



## **Dr. Nandakumar Kalarikkal**

*Associate Professor & Head of Advanced Materials Laboratory*

*School of Pure and Applied Physics*

*Hon: Joint Director*

*International and Inter University Centre for Nanoscience and Nanotechnology*

*Member Senate*

*Mahatma Gandhi University, Kottayam - 686 560, Kerala, India*

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### **Education**

**M. Sc (Master of Science), Industrial Physics**

Cochin University of Science & Technology, Kerala, India

**Ph. D (Doctor of Philosophy), Semiconductor Physics**

Cochin University of Science & Technology, Kerala, India

Thesis title: *“Optical and thermal properties of selected ternary amorphous semiconductors”*.

**Postdoctoral Fellow**

CSIR-National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram, Kerala, India

### **Recognition**

1. Visiting Fellow, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India
2. Visiting Fellow, Gulbarga University, Gulbarga, Karnataka under SAP scheme of UGC
3. Visiting Professor, Alemaya University (1998-2002) & Mekkele University (2006-2007), Ethiopia
4. Conference Fellowship Award of the Seventh International Conference on Phonon Scattering in Condensed Matter held at Cornell University, USA

5. Research Associate Fellowship from DST & CSIR, Govt. of India (1992)
6. Senior Research Fellowship from CSIR, Govt. of India (1990)
7. Junior Research Fellowship from Department of Atomic Energy, Govt. of India (1987)

## Teaching areas

- Materials Science/Solid State Physics, Quantum Optics, Statistical Physics, Quantum Mechanics, Classical Mechanics, Physics of Nanomaterials, Mesoscopic Physics, Introduction to Nanoscience and Nanotechnology (Open Course), Experimental Physics, Nanophotonics

## Research Areas

The research works of my group include the synthesis, characterization and applications of various nanomaterials, ion irradiation effects on various novel materials and phase transitions. The different topics of current research works are:

- **Nanomultiferroics**

In this class of materials we are synthesizing various systems such as R-CrO<sub>3</sub>, R-MnO<sub>3</sub>, R-Fe<sub>2</sub>O<sub>4</sub> where R could be Ho, Er, Tm, Yb, Lu or Y and metal-organic frame works. The samples are prepared mainly through sol-gel route and characterized for their structural, multiferroic, linear and nonlinear optical properties using TGA/DTA, XRD, SEM, HRTEM, FTIR spectroscopy, Dielectric spectroscopy, VSM, UV-Vis-NIR spectroscopy, Photoluminescence spectroscopy and Z-scan technique. The thermal parameters such as heat capacity, thermal conductivity, thermal diffusivity are also investigated near the multiferroic transitions. The synthesis and multiferroic coupling of composite nano/multiferroics are also a thrust area of the group.

- **Nanosemiconductors and Nanophosphors**

In this class of materials we concentrate on core-shell quantum dots, metal oxides and Sr<sub>2</sub>CeO<sub>4</sub> type materials. The materials are prepared through novel green synthesis routes and sol-gel method and characterized for their various properties. The potential uses of these materials are being explored in different fields which include water purification, sensing and energy applications.

- **Nanocomposites**

Under this class of materials various metal, metal oxide, carbon structures (grapheme and CNT), magnetic particles and quantum dot filled polymer nanocomposite materials are prepared using various methods. These composites are explored for various applications which include water purification, super tough coatings and dental applications. The interfacial effects and aggregation behavior of the fillers of the as prepared nanocomposites are also a thrust area for the group.

- **Nanoferroelectrics**

Under this class, we are mainly concentrating on relaxor type of ferroelectrics such as Strontium Barium Niobate systems and the effect of rare earth ion doping on the linear and nonlinear optical properties. The phase transitions in this class of materials are also investigated in detail.

➤ **Nanoferrites**

Different nanostructured spinel ferrite systems have been prepared using sol-gel technique and their structural, magnetic, electrical, linear and nonlinear optical properties are investigated. Various systems such as  $\text{NiFe}_2\text{O}_4$ ,  $\text{CoFe}_2\text{O}_4$ ,  $\text{ZnFe}_2\text{O}_4$  and mixed compositions of these ferrites have been synthesized and their various physical properties are investigated. The water soluble nanoferrites are also of potential interest to the group.

