

Brief Curriculum Vitae:

Dr. Shubra Singh
Crystal Growth Centre
Anna University
Chennai-600 025
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Phone: 09840422496, 09600018197
D.O.B: 13.11.1979



Professional experience

DST-INSPIRE Faculty : Crystal Growth Centre, Anna University, Chennai, Aug 2012-present

Assistant Prof. (contract): Materials Science Centre, IIT Kharagpur (2012)

Senior Project Officer : BHEL Consultancy Project, IIT Madras (2011)

CEFIPRA Post Doc. Fellow : UMR 6226 CNRS, University of Rennes 1, France (Sep'2009–Dec'2010) - Prof. Werner Paulus group

Project Fellow (JRF) : Energy Research Unit, Indian Association for Cultivation of Science, Kolkata (2004) - Prof. Swati Ray's group

Education

Ph.D. Degree : Indian Institute of Technology, Madras (2009), Best Thesis

MSc. Degree : Calcutta University (2003), First Class

BSc. Degree : Calcutta University (2001), First Class

Total International publications in refereed journals: 25

Total conference publications: 32

Teaching experience (at IIT Kharagpur and Anna University): 2.5 years

Post doctoral experience (overlapping with teaching experience): 4.5 years

Past and Current Research Activities

Experimental Condensed Matter Physics and Materials Science

- Mixed conducting oxygen deficient compounds as cathode material for solid oxide fuel cells
- CO₂ capture
- CIS based nanoinks for Photovoltaics,
- Electrical, optical and structural characterization of Oxides in bulk, nanostructured and thin film form, by PLD, PVD techniques and synthesis by chemical route
- Oxynitrides for photocatalytic applications

Awards/honours/Fellow details and other recognitions received

- (i) Calcutta University Ranker in M.Sc. (2003)
- (ii) Award of **Lectureship NET** (National Eligibility Test) in Physical Sciences by Joint CSIR-UGC (2003)
- (iii) **All India rank of 40** in the **GATE** examinations in 2004 with **98.47** percentile conducted nationwide, granted by Indian Institute of Technologies, India
- (iv) ISRS **best paper award** at the International symposium for Research Scholars (ISRS 2008), Dec-2008, IIT Madras, India
- (v) **Prof. Lashkar Best Thesis Award** in PhD (Department of Physics) in July 2009 at Indian Institute of Technology Madras (IITM), India
- (vi) **CEFIPRA Post doctorate Fellow** by Indo-French Centre for the Promotion of Advanced Research (IFCPAR), New Delhi, India
- (vii) **DST-INSPIRE Faculty Award 2012**
- (viii) Research work appeared on the **cover page of J. Phys. D: Applied Physics** (International refereed journal), 21st October 2007
- (ix) Journal paper appeared as the **most downloaded paper** in the years 2007-2010 among IOP (Institute of Physics) journals
- (x) Research Councilor from Department of Physics, IIT Madras for the period 2006-2007.
- (xi) **Fast Track Young Scientist (DST) 2014**
- (xii) **Travel Grant for Young scientists (below 35 years) under International Travel Support Scheme (ITS)** by SERB to attend MRS Spring Meeting at SAN Francisco, California, 2014.

Details of publications / conference papers presented, listing chronologically:

Referees International Journal Publications and Book chapters (Total- 179

Citations)

- [1]. Investigation of $\text{CaFeO}_{2.5}$ single crystals grown by flux growth technique, **Shubra Singh**, Sumithra Sivadas Menon, K. Gupta and R. Jayavel (**Materials Letters**) (Impact Factor 2.2)
- [2]. R. Ramesh, R. Loganathan, Sumithra Sivadas Menon, K. Baskar and **Shubra Singh**, Controlled nucleation and growth of nanostructures by employing surface modified GaN based layers/heterostructures as bottom layer, **RSC Advances** 4 (14) (2014) 7112 - 7119. (Impact Factor 2.562)

