S. N. Jha, Somaditya Sen, Effect of lattice distortion on bandgap decrement due to vanadium substitution in TiO₂ nanoparticles Materials Science in Semiconductor Processing, *Materials Science in Semiconductor Processing*, vol. 50, pp. 7-13, 2016

Tulika Srivastava, Sunil Kumar, Parasharam Shirage, Somaditya Sen, Reduction of O²⁻ related defect states related to increased bandgap in Si⁴⁺ substituted ZnO, *Scripta Materialia*, vol. 124, pp. 11-14, 2016

2015-2013

Amit Kumar Rana, Aneesh J. , Yogendra Kumar, Arjunan , K. V. Adharsh, Somaditya Sen and Parasharam Shirage, ENHANCEMENT OF TWO PHOTON ABSORPTION WITH NI DOPING IN THE DILUTE MAGNETIC SEMICONDUCTOR ZNO CRYSTALLINE NANORODS, *Applied Physics Letters*, vol. 107 (23), pp. 231907, 2015

Yogendra Kumar, amit rana, Prateek Bhojane, Manojit Pusty, Vivas Bagwe, Somaditya Sen, Parasharam M Shirage, Controlling of ZnO nanostructures by solute concentration and its effect on growth, structural and optical properties, *Materials Research Express*, vol. 2(10), pp. 105017, 2015

Amit Kumar Rana, Yogendra Kumar, Niharika Saxena, Rajasree Das, Somaditya Sen, and Parasharam Shirage, Studies on the control of ZnO nanostructures by wet chemical method and plausible mechanism, *AIP Advances*, vol. 5, pp. 97118, 2015

Rajasree Das, Amit Kumar, Yogendra Kumar, Somaditya Sen and Parasharam M. Shirage, Effect of growth temperature on the optical properties of ZnO nanostructures grown by simple hydrothermal method, *RSC Advances*, vol. 5, pp. 60365, 2015

Vikash Malik, Somaditya Sen, David R Gelting, Marija Gajdardziska-Josifovska, Marius Schmidt and Prasenjit Guptasarma, Field-enhanced magnetic moment in ellipsoidal nano-hematite, *Materials Research Express*, vol. 1-2, pp. 026114, 2014

Achintya Bera, Koushik Pal, D. V. S. Muthu, Somaditya Sen, Prasenjit Guptasarma, U. V. Waghmare, and A. K. Sood, Sharp Raman Anomalies and Broken Adiabaticity at a Pressure Induced Transition from Band to Topological Insulator in Sb₂Se₃, *Phys. Rev. Lett.*, vol. 110, pp. 107401, 2013

Most Cited Publications:

Sharp Raman anomalies and broken adiabaticity at a pressure induced transition from band to topological insulator in Sb ₂ Se ₃ A Bera, K Pal, DVS Muthu, S Sen, P Guptasarma, UV Waghmare, ... <i>Physical review letters</i> 110 (10), 107401	47
Structure and other physical properties of magnesium vanadate glasses S Sen, A Ghosh <i>Journal of non-crystalline solids</i> 258 (1), 29-33	43
Multiphonon assisted hopping in strontium vanadate semiconducting glasses S Sen, A Ghosh <i>Journal of Physics: Condensed Matter</i> 11 (6), 1529	39
Structural properties of strontium vanadate glasses S Sen, A Ghosh <i>Journal of Materials Research</i> 15 (4), 995-999	36
Thermal and ion induced annealing of nanocrystalline ZnO thin film deposited by atom beam sputtering DC Agarwal, F Singh, D Kabiraj, S Sen, PK Kulariya, I Sulania, S Nozaki, ... <i>Journal of Physics D: Applied Physics</i> 41 (4), 045305	29
Semiconducting properties of magnesium vanadate glasses S Sen, A Ghosh <i>Journal of applied physics</i> 86 (4), 2078-2082	21
Effect of growth temperature on the optical properties of ZnO nanostructures grown by simple hydrothermal method R Das, A Kumar, Y Kumar, S Sen, PM Shirage <i>RSC Advances</i> 5 (74), 60365-60372	19
Electrical properties of semiconducting barium vanadate glasses S Sen, A Ghosh <i>Journal of Applied Physics</i> 87 (7), 3355-3359	17
Negative photoconduction of planar heterogeneous random network of ZnO-carbon nanotubes S Sen, D Chowdhary, NA Kouklin <i>Applied Physics Letters</i> 91 (9), 093125	16

Ac conductivity of strontium vanadate semiconducting glasses S Sen, A Ghosh Journal of Physics: Condensed Matter 13 (9), 1979	16
Controlling of ZnO nanostructures by solute concentration and its effect on growth, structural and optical properties Y Kumar, AK Rana, P Bhojane, M Pusty, V Bagwe, S Sen, PM Shirage Materials Research Express 2 (10), 105017	12
Polaronic transport properties of some vanadate glasses: Effect of alkali-earth oxide modifiers S Sen, A Ghosh Physical Review B 60 (22), 15143	12
Hopping conduction in calcium vanadate semiconducting glasses S Sen, A Ghosh Journal of Physics: Condensed Matter 11 (41), 8061	12