➤ **Nanomedicine**

Work has been started in this field for mainly nutrient supplements using various multivitamins at the nano level. A pharmaceutical industrial collaboration with the Centre for Nanoscience and Nanotechnology is established for this purpose. Preparation and characterization of Nanoscaffolds for artificial skin, drug release applications are also explored. Bioglass for alveolar bone regeneration and polymer nanocomposites with improved properties for dental applications have also been thrust areas of the group.

➤ **Nanosensors**

The various nanomaterials synthesized in the laboratory are explored for different sensing applications which include nanoparticles incorporated membranes for bio-sensing and water purification applications.

➤ **Ion beam irradiation effects & Phase transitions**

Heavy ion beam irradiation effects on the structural and multiferroic properties of sol-gel derived films of selected nanomultiferroic films are investigated under this category. The studies on the phase transitions of bulk and nanomaterials are also investigated using different techniques. Such as Photo-pyroelectric and dielectric measurements over a wide temperature range.

➤ **Laser Ablation and Nonlinear Optics using Nd-YAG Laser**

We synthesize nanoparticles of various materials using laser ablation in liquid media and correlating the particle properties with plasma parameters. The cavitation and bubbling mechanisms during ablation in liquid media are also being studied in detail.

Preparation of thin films of complex metal oxides using Pulsed Laser Deposition (PLD) and characterization of the films for tailored application are also being carried out.

The optical limiting properties of various nanomaterials are also investigated using Nd-YAG laser of nanopulses at 532 nm and its harmonics using Z-scan technique.

**Facilities available**

A very good wet chemistry synthesis laboratory with major infrastructure facilities such as Furnaces, Centrifuges, Magnetic stirrers, pH meters, Hot air ovens, Microwave oven, Pelletizer, Ultrasonicator and Spin Coaters etc.

For experimental characterizations, Dielectric and resistivity measurement facilities from 77K to 773K, UV-Vis-NIR spectrophotometer, Spectrophotofluorimeter with life time measurement facility, X-ray diffractometer, ME coupling measurement unit, Differential Scanning Calorimeter, Laser Ablation, PLD and Z-scan set ups with Nd-YAG laser, HRTEM are available.

Facilities like FTIR, SEM, TGA/DTA etc. are also available as central facilities of the University.

## List of publications (2011-2014)

1. Structure and magnetic properties of the  $\text{Al}_{1-x}\text{Ga}_x\text{FeO}_3$  family of oxides: A combined experimental and theoretical study  
Rana Saha, Ajmala Shireen, A. K. Bera, Sharmila N. Shirodkar, Y. Sundarayya, **Nandakumar Kalarikkal**, S. M. Yusuf, Umesh V. Waghmare, A. Sundaresan and C N R Rao  
*Journal of Solid State Chemistry*, Vol. 184, Issue 3, 494 (2011)
2. A New Synthetic Pathway of  $\text{Sr}_2\text{CeO}_4$  Blue-White Phosphor and its Characterization  
Seema. R and **Nandakumar Kalarikkal**  
*Journal of Luminescence*, 31, Issue 10, 2181 (2011)
3. Nonlinear optical properties of nanosized rare earth doped strontium barium niobate ceramics  
Nuja. J, Suchand Sandeep. C. S., Reji Philip and **Nandakumar. K**  
*Spectroscopy Letters*, 44, 334 (2011)
4. An open aperture z-scan study of  $\text{Sr}_2\text{CeO}_4$  blue phosphor  
R. Seema, C.S. Suchand Sandeep, Reji Philip and **Nandakumar Kalarikkal**  
*J. Alloys and Compounds*, 509, 34, 8573-8576 (2011)
5. Mossbauer Study of Ni, Ni-Co and Co Ferrite Nanoparticles  
Jeevan Job Thomas and **Nandakumar Kalarikkal**  
*American Institute of Physics Conference Proceedings*, Vol. 1349, 1175-1176 (2011)
6. Luminescence and Optical Limiting Properties of  $\text{Sr}_2\text{CeO}_4$  Blue Emitter  
R. Seema, C. S. S. Sandeep, Reji Philip and **Nandakumar Kalarikkal**  
*American Institute of Physics Conference Proceedings*, Vol. 1349, 1273-1274 (2011)
7. The Open Aperture Z-Scan Studies on Biferroic  $\text{YCrO}_3$   
Shiji Krishnan, C. S. Suchand Sandeep, Reji Philip and **Nandakumar Kalarikkal**  
*American Institute of Physics Conference Proceedings*, Vol. 1349, 1277-1278 (2011)
8. Natural rubber latex/potato starch nanocrystal nanocomposites: correlation of morphological/ electrical properties  
Emilie Bouthegourd, K.R. Rajisha, **Nandakumar Kalarikkal**, Jean Marc Saiter and Sabu Thomas  
*Materials Letters*, 65, 3615–3617 (2011)
9. Nonlinear optical absorption studies of sol - gel derived Yttrium Iron Garnet ( $\text{Y}_3\text{Fe}_5\text{O}_{12}$ ) nanoparticles by Z-scan technique  
B. Raneesh, I.Rejeena, Reana P. Ummar, P.Radhakrishnan, A. Saha and **Nandakumar Kalarikkal**  
*Ceramics International*, 38, 1823 (2012)
10. Structural and Photoluminescence studies on nanosized Samarium doped Strontium Barium Niobate ceramics  
Nuja J and **Nandakumar Kalarikkal**  
*Spectroscopy Letters*, 45, 184 (2012)
11. Two-photon assisted excited state absorption in multiferroic  $\text{YCrO}_3$  nanoparticles  
Shiji Krishnan, C. S. Suchand Sandeep, Reji Philip and **Nandakumar Kalarikkal**  
*J. Chem. Phys. Lett.*, 529, 59 (2012)
12. Comparative study on the optical limiting properties of different nano spinel ferrites using Z-scan technique  
Jeevan Job Thomas, Shiji Krishnan, K. Sridharan, Reji Philip, **Nandakumar Kalarikkal**  
*Materials Research Bulletin*, 47, 1855 (2012)
13. Cation distribution and micro level magnetic alignments in the nanosized nickel zinc ferrite  
Jeevan Job Thomas, A. B. Shinde, P. S. R. Krishna and **Nandakumar Kalarikkal**  
*Journal of Alloys and Compounds*, 546, 77 (2012)