- [3]. R. Loganathan, M. Jayasakthi, K. Prabakaran, R. Ramesh, P. Arivazhagan, B. kuppulingam, S. Sankaranarayanan, **Shubra Singh** and K. Baskar, Growth and characterization of AlInGaN/AlN/GaN grown by MOCVD, Physics of Semiconductor devices, V. K. Jain and Abhishek Verma (Editors) by Environmental Science and Engineering, **Springer**, (2013) 117-119.
- [4]. **Shubra Singh**, Growth of CuInS₂ Nanotubes from Cu₂S - CuInS₂ heterostructures as a Potential Photovoltaic Material, **Analytical letters** 46 (2013) 1587-1596 (Impact factor – 1)
- [5]. Effect of Al-mole fraction in Al_xGa_{1-x}N grown by MOCVD, M. Jayasakthi, R. Ramesh, K. Prabakaran, R. Loganathan, B. Kuppulingam, M. Balaji, P. Arivazhagan, S. Sankaranarayanan, **Shubra Singh**, and K. Baskar, **AIP Conference Proceedings** 1591 1458 (2014)
- [6]. Synthesis, morphology and optical properties of GaN and AlGaN semiconductor nanostructures B. Kuppulingam, **Shubra Singh**, and K. Baskar, **AIP Conference Proceedings** 1591, 1437 (2014)
- [7]. E. Senthil Kumar, **Shubra Singh** and M. S. R. Rao, “Zinc Oxide: The versatile material with an assortment of physical properties” **Springer Series in Materials Science** 180, 1-38 (2014).
- [8]. Kapil Gupta, **Shubra Singh**, Monica Ceretti, M.S. R. Rao, and Werner Paulus, Scaling of extended defects in nano-sized Brownmillerite CaFeO_{2.5}, **Phys. Status Solidi A**, 210, 1–7 (2013). (Impact factor – 1.469) **Cited 1 time**
- [9]. **Shubra Singh**, Kapil Gupta, M. S. R. Rao, Synthesis and microstructural investigation of Sr₂Co₂O₅ as cathode and gadolinia doped ceria as electrolyte material for SOFC application, **J. Nanosci. Lett.** (2013) 3: 12, 1-4.
- [10]. **Shubra Singh**, Sunil Kumar Samji and M.S. R. Rao, Synthesis and characterisation of CuInGaS₂ nano-ink for photovoltaic applications, **Journal of Experimental Nanoscience** (2012) 1–6. (Impact factor – 0.875) **Cited 1 time**
- [11]. **Shubra Singh**, J.N.Divya Deepthi, B. Ramachandran and M. S. R. Rao, Synthesis and comparative study of Ho and Y doped ZnO nanoparticles, **Material Letters** 65 (2011) 2930-2933. (Impact factor – 2.322) **Cited 3 times**
- [12]. C. Sudakar, **Shubra Singh**, M.S.R. Rao and G. Lawes, “The role of defects in multifunctional oxide nanostructures” in Functional Metal Oxide Nanostructures, with Junqiao Wu, Weiqiang Han, Ho-Cheol Kim, Anderson Janotti, Jinbo Cao (Editors), **Springer** (2011) 37-69. **Cited 1 time**
- [13]. **Shubra Singh**, Daisuke Nakamura, Kentaro Sakai, Tatsuo Okada and M S Ramachandra Rao, Investigation of low-temperature excitonic and defect emission from Ni-doped ZnO nanoneedles and V-doped ZnO nanostructured film **New Journal of Physics** 12 (2010) 023007. (Impact factor – 4.063) **Cited 2 times**