CONFERENCES (Recent)

Anita, Arun Kumar Yadav, Sunil Kumar, Parasharam M. Shirage, Somaditya Sen, Influence of V ⁵⁺ doping on structure, microstructure and electrical properties of 0.94(Na _{0.5} Bi _{0.5} TiO ₃)-0.06(BaTiO ₃) lead-free ceramics, <i>International Conference on Technologically Advanced Materials and Asian Meeting on Ferroelectricity (ICTAM-AMF10), New Delhi, India, 2018</i>
Gaurav Bajpai, Tulika Srivastava, Parasharam Shirage,, and Somaditya Sen, Influence of Si incorporation on mechanical properties of ZnO particles, <i>AIP Conference Proceedings</i> , vol. 1832, article 050156 (2017), 2017
Arun Kumar Yadav, Anita, Sunil Kumar, Somaditya Sen, Structural and ferroelectric properties of perovskite Pb(1-x)(K _{0.5} Sm _{0.5})xTiO ₃ ceramics, <i>Suntec Singapore</i> , 2017
Tulika Srivastava, Gaurav Bajpai, Sunil Kumar, Parasharam Shirage, Somaditya Sen, Effect of Si doping on optical & electrical property of ZnO, <i>The International Conference on Fiber Optics and Photonics 2016 © OSA 2016, IIT Kanpur</i> , vol. W3A.88, pp. W3A.88, 2016
Arun Kumar Yadav, Anita, Sunil Kumar, Parasharam M. Shirage, Somaditya Sen, Structural and dielectric properties of A-site modified perovskite Pb(1-x)(Na _{0.5} Sm _{0.5})xTiO ₃ , <i>International Conference on Technologically Advanced Materials and Asian Meeting on Ferroelectricity (ICTAM-AMF10), New Delhi, India</i> , 2016
Gaurav Bajpai, Tulika Srivastava, Sunil Kumar, Parasharam Shirage and Somaditya Sen,, Structure, electronic and photoluminescence study of Si doped ZnO nano-particles, <i>ICONAMMA -2016</i> , vol. 149, article 012186, 2016
Nasima Khatun, Somaditya Sen, Precursors, synthesis method, sintering parameters and grain size effect on dielectric and ferroelectric properties of BaTiO ₃ , <i>International Conference on Material Science and Technology - 2016, St. Thomas College, Pala, Kerala, India</i> , vol. 3, pp. 170, 2016

TEACHING EXPERIENCE

ACADEMIC RESPONSIBILITIES

UNDER GRADUATE COURSES:

Electrodynamics
B.Tech Optics Laboratory
Bachelors Physics Laboratory

POST GRADUATE / PHD LEVEL COURSES:

Classical Mechanics
Thermodynamics
Quantum Mechanics
Statistical Mechanics
MSc Electronics Lab

RESEARCH

Currently mentoring 10 PhD scholars and 15 interns, on semiconducting dielectrics, ferroelectrics and magnetic materials.

ADMINISTRATIVE RESPONSIBILITIES

- Represent IITI in every major administrative meeting
- Established MoU with Ming Chi University of Technology, 2016, 2017
- Major role in establishing research relationship with Amity University, 2017
- Member of Board of Governors IITI (Jan 2016-present)
- Member of Building Works Committee ABVIITMG, (Dec 2016-present)
- Associate Dean Planning and Acting Dean Planning (Sept 2015-April 2017)
- Headed IIT Indore team in National Science Fair Summit 2015, N Delhi
- Headed IIT Indore team in the Indo-French Tech Summit 2013, N Delhi
- Headed IIT Indore team in Indo-Australia Student Exchange Plan 2014
- Will head IITI to Indo-US Tech Summit in Nov 2014
- Leading role to establish IITI-RRCAT MoU
- Arranged Student RnD team to meet President of India, Mr Pranab Mukherjee, ex-President of India, Dr Abdul Kalam, ex-MHRD minister, Dr Shashi Tharoor, eminent scientists like Prof C N R Rao (Bharatratna), Prof S V Raghavan (Scientific Secretary to the Govt of India), Prof Ramasamy (DST Secretary), Dr V K Saraswat (Padmashri, Padmabhusan) to showcase IITI research.
- Nurturing Research and Development relations with universities/industries
- Setup of institutional research centres for material science and astrophysics
- Major role in academic events like convocations, seminars, conferences, public lectures and institutional reporting to Ministry, etc.

HOBBIES / LIKINGS:

Photography, Poetry, Music, Nature, Meditation, Social Work.