14. Structural and magnetic properties of geometrically frustrated multiferroic ErMnO<sub>3</sub> nanoparticles  
B. Raneesh, A. Saha, D. Das and N. **Kalarikkal**  
*J. Alloys and Compounds*, 551, 654 (2013)
15. Temperature dependent neutron diffraction and Mossbauer studies in zinc ferrite nanoparticles  
Jeevan Job Thomas, A. B. Shinde, P. S. R. Krishna and **Nandakumar Kalarikkal**  
*Materials Research Bulletin*, 48, Issue 4, 1506 (2013)
16. Synthesis of YCrO<sub>3</sub> nanoparticles through PAA assisted sol-gel route  
Shiji Krishnan and **Nandakumar Kalarikkal**  
*Sol-Gel Science and Technology*, Vol. 66, Issue I, 6 (2013).
17. Surface energy properties of Yttrium Barium Copper Oxide filled Polystyrene composites  
Rosalin Abraham, Jayakumari Isac, **Nandakumar K**, Yakhmi Y J, Sabu Thomas  
*Advances in Ceramic Science and Engineering (ACSE)*, Vol. 2, Issue 2, (2013).
18. Effect of gamma radiation on the structural, dielectric and magnetoelectric properties of nanostructured hexagonal YMnO<sub>3</sub>  
B. Raneesh, A. Saha, **Nandakumar Kalarikkal**  
*Radiation Physics and Chemistry*, 89, 28 (2013).
19. Size-dependent thermal properties of muliferroic ErMnO<sub>3</sub> nanoparticles using Photo-pyroelectric technique  
B.Raneesh, H. Saumya, J. Philip, **Nandakumar Kalarikkal**  
*J. Alloys and Compounds*, 579, 243 (2013).
20. Electrical properties of Graphene filled natural rubber composites  
Yaragalla Srinivasarao, Yahaya Subban Ri Hanum, Chin Han Chan, **Kalarikkal Nandakumar**, Thomas Sabu  
*Advanced Materials Research*, Vol. 812, 263 (2013).
21. Synthesis and characterization of gelatin/zeolite porous scaffold  
Neethu Ninan Yves Grohens Anne Elain **Nandakumar Kalarikkal**, Sabu Thomas  
*European Polymer Journal*, 49, 9, 2433-2445 (2013).
22. A facile and rapid method for the black pepper leaf mediated green synthesis of silver nanoparticles and the antimicrobial study  
Robin Augustine, Sabu Thomas, **Nandakumar Kalarikkal**  
*Applied Nanoscience*- DOI 10.1007/S13204-013-0260-7 (2013)
23. Studies on Structural and Optical Properties of ZnO and Mn-doped ZnO Nanopowders  
Arun S. Menon, Nandakumar Kalarikkal and Sabu Thomas  
*Indian Journal of Nanoscience*, Volume 1, Issue 1, 16-24 (2013)
24. Facile synthesis of transparent and fluorescent epoxy - CdSe/CdS/ZnS core-multi shell nanocomposite  
Sneha Mohan, Oluwatobi S. Oluwafemi, Sandile P. Songca, Otolorin A. Osibote, Soney C. George, **Nandakumar Kalarikkal**, Sabu Thomas  
*New Journal of Chemistry*, 38,155 (2014)
25. Completely green synthesis of dextrose reduced silver nanoparticles, its antimicrobial and sensing properties  
Sneha Mohan, Oluwatobi S. Oluwafemi, Sandile P. Songca, Otolorin A. Osibote, Soney C. George, V. P. Jayachandran, **Nandakumar Kalarikkal**, Sabu Thomas  
*Carbohydrate Polymers*, 106, 469-474 (2014)
26. Electrospun polycaprolactone/ZnO nanocomposite membranes as biomaterials with antibacterial and cell adhesion properties  
Robin Augustine, Hruda Nanda Malik, Dinesh Kumar Singhal, Ayan Mukherjee, Dhruva Malakar, **Nandakumar Kalarikkal** & Sabu Thomas  
*J. Polymer Research*, 21, 347 (2014)
27. Interaction of phospholipid with silver nanorods  
K.N Anju, S.Mahesh, N. Kalarikkal  
*American Institute of Physics Conference Proceedings*, Vol. 1576, 232 (2014)