- [14]. **Shubra Singh**, E. Senthil Kumar, M. Kottaisamy and M. S. Ramachandra Rao Synthesis and formation mechanism of ZnO Nanobruses, *AIP Conf. Proc.* **1276**, (2010) 37-42.
- [15]. E. Senthil Kumar, Jyothirmoy Chatterjee, **Shubra Singh**, Nandita Dasgupta, M. S. Ramachandra Rao, Thin Film Growth, Electrical Transport and Ohmic Contact Studies of p-ZnO, *IEEE Region 10 Annual International Conference, Proceedings/TENCON* (2010) 995-997.
- [16]. **Shubra Singh**, E. Senthil Kumar and M. S. Ramachandra Rao, Microstructural Study of Assorted ZnO Nanostructures: Nanocombs, Nanocones and Microspheres *J. of Nanoscience and Nanotechnology* **9** (2009) 1–5. (Impact factor – 1.15)
- [17] **Shubra Singh** and M.S. Ramachandra Rao, Green light emitting oxygen deficient ZnO forks, brooms and spheres, *Scripta Materialia* **61** (2009) 169-172. (Impact factor – 2.821) **Cited 3 times**
- [18]. **Shubra Singh** and M. S. Ramachandra Rao, Optical and electrical resistivity studies of isovalent and aliovalent 3d transition metal ion doped ZnO, *Phys. Rev. B- Condensed Matter and Materials Physics* **80** (2009) 045210. (Impact factor – 3.767) **Cited 27 times**
- [19]. **Shubra Singh**, N. Rama, K. Sethupathi and M. S. Ramachandra Rao, Correlation between electrical transport, optical, and magnetic properties of transition metal ion doped ZnO, *Journal of Applied Physics* **103** (2008) 07D108. (Impact factor – 2.064) **Cited 5 times**
- [20]. **Shubra Singh**, E. Senthil Kumar and M. S. Ramachandra Rao, Microstructural, optical and electrical properties of Cr doped ZnO, *Scripta Materialia* **58** (2008) 866–869. (Impact factor – 2.821) **Cited 25 times**
- [21]. **Shubra Singh**, S. Bhaskar Reddy, M. Kottaisamy, M. S. Ramachandra Rao, Formation of ZnO nanobruses in direct atmosphere using carbon catalyst and Zn metal source, *NANO* **3** (2008) 361–365. (Impact factor – 1.167) **Cited 4 times**
- [22]. **Shubra Singh**, P Thiyagarajan, K Mohan Kant, D Anita, S Thirupathiah, N Rama, Brajesh Tiwari, M Kottaisamy and M S Ramachandra Rao, Topical review: Structure, microstructure and physical properties of ZnO based materials in various forms: bulk, thin film and nano, *J. Phys. D: Appl. Phys.* **40** (2007) 6312-6327 . (Impact factor – 2.528) **Cited 68 times**
- [23]. **Shubra Singh** and M. S. Ramachandra Rao, Structure and Physical Properties of Undoped ZnO and Vanadium Doped ZnO Films Deposited by Pulsed Laser Deposition, *J. of Nanoscience and Nanotechnology* **8** (2007) 1–3. (Impact factor – 1.15)
- [24]. **Shubra Singh**, N. Rama and M. S. Ramachandra Rao, Transport properties of transition metal doped ZnO: bulk and thin films, *Mat. Res. Soc. Sym. Pro.* (2007) 397-402.

[25]. **Shubra Singh**, N. Rama and M. S. Ramachandra Rao, Influence of d-d interband transitions on electrical resistivity in Ni doped polycrystalline ZnO, *Appl. Phys. Letts.* **88** (2006) 222111-222113. (Impact factor – 3.794) **Cited 38 times**

Papers presented at Regional/National & International:

International Conferences/Symposiums

- [1]. Sumithra Sivadas Menon, K.Gupta, R. Jayavel, K. Baskar and **Shubra Singh**, Growth and characterization of brownmillerite $\text{CaFeO}_{2.5}$ single crystals by flux technique, presented at International conference on Materials and Characterization Techniques, VIT Vellore, March 10-12, 2014.
- [2] Sumithra Sivadas Menon, K. Baskar and **Shubra Singh**, Growth and characterization of nanostructured brownmillerite $\text{SrFeO}_{2.5}$ for SOFC applications presented at International conference on Materials and Characterization Techniques, VIT Vellore, March 10-12, 2014.
- [3]. R. Loganathan, M. Jayasakthi, K. Prabakaran, R. Ramesh, P. Arivazhagan, B. kuppulingam, S. Sankaranarayanan, M. Balaji, **Shubra Singh** and K. Baskar, “Growth and characterization of $\text{AlInGaN}/\text{AlN}/\text{GaN}$ grown by MOCVD” by IWPSD, New Delhi, Dec 2013.
- [4]. R. Ramesh, R. Loganathan, Sumithra Sivadas Menon, K. Baskar and **Shubra Singh**, “Morphological and Optical Characterization on ZnO-GaN Heterostructures” by presented at IWPSD, New Delhi, Dec 2013.
- [5]. Sumithra Sivadas Menon, B. Kuppulingam, R. Ramesh, K. Baskar and **Shubra Singh**, “Morphology and optical studies on nanostructured wurtzite ZnO-GaN solid solution for photocatalytic applications” by International Conference on Nanoscience & Nanotechnology (ICNN-2013) during 18-20 November, 2013 at Babasaheb Bhimrao Ambedkar University, Lucknow, U.P., India.
- [6]. **Shubra Singh**, Kapil Gupta, Sumithra Menon and M.S. Ramachandra Rao, “Room temperature electrochemical oxidation studies on nanostructured $\text{CaFeO}_{2.5}$ composites” at IUMRS, 16-20 Dec. 2013, IISC Bangalore, India.
- [7]. Kapil Gupta, **Shubra Singh** and M.S.Ramachandra Rao, “Behaviour of Brownmillerite $\text{CaFeO}_{2.5}$ in CO_2 containing atmosphere: structural and optical changes”, IUMRS, 16-20 Dec. 2013, IISC Bangalore, India.

- [8]. **Shubra Singh**, Kapil Gupta and M.S.Ramachandra Rao, “Synthesis and Oxygen isotope exchange studies on Brownmillerite $\text{CaFeO}_{2.5}$ ” Invited Paper presented by **Shubra Singh** at IWCGCAMD, Crystal growth centre, Anna University, Dec. 16-19, 2012.
- [10]. **Shubra Singh** Kapil Gupta and M.S.Ramachandra Rao, “Enhancement of oxygen ion mobility in nano $\text{CaFeO}_{2.5}$ ” at ANM 2012, IIT Madras.
- [11]. **Shubra Singh**, Kapil Gupta and M.S.R. Rao on “Role of extended defects in $\text{CaFeO}_{2.5}$ ” at ANM 2012, IIT Madras, Oct 17-19, 2012.
- [12]. **Shubra Singh**, Sunil Kumar Samji and M. S. Ramachandra Rao, Synthesis and characterization of CIGS nano-ink, International Conference on Advanced Nanomaterials and Nanotechnology, ICANN 2011, IIT Guwahati, India, Dec.2011.
- [13]. **Shubra Singh** and M. S. Ramachandra Rao, Changes in morphology of CIS nano-inks with Ga doping, presented at **DAE-BRNS**. MRC, IISc, Bengaluru November 09-11, 2011.
- [14]. **Shubra Singh**, Kapil Gupta and M. S. R. Rao, Cobalt based cathode materials for solid oxide fuel cell applications, **DAE BRNS** 6th National Symposium on PLD deposited Thin Films and Nanostructured Mats. (PLD-2011), Nov. 09-11, 2011 at MRC, IISc, Bengaluru.
- [15]. E. Senthil Kumar, Jyothirmoy Chaterjee, **Shubra Singh**, Nandita Dasgupta, M. S. Ramachandra Rao, Electrical Transport and Ohmic Contact Studies of p-ZnO, Thin Film Growth, Electrical Transport and Ohmic Contact Studies of p-ZnO, *IEEE TENCON 2010*, Fukuoka, Japan.
- [16]. **Shubra Singh**, Kapil Gupta, Phillippe Papet, Monica Ceretti, M. S. Ramachandra Rao and Werner Paulus, “Influence of particle size and phonon modes on oxygen ion mobility in non-stoichiometric oxides” presented at 7th International Conference on Inorganic Materials, 12 – 14 September (2010) in Biarritz, France.
- [17]. **Shubra Singh**, E. Senthil Kumar, M. Kottaisamy and M. S. Ramachandra Rao, Synthesis and formation mechanism of ZnO Nanobruses, presented at *ICANN 2009* conference held at IIT Guwahati, India.
- [18]. **Shubra Singh**, E. Senthil Kumar and M.S. R. Rao, Microstructural study of assorted ZnO nanostructures: nanocombs, nanocones and microspheres, 2nd International Conference on Advanced Nano Materials, Aveiro, Portugal, June, (2008).
- [19]. **Shubra Singh** and M.S. R. Rao, Synthesis of ZnO microstructures from metallic Zn. International Symposium for Research Scholars (*ISRS*) 2008, IIT Madras, December, 2008.

