

CURRICULUM VITAE

PERSONAL INFORMATION			
Name	Sheela	K.	Ramasesha
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Nationality	Indian	Gender	Female

Current Research Activities (Last 6 years):

I have designed research programs to validate many concepts for application of solar technologies in India. My research involved designing and fabricating a solar cell and goes all the way to studying yield patterns of installed solar photovoltaic (SPV) systems. These results are published in international journals.

20 kWp rooftop SPV system: To study the effect of atmospheric conditions on the yield of a SPV system at a location, a grid interactive 20 kWp SPV system has been set-up. The aim of the project was to answer performance concerns of SPV systems during Indian monsoons and to evaluate yield in different seasons. The system has worked at optimum level for 3½ y generating 29 MWh electricity saving 20 tonnes of CO₂ emission per year. On scientific front, a general empirical equation is obtained to predict yield from SPV plants for given atmospheric conditions of a location.

Solarized trains: Carried out both experiments and calculations to assess amount of power that can be generated with SPV panels on train coach tops. A scientific experiment was carried out by retrofitting two flexible SPV modules on a coach rooftop and was trial run at speeds ~120 km/h by mounting them on three designated trains in India. The trial runs were conducted during onset of south-west monsoon season, as it would indicate low sunshine period performance of PV system. It is estimated that one Solar Rail Coach can generate ≥18 kWh of electricity/day, leading to a diesel saving of 1,700 litres/coach/year, in running amenities. Since Indian Railways operates ~64,000 coaches, by retrofitting SPVs, an annual diesel saving of 108 M litres and reduction in CO₂ emission of ~300 k tonnes is possible, leading to a significant contribution to control environmental pollution.

Tracker vs Fixed Tilt: The program was aimed at measuring the additional energy that can be harnessed by setting the SPV modules on a sun tracker. For this study, two sets of identical p-Si PV panels, each set consisting of two 230 Wp panels connected in series were setup. One set is placed on a dual axis sun tracker and the other at optimum fixed tilt angle for Bangalore. The data indicates

that the panels on the tracker generated 21% more power than the ones on the fixed tilt. The return on investment for tracker was estimated at ~15 months.

Ultracapacitor(UC) with solar power: A 12V/250F Substrate-integrated lead-carbon hybrid UC with polymeric silica gel electrolyte as the hybrid of lead-acid battery and electrical double-layer capacitor has been developed at IISc. Charging UC using a solar panel (10Wp) was studied for one year. Due to the quick charging character of the UC, even on cloudy days complete charging could be achieved. This study has helped in designing solar lanterns for rural applications.

Concentrated Photovoltaic(CPV) testing and simulation: In collaboration with Imperial College, London, CPV module on a dual-axis sun tracker were set-up to study the effect of atmospheric conditions like exposure to aerosols, temperature fluctuations and water vapor on power output. In addition to CPV modules, a p-Si panel was also mounted on the sun tracker and the power output of this panel was also monitored. This study concluded the suitability and cost payback times of CPV for Bangalore compared to flat solar panels on sun tracker. Data was collected for a year and a model was developed to predict the power output.

Semitransparent solar cells: Low cost processes for making inorganic semitransparent solar cells for use as windowpanes and skylights of buildings was developed. Thin film deposition of both n- and p-type semiconductors was carried out using optimized solutions. Besides being cost effective, large area coating is possible with this process. Fabrication of a 600 nm thick solar cell with a transparency of 62% at 700 nm wavelength was achieved.

Solar for Rural: In a remote village, a stand-alone solar panel, an energy storage device and LED lamps were set-up in a weaver's colony. With this set-up, children could study at nights. The parents could continue to work even after sunset in the house to enhance their earning.

Popular articles for students: I have written a series of articles highlighting the environmental effects of fossil fuel usage around the world. The articles also highlight the renewable energy technologies that are available and their pros/cons. These articles also emphasize control of climate change using these technologies.