28. Collagen coated electrospun polycaprolactone(PCL) with titanium dioxide (TiO<sub>2</sub>) from and environmentally benign solvent: preliminary physic-chemical studies for skin substitute  
Kajal and **Nandakumar Kalarikkal** et. al.  
*J. Polymear Research*, 21:410, DOI 10.1007/s10965-014-0410-y (2014)
29. Magnetolectric properties of multiferroic composites (1-x)ErMnO<sub>3</sub> xY<sub>3</sub>Fe<sub>5</sub>O<sub>12</sub> at room temperature  
B.Raneesh, H.Soumya, J.Philip, S.Thomas, **K.Nandakumar**  
*Journal of Alloys and Compounds*, 611, 318-385, (2014)
30. Wound healing analysis of pectin/carboxymethyl cellulose/ microfibrillated cellulose based composite scaffolds  
Neethu Ninan, Muthunarayanan Muthiah, In-Kyu Park, **Nandakumar Kalarikkal**, Anne Elain, Tin Wui Wong, Sabu Thomas, Yves Grohens  
*Materials Letters*, 132, 34-37, (2014)
31. Electrospun polycaprolactone membranes incorporated with ZnO nanoparticles as skin substitutes with enhanced fibroblast proliferation and wound healing  
Robin Augustine, Edwin Anto Dominic, Indu Reju, Balarama Kaimal, **Nandakumar Kalarikkal** and Sabu Thomas  
*RSC Advances*, DOI: 10.1039/c4ra0240h (2014)

### Book Chapters

The following papers appear as chapters in the book entitled **Advanced Nanomaterials: Synthesis, Properties, and Applications published by Apple Academy Press (2014)**

1. Thin Film and Nanostructured Multiferroic Materials  
*B. Raneesh and Nandakumar Kalarikkal*
2. Current Advances in Nanomedicine: Applications in Clinical Medicine and Surgery  
*Indu Raj P, Vinod Kumar, and Nandakumar Kalarikkal*
3. Recent Advances in Nanomedicine: Applications in Diagnosis and Therapeutics  
*Sandhya Gopalakrishnan, Kannan Vaidyanathan, and Nandakumar Kalarikkal*