- [20]. **Shubra Singh**, N. Rama and M. S. Ramachandra Rao, Correlation between electrical transport, optical, and magnetic properties of transition metal ion doped ZnO, **Shubra Singh**, N. Rama and M. S. Ramachandra Rao, Presented at 52nd MMM conference held in Tampa, Florida (2007).
- [21]. **Shubra Singh**, N. Rama and M.S. Ramachandra Rao, Electrical and magnetic properties of Zn_{1-x}Dy_xO, Presented at International conference on Electronic and Photonic Materials, Devices and Systems-2006 held at Kolkata Jan 4-6th (2006).
- [22]. **Shubra Singh** and M. S. Ramachandra Rao, Presented at the International Symposium for Research Scholars (ISRS) 2006 held in IIT Madras, India from 18th Dec to 20th Dec (2006).
- [23]. **Shubra Singh** and M. S. Ramachandra Rao, Structural and electrical properties of Chromium doped ZnO: bulk and thin films, Structural and Physical properties of ZnO hexagons deposited by PLD, Presented at 3rd International conference on advances in thin films and surface coatings held in Singapore from 11th to 15th Dec. (2006).
- [24]. **Shubra Singh**, N. Rama and M. S. Ramachandra Rao, Transport studies of transition metal ion doped ZnO: Bulk and thin films, Presented at Materials Research Society Fall meetings, Boston MA, USA. Nov-27, Dec 1 (2006).

National Conferences/Symposiums

- [1]. Sumithra Menon and **Shubra Singh**, National seminar on crystal growth and characterization, Dec 20-22, Crystal growth centre, Anna University, 2012.
- [2]. **Shubra Singh**, Sunil Kumar and M. S. Ramachandra Rao, Changes in morphology of CIS nano-ink with Ga doping, DAE BARNS National Symposium on Pulsed Laser Deposition of the thin films and nanostructured materials held at IISC Bangalore, Nov. 9-11 (2011).
- [3]. **Shubra Singh**, Werner Paulus, M. S. Ramachandra Rao, Cobalt based cathode materials for solid oxide fuel cell applications DAE BARNS, Kapil Gupta, National Symposium on Pulsed Laser Deposition of the thin films and nano. materials held at IIT Madras, Nov. 9-11 (2011).
- [4]. **Shubra Singh**, Divya Deepthi, E. Senthil Kumar and M. S. Ramachandra Rao, Functional properties of ZnO, DAE BARNS National Symposium on Pulsed Laser Deposition of the thin films and nanostructured materials held at IIT Madras, Dec. 1-3rd (2009).
- [5]. **Shubra Singh** and M. S. Ramachandra Rao, E. Senthil Kumar, Optical, Electrical transport and Optoelectronic properties of bulk heterostructures and nanostructures of ZnO, Indo-NUS workshops

on current trends in physics held at Indian Institute of Technology Madras, Chennai, India, 28-01 Feb-Mar. (2008)

[6]. **Shubra Singh** and M.S. R. Rao, Low Temperature Behaviour of LO Phonon Mode in the Infrared Spectra of ZnO: Ni Thin Films, T.N. Sairam, *Proceedings of the DAE Solid State Physics Symposium*, BARC, Mumbai (2008).

[7]. **Shubra Singh**, M.S. Ramachandra Rao and C.S. Sundar, T.N. Sairam, Observation of LO phonon mode in the IR transmission spectra of ZnO: Ni thin films, Presented at *DAE Solid State Physics Symposium* held at Department of Studies in Physics, University of Mysore 27 - 31 Dec. (2007).

[8]. , **Shubra Singh**, N. Rama and M.S.Ramachandra Rao, Physical properties of doped ZnO thin films grown by Pulsed Laser Deposition, Presented at *DAE BARNS 3rd National Symposium on Pulsed Laser Deposition of the thin films and nanostructured materials* held at Tirupathi, Nov 7-8th (2005).