At NIAS:

The main issue that needs to be addressed in our country is that of providing clean atmosphere and electricity to all. We are in the process of modelling the pollutants from the chimney of a coal-fired thermal power plant and their extent of dispersion around the plant. We are also in the process of identifying the sources of pollution in cities and correlating the pollution levels to health issues faced by the citizens.

EDUCATION:	
Ph.D.	Chemistry, Indian Institute of Science, Bangalore
M.Sc.	Chemistry, Bangalore University
WORK EXPERIENCE: <i>In reverse chronological order with dates and nature of duties</i>	
DATE	DETAIL
Sept. 2017 - present	Principal Scientist, National Institute of Advanced Studies, Bangalore Nature of duties: Research in renewable energies technologies and Pollution.
Dec 2010 - Apr. 2017	Visiting Scientist, Divecha Centre for Climate Change, Indian Institute of Science, Bangalore Nature of duties: Research in renewable energies technologies and Climate sciences.
Jan 2009 – Dec 2010	Consultant Nature of duties: Providing consultation to private companies on renewable energy issues.
Dec. 2003 – Aug 2008	Manager, General Electric(GE) R&D Center Nature of duties: Managerial and leading R&D activities in a wide range of technical areas
Dec 2001 – Dec 2003	Materials Scientist, General Electric(GE) R&D Center Nature of duties: Project leadership and R&D activities in Solid Oxide Fuel Cells (SOFC)
Jan.'94 – Nov. 2001	UGC Res. Sci., Category `C', (Equivalent to the grade of Professor), Mater. Science Div., National Aerospace Lab, Bangalore, Nature of duty: Research on Ceramic matrix and metal matrix composites
Jan. 1989-Jan.1994	UGC Res. Sci., Category `B', (Equivalent to the grade of Asst. Prof.), Mater. Science Div., National Aerospace Lab, Bangalore, Nature of duty: Research on properties of materials under high pressure
Feb.1988 - Jan.1989	Research Associate, Metallurgy Department I.I.Sc., Bangalore, Nature of duty: Research on solid state ionic materials
Dec.1984 - Dec.1987	CSIR Pool Officer, Physics Department I.I.Sc., Bangalore, Nature of duty: Research on transport properties of materials
Dec.1982 - Jun.1984	Postdoctoral Research Associate, Chemistry Department, Princeton Univ. USA. Nature of duty: Research on laser spectroscopy
Feb.1982 - Sep.1982	Postdoctoral Research Associate, Chemistry Department, Louisiana State Univ., USA Nature of duty: Research on Single Crystal x-ray diffraction studies
Sep.1979- Nov.1981	Postdoctoral Research Associate, Inorganic Chemistry Laboratory, Oxford University, U.K. Nature of duty: Research in solid state chemistry

Extended Visits:

- Visiting Scientist - Department of Chemistry, Princeton University, Princeton, USA, Jul. - Aug., 1988.
- Visiting Scientist - Physics Department, Princeton University, Princeton, USA, Mar. - Aug., 1992.
- JSPS visiting Scientist - Kyushu National Industrial Research Institute, Tosu, Japan - Oct. 1996.
-Institute of Solid State Physics, Tokyo University, Tokyo, Japan - Nov. 1996

Awards and Honors Received:

- Materials Research Society of India (MRSI) medal for 2001.
- C.V. Raman Young Scientist Award for 1999 awarded by the KSCST.
- 2 Management awards for performance at GE
- Ecomagination champion award at GE
- Featured in "Lilavati's Daughters" brought out by The Indian Academy of Sciences, for highlighting successful woman professionals in science.
- UNESCO certificate of Recognition (1990)
- Merit Prize in Mathematics at Bachelor of Science degree □ National Merit Prize at Secondary School Leaving Examination

Six Sigma Achievements (In GE):

- Green Belt certified - Nov. 2002.
- Black Belt certified - Dec 2004.

Professional Services:

- Serving as a referee for many International Journals.
- Served on the editorial advisory board of "Journal of Active and Passive Electronic Components", an international journal published by Gordon and Breach Scientific Publishers.