### Books Edited

1. **Nanomaterials: Synthesis, Characterization, and Applications, Volume 3 of the Advances in Nanoscience and Nanotechnology book series**  
Editors: A. K. Haghi, Ajesh K. Zachariah, **Nandakumar Kalarikkal**
2. **Advanced Nanomaterials: Synthesis, Properties, and Applications**  
Editors: Sabu Thomas, **Nandakumar Kalarikkal**, A. Manuel Stephan, B. Raneesh and A. K. Haghi
3. **Polymers for Packaging Applications (September 2014)**  
Editors: Sabu Thomas, Sajid Alavi, Jini Varghese, **Nandakumar Kalarikkal**, Srinivasarao Yaragalla
4. **Recent Trends in Natural Polymers and Biomaterials: Macro to Nanoscales (In Press)**  
Editors: Sabu Thomas, **Nandakumar Kalarikkal**, Weimin Yang, Oluwatobi Samuel Oluwafemi and Bindhya
5. **Advances in Nanomedicine and Tissue Engineering (In Press)**  
Editors: Sabu Thomas, **Nandakumar Kalarikkal**, Anne George, Joshi K. S, and Robin Augustine
6. **Biomaterial Applications: Macro to Nanoscales**  
Editors: Sabu Thomas, **Nandakumar Kalarikkal**, Yang Weimin, Snigdha S Babu

## Research Group

1. Prof. Sabu Thomas, Director, IIUCNN
2. Dr. Geethamma. V. G, Assistant Professor, IIUCNN
3. Dr. M. S. Latha, Assistant Professor, IIUCNN
4. Dr. Raji. V, Assistant Professor, IIUCNN
5. Dr. Kala M. S, St. Theresa's College, MGU
6. Dr. Kajal, Post-Doctoral Fellow, IIUCNN
7. Dr. Angulakshmi, Post-Doctoral Associate, IIUCNN
8. Dr. Obey Koshi, Post-Doctoral Fellow, IIUCNN
9. Mr. Raneesh Balakrishnan (Multiferroics)
10. Ms. Rajakumari (Nanomedicine/Nanopharmaceutics)
11. Mr. Sreenivasa Rao (Carbon structures based polymer nanocomposites)
12. Ms. Rehana P Ummer (Multiferroic nano/composites)
13. Mr. Robin Augustine (Polymer nanocomposite membranes for tissue engineering)
14. Ms. Sneha P Mohan (Core-shell quantum dots and Polymer nanocomposites)
15. Mr. El Haji Mamor (Quantum dot sensitized grapheme hybrid structures)-International Student
16. Ms. Lakshmi Priya (Polymer nanocomposites)
17. Ms. Arunima (Polymer nanocomposites)
18. Ms. Anju Nair (Ag-Hybrid structures for Bio-sensing applications and Bio-glass)
19. Ms. Bhavita (Aggregation behavior of nanoparticles)
20. Dr. Sandhya Gopalakrishnan (Polymer nanocomposites for denture application)
21. Dr. Indu Vinod (Polymer nanocomposites for denture application)
22. Dr. Nebu (Bioglass for periodontal surgical applications)
23. Mr. Jemy James (Laser Plasma/Laser Ablation)
24. Ms. Shabina Kappadan (Polymer nanomembranes for catalysis)
25. Mr. Avinash M. S (Graphene hybrid structures for NLO applications)
26. Mr. Tesafikaros Woldu (Nanomultiferroics)-International Student
27. Ms. Anshita Mayeen (Energy harvesting structures)
28. Ms. Ann Rose Abraham (Nanomultiferroics/ Metal-Organic frame works)
29. Ms. Parvathy (Laser Plasma)
30. Mr. Alok Tiwari (PLD thin films)
31. Mr. Harilal, M. Sc. Student (Materials for battery applications)
32. Mr. Navaneeth, M. Sc. Student (Graphene Hybrid structures/Laser Plasma)
33. Ms. Sreelakshmi, M. Sc. Student (Graphene Hybrid structures)

## Previous group members

- Dr. Jaimon Yohannan (Ferroelectrics)
- Dr. Seema R Nair (Nanophosphors)
- Dr. Nuja S John (Nanoferroelectrics)
- Dr. Jeevan Job Thomas (Nanoferrites)
- Ms. Shiji Krishnan (Multiferroics)

## Ph. D, M. Phil and M. Sc. theses guided

- Ph.D: 5
- M. Phil: 15
- M. Sc.: 8

## Research Collaborations

- Bhabha Atomic Research Centre, Mumbai, India
- Raman Research Institute, Bangalore, India
- Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India
- UGC-DAE Consortium for Scientific Research-Kolkata Centre, Kolkata, India
- Cochin University of Science & Technology, Kochi, India
- Inter University Accelerator Centre, New Delhi, India
- Cape-Peninsula University of Technology, South Africa
- Université de Bretagne Sud, France
- Jožef Stefan Institute, Ljubjana, Slovenia
- Trent University, Canada
- Deakin University, Australia
- Pushpagiri Medical Society, Thiruvalla, Kerala, India
- University of Technology-MARA, Malaysia
- Institut Jean Lamour-UMR 7198 CNRS-Université de Lorraine, France