Patents/IPR Filed:

Sl. No.	Details of Inventions	Patents No.	Date & Countries	Contribution:
1.	A OXYGEN-DEFICIENT NANOMATERIAL FOR REVERSIBLE CO₂ CAPTURE AT RT	Patent filed-Application No. 5170/CHE/2013	19/11/2013 India	Synthesis, characterization and sample analysis along with co-inventors

Research guidance listing (In Progress):

Research Degree	Name of Scholar	Title of Thesis	Year of award	Main Supervisor (Guide)
Ph.D	Sumithra Sivadas Menon	Oxynitrides for photocatalytic applications (tentative)	Ongoing	Dr. Shubra Singh
Ph.D	Suchita Dhankhar	Growth and characterization of Ca and Sr based oxygen deficient oxides (tentative)	Ongoing	Dr. Shubra Singh

Role in and details of externally funded projects carried out, listing (ongoing):

Sl	Title of the Project and Role	Quantum of Support	Funding Agency	Years of Project
1	Realization of high oxygen ion mobility in Ca and Sr based compounds (Principal and sole Investigator - Dr. Shubra Singh)	95 Lakhs	DST-INSPIRE	5 years (Aug. 2012-July 2017)
2	Surface modified GaN/InGaN Heterostructures with AlGaIn barrier layers for photovoltaics applications (Principal Investigator – Dr. K. Baskar, Co-Investigator-Dr. Shubra Singh)	60 Lakhs (approx.)	DST SERI	3 Years (Commencing 2014)
3	DST Fast Track Young Scientist Project (Principal and sole Investigator-Dr. Shubra Singh)	10 Lakhs (approx.)	DST	3 years (Commencing 2014)

Total project funding: 160 Lakhs (approx.)

Book Published

- (i) **Book:** M.S.R. Rao and **Shubra Singh** “Nanoscience and Nanotechnology: Fundamentals to Frontiers”, Wiley publications (India), 2013.
- (ii) Co-authors of **three book chapters** with Springer (2013)

Membership:

1. Life member: **Indian Science Congress**
2. Executive member: **National smart Olympiad**
3. **Technical Committee member and Project co-ordinator** appointed by Anna University for schools and colleges by Robotics and Artificial Intelligence Foundation (RAIF)

Refereed journals for:

1. Solar Energy Materials and Solar Cells
2. Journal of Luminescence

Invited Talks/oral talks presented:

1. Kyushu University, Japan
2. University of Rennes 1, UMR 6226 CNRS, France (2009)

3. IWCGCAMD, Anna University, Chennai (2012)
4. National Smart Olympiad, Hyderabad (Jan. 2013)
5. Delivered a talk on “Synthesis and characterization of Brownmillerite compounds” at Materials Research Centre, IISC Bangalore on 27th August 2013.
6. IWEMT 2014, Anna University, Chennai (2014)

Professional Training/Workshops attended

- [1]. Workshop on Ultra High Vacuum: Application to Material Research, 19-21 Feb. 2002, SINP, Kolkata, organized by Indian Physics Association (Calcutta Chapter), Material Research Society of India (surface and Interfaces group) in collaboration with SINP and Nuclear Science Center, New Delhi.
- [2]. Workshop on Cryogenics: Experiments and Applications, 21-23 Mar. 2003, SINP, Kolkata, organized by Indian Physics Association (Calcutta Chapter).
- [3]. Indo-NUS workshop on current trends in physics, 28-01 Feb-Mar. 2008, Indian Institute of Technology Madras, Chennai, India.
- [4]. Research Project on nanoparticles embedded soft matter, IISC Bangalore (Jan-Mar. 2011)
- [5]. 3rd workshop on Nanomaterials for Solar cell application at ITC Sonar Bangla, Kolkata on 3-4 May, 2012.
- [6]. Workshop on Powder, Nano and thin film Characterization using X-ray Diffraction, Crystal growth centre, Anna University Chennai, India, 29-30 August 2013.

Visits abroad for presenting research work and scientific collaboration:

Singapore, Japan, U.S. and France