Professional Organizations Memberships:

- Third World Organization of Women in Science - Life Member
- Materials Research Society of India (MRSI) - Life Member
- Indian Ceramic Society (ICS) - Life Member
- Indian Society For Advancement of Materials And Process Engineering (ISAMPE) - Life Member
- Chemical Research Society of India (CRSI) - Life Member

Research Projects taken up:

- "National Mission on Strategic Knowledge for Climate Change (NMSKCC) - Global Technology Watch Group (GTWG) - Solar PV generation technologies" Sponsored by Dept. of Science & Technology, Govt. of India.
- "Development of Nanopillar-based Photovoltaic Cells" Sponsored by Dept. of Science & Technology, Govt. of India.

- “Synthesis, characterization and measurement of properties of Molybdenum Disilicide: A Structural ceramic” Sponsored by Dept. of Science & Technology, Govt. of India.
- “To study the reactive infiltration of aluminum into molybdenum disilicide preforms and the effect of preform density on the microstructure of the resulting composite compact” – sponsored by Council of Scientific & Industrial Research, Govt. of India.
- “Making wear resistant components for an IC engine” NAL Internal project.

Community Service:

- For the past 8 yrs, sponsoring mid-day meals for the full year for 1000 students through Akshaya Patra.
- As a member of the Lioness Club, I was involved in many charity activities like clothes drive for the orphanages, artificial limbs for the physically challenged persons and conducting quiz programmes in poor neighbourhood schools.
- Supported education of two high school students for 3 years.
- Annually sponsoring prizes for meritorious students in under privileged primary schools, for 5 years.
- Instituted merit prizes for girl students in Classes 8 and 9 in Science and Math subjects.
- Support running of Seva Sadan, a girls orphanage, in Malleshwaram, Bengaluru

Publications:

- 1) **Sheela K. Ramasesha**, “Should India Consider Molten-salt Tower Technology to Reduce Pollution?” (Communicated).
- 2) Jayant Singh and **Sheela K. Ramasesha**, “Dispersion of Pollutants Emitted from The Stack of a Coal-fired Thermal Plant” (To be Communicated)
- 3) Lavanyaa VP, Srikanth R and **Sheela K. Ramasesha**, “Environmental Hazards : A case study in Bengaluru” (To be Communicated).
- 4) **Sheela K. Ramasesha**, “Clean Air for Indian Cities – Causes and Alleviation Strategies”(Communicated).
- 5) Dhirajsing Rughoo and **Sheela K. Ramasesha**, “Solar Power in the Island Nation, Mauritius” (Under Review).
- 6) Dinesh Kumar, Shyam Krishnan N, Murugaiya Sridar Ilango, and **Sheela K Ramasesha**, “Device Simulation of a Novel Nano-structured CdS/CdTe solar cell with back Contacts” J. Comput. Electron. (In Press).
- 7) **Sheela K. Ramasesha**, “Pollution and Health – Bangalore Scenario”, National Health Conclave on Climate Change and Health – Role of the Health Sector, on 23rd March 2019, New Delhi, pg 30.
- 8) Harsh G. Kamath, N.J. Ekins-Daukes, Kenji Araki and **Sheela K. Ramasesha**, “The Potential for Concentrator Photovoltaics: A Feasibility Study in India” Prog Photovolt Res Appl. 27, 316 – 327 (2019) DOI : 10.1002/pip.3099
- 9) Harsh G. Kamath, N.J. Ekins-Daukes, Kenji Araki and **Sheela K. Ramasesha**, “Performance Analysis and Fault Diagnosis Method for Concentrator Photovoltaic Modules”, IEEE J Photovoltaics 9, 424 – 430 (2019). DOI : 10.1109/JPHOTOV.2018.2883621
- 10) Murugaiya Sridar Ilango and **Sheela K. Ramasesha**, “Patterning of nanopillars-based CdS/CdTe thin films for photonic applications”, Surface Engg. 34(12), 906 - 913 (2018) DOI : 10.1080/02670844.2017.1349033.
- 11) Murugaiya Sridar Ilango and **Sheela K Ramasesha**, “Novel patterning of CdS / CdTe thin film with back contacts for photovoltaic application”, Pramana-J. of Physics 90(4), 95-102 (2018) DOI: 10.1007/s12043-018-1542-0
- 12) Amruta Mutalikdesai and **Sheela K Ramasesha**, “Emerging Solar Technologies - Perovskite solar cell”, Resonance 22(11), 1061-1083 (2017).