## Research Grants

- Irradiation effects on the structural and electrical properties of selected ferroelectric ceramics, NSC-UFUP project (**Principal Investigator**)-Completed
- Nano Materials: Synthesis, characterization and applications, DST, New Delhi (**Principal Co-Investigator**)-Completed
- Ion beam irradiation effects on the structural and ferroic properties of selected sol-gel derived films of nanomultiferroics-UGC-DAE-CSR Kolkata Centre Project-**On going**-(**Principal Investigator**)
- Development of engineered nano-structured materials for high performance applications-DST-Nanomission-New Delhi-**On going**-(**Principal Co-Investigator**)
- Development of super tough nanocomposites from epoxy resin, liquid rubber and nanoclay, Kerala State Council for Science, Technology and Environment (KSCSTE under the SARD program-**On going**-(**Project Co-Investigator**)
- Development of Multi Walled Carbon Nanotube Filled Polycarbonate/ Polypropylene Double Percolating Conductive Polymer Blend Nanocomposites for Electromagnetic Interference Shielding Gaskets for Mobile Phones.-DIT-New Delhi-**On going**-(**Principal Co-Investigator**)
- Nanoparticle aggregation behavior in polymer nanocomposites- UGC-DAE-CSR Kolkata Centre Project-**Ongoing** -(**Principal Investigator**)

## Conferences/Workshops convened

- National Workshop on “Synthesis, Characterization and Applications of Nanomaterials”- NWNM- 2010 held at Mahatma Gandhi University, Kottayam, Kerala, India during 12-14 January 2010 (**Convener**)
- International Conference on Nanomaterials: Synthesis, Characterization and Applications-ICN 2010 held at Mahatma Gandhi University, Kottayam, Kerala, India during 27-29 April 2010 (**Co-Convener**)
- First International Conference on Composites and Nanocomposites ICNC-2011 held at Mahatma Gandhi University, Kottayam, Kerala, India during 7-9 January 2011 (**Convener**)



- Second International Conference on Nanomaterials: Synthesis, Characterization and Applications-ICN 2012 to be held at Mahatma Gandhi University, Kottayam, Kerala, India during 12-15 January 2012 (**Convener**)
- First Indo-US International Conference on Polymers for Packaging Applications held at Mahatma Gandhi University, Kottayam, Kerala, India during 31st March to 2nd April 2012 (**Convener**)
- The India-Israel Meeting on Materials Science and Nanoscience (IIMMN)-2013 held at Mahatma Gandhi University, Kottayam, Kerala, India during 31st January to 1st February 2013 (**Convener**)
- Third Euro-India International Conference on Nanomedicine and Tissue Engineering (ICNT)-2013 held at Mahatma Gandhi University, Kottayam, Kerala, India during 9-11 August 2103 (**Convener**)
- International Conference on Advanced Polymeric materials ICAPM 2013 held at Mahatma Gandhi University, Kottayam, Kerala, India during 11-13 October 2013 (**Convener**)
- Third International Conference on Recycling and Reuse of Materials ICRM-2014 held at Mahatma Gandhi University, Kottayam, Kerala, India during 11-13 April 2014 (**Convener**)
- 29th National Symposium on Plasma Science and Technology and International Conference on Plasma Science and Nanotechnology-Plasma 2014 to be held at Mahatma Gandhi University, Kottayam, Kerala, India during 8-11 December 2014 (**Convener**)

### **Other information**

- External examiner for M. Sc, M. Phil and Ph. D theses evaluator for various universities in India and abroad.
- Resource person for many workshops and seminars organized by different colleges, refresher courses and national and international workshops/conferences organized by School of Pure and Applied Physics, Centre for Nanoscience and Nanotechnology of Mahatma Gandhi University and other institutions in India and abroad.
- Reviewer for many international journals.

### **Membership in Professional bodies**

- The Indian Physics Association- Life Membership
- Plasma Science Society of India-Life Membership
- Academy of Physics Teachers- Annual

### **Hobbies**

Music, classical art forms, reading, movies, travel, photography, videography, gardening and bird watching

Link: <http://cnnmgu.blogspot.in/2013/05/dr-nandakumar-kalarikkal-talks.html>