- 13) Amruta Mutalikdesai and **Sheela K Ramasesha**, "Solution Process for Fabrication of Thin film CdS/CdTe Photovoltaic (PV) cell with TiO₂ buffer layer", *Thin Solid Films* 632, 73-78 (2017).
- 14) M. Shrvanth Vasisht, G.A. Vashista, J. Srinivasan and **Sheela K. Ramasesha**, "Rail coaches with rooftop solar photovoltaic systems: A feasibility study", *Energy*, 118, 684-691 (2017).
- 15) M. Shrvanth Vasisht and **Sheela K. Ramasesha**, "Forecast of solar power a key to power management and environmental protection", *Clean Technologies and Environmental Policy*, 19(1), 279-286, (2017).
- 16) Harsh G. Kamath, Ned Ekins-Daukes and **Sheela K. Ramasesha**, "Analysis of Outdoor Performance of a 550X Concentrator Photovoltaic System in Bangalore", 13th International Conference on Concentrator Photovoltaic Systems, Ottawa, Canada, May 01 – 03, 2017.
- 17) Vashista G Ademane, Harsh Kamath, N.J. Ekins-Daukes, Kenji Araki and **Sheela K Ramasesha**, "Outdoor performance study of a 550X concentrator photovoltaic system in Bangalore", International Photovoltaic Science and Engineering Conference ("PVSEC-26"), Singapore, 24 - 28 October 2016.
- 18) M. K. Darshana, K. Karnataki, G. Shankar and **Sheela K. Ramasesha**, "A Practical Implementation of Energy Harvesting, Monitoring and Analysis System for Solar Photovoltaic Terrestrial Vehicles in Indian Scenarios", 2015 IEEE International WIE Conference on Electrical and Computer Engineering (WIECON-ECE), 19-20 Dec. 2015, pp 542 - 545.
- 19) S. R. Adheesh, M. Shrvanth Vasisht and **Sheela K. Ramasesha**, "Air- pollution and economics: diesel bus versus electric bus", *Current Science*, 110(5), 858- 862(2016).
- 20) M. Shrvanth Vasisht, J. Srinivasan and **Sheela K. Ramasesha**, "Performance of solar photovoltaic installations: Effect of seasonal variations", *Solar energy*, 131, 39 – 46 (2016).
- 21) Murugaiya Sridar Ilango, Amruta Mutalikdesai and **Sheela K. Ramasesha**, "Anodization of Aluminium using a fast two - step process", *J. Chem. Sci.* 128, No. 1, 153 - 158 (2016).
- 22) **Sheela K. Ramasesha**, "Solar Energy: An Introduction", Book Review, *Current Science*, 110 (12) 2307-2308 (2016).
- 23) K.N Nithyayini and **Sheela k Ramasesha**, "Fabrication of Semi-Transparent Photovoltaic Cell by a Cost-Effective Technique" *Metallurgical and Materials Transaction E*, Vol. 2E, 157 - 163 (2015).
- 24) Roshan R. Rao, H. R. Swetha, J. Srinivasan and **Sheela k Ramasesha**, "Comparison of performance of solar photovoltaics on dual axis tracker with fixed axis at 13degrees N latitude" *Current Science*, VOL. 108 (11), 2087 - 2094 (2015).
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- 26) Murugaiya Sridar Ilango, Vijay Monterio and **Sheela K Ramasesha**, "Fabrication of back contacts using laser writer and photolithography for inscribing textured solar cells" *Bull. Mater. Sci.*, 38 (1), 191-196 (2015).
- 27) M. Shrvanth Vasisht, C.Vishal, J.Srinivasan, **Sheela K. Ramasesha**, "Solar photovoltaic assistance for LHB rail coaches", *Current Science*, 107(2), 255-259 (2014).
- 28) **Sheela K. Ramasesha**, "Challenges in the Quest for Clean Energies 4. Other Renewable Resources and Conclusion", *Resonance*, 18(12), 1110 - 1126 (2013).
- 29) **Sheela K. Ramasesha**, "Challenges in the Quest for Clean Energies 3. Wind Technologies", *Resonance*, 18(8), 757-770 (2013).
- 30) **Sheela K. Ramasesha** and Arindam Chakraborty, Power generation using wind energy in northwest Karnataka, India, *Current Science*, 104(6), 757- 761 (2013).
- 31) **Sheela K. Ramasesha**, "Challenges in the Quest for Clean Energies 2. Solar Energy Technologies", *Resonance*, 18(3), 440-57 (2013).
- 32) **Sheela K. Ramasesha**, Challenges in the Quest for Clean Energies I. Background, *Resonance*, 18(5), 206 - 17 (2013).
- 33) Laxman Gouda, Yelameli Ramesh Aniruddha, **Sheela K. Ramasesha**, "Correlation between the Solution Chemistry to Observed Properties of CdTe Thin Films Prepared by CBD Method" *J. Mod. Phys.*, 3, 1870-1877 (2012).

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- 36) "Solid Oxide Fuel Cells - Challenges and Opportunities", Oral Presentation, National Seminar on Creating Infrastructure for Adoption of Fuel Cell Technology in India, organized by NTPC, Feb. 10-11, 2004, PMI, Noida (UP), India
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- 51) **Sheela K. Ramasesha**, "Ceramic Science and technology: Part 2" *Resonance*, **4**(12), 21 - 30 (1999).
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- 57) **Sheela K. Ramasesha**, "Order-disorder Transitions in C60 and C70", Adv. High Pressure Science and Techn., Tata McGraw Hill ed. A.K. Singh, pp 109 - 120 (1995).
- 58) **Sheela K. Ramasesha**, K.V.R. Prasad, M.V. Shankar and K.B.R. Verma, "The Dielectric Properties of Bi₂VO_{5.5} Under Pressure" Adv. High Pressure Science and Techn., Tata McGraw Hill, ed. A.K. Singh, pp 85 - 92 (1995).
- 59) **Sheela K. Ramasesha**, M.V. Radhika Rao, A.K. Singh and A.M. Umarji, "Effect of Pressure on the ferroelectric transition temperature in Pb(Fe_{1/2}Nb_{1/2})O₃" Proc. XV AIRAPT Conference 1995.
- 60) **Sheela K. Ramasesha**, A.K. Singh, C.N.R. Rao and J.M. Honig, "A High-pressure Study of Fe₃O₄ Through the Verwey Transition" Phys. Rev. B **50**, 13789-13791 (1994).
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- 62) **Sheela K. Ramasesha** and A.K. Singh, "Measurement of electrical Resistance Across the Orientational Phase Transition in Solid C₆₀ Under Pressure" Solid State Commun. **91**, 25 - 28 (1994).
- 63) **Sheela K. Ramasesha**, "Thermoelectric Power of YBa₂Cu₃O_{7-x} and YBa₂Cu₄O₈ Under Pressure" Active and Passive Elec. Comp. **15**, 147-153 (1993).
- 64) **Sheela K. Ramasesha**, C. Divakar, P.S. Gopalakrishnan and A.K. Singh, "Thermoelectric Power of Bismuth up to 9 GPa" in "Recent Trends in High Pressure Research", ed. A.K. Singh, pp. 456-458 (1992).
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- 67) **S. K. Ramasesha** and A.K. Singh, "Variation of Thermoelectric power of YBa₂Cu₃O_{7-x} under pressure up to 9 GPa", Bull. Mater. Sci. **14(3)**, 767-770 (1991).
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