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Education:

B.S.	Mahatma Gandhi University, India	1986 -1989
M.S.	Mahatma Gandhi University, India	1989 -1991
Ph.D.	Indian Institute of Technology (IIT) Delhi, India	1994 -2001

PhD Advisor: Prof. L. K. Malhotra

Employment History:

Associate Professor (Tenured), Department of Physics, University of Houston	2017 - present
Associate Professor (Tenure Track), Department of Physics, University of Houston	2012 - 2017
Development Engineer, First Solar, Perrysburg, Ohio	2011-2012
Chief Scientist, Sentech Corporation, Boalsburg, PA	2007-2010
Research Associate, Materials Research Institute, Penn State University, PA	2007-2010
Post doctoral Scholar, Penn State University PA	2001-2006
Post doctoral Scholar, University of Kentucky, Lexington, KY	2000-2001

Honors and Awards:

- Top 2% of the scientists in the world, Stanford University Report, 2020.
- John C. Butler Excellence in Teaching Award, College of Natural Sciences and Mathematics, U. of Houston, 2020.
- Received "Erudite Visiting Professor" award from Mahatma Gandhi University, India under The Erudite Scholars – in Residence Program by Government of Kerala, India (2017).
- Received Teaching Excellence award (group) from University of Houston (2017).
- Received the title 'Highly Cited Researcher' from Thomson Reuters (http://highlycited.com/) (2014, 2015, 2016).
- Listed by Thomson Reuters as one of the World's Most Influential Scientific Minds (2014, 2015).
- Ranked 9th in the Thomson Reuters' list of 'World's Top 100 Materials Scientists' in the past decade (http://sciencewatch.com/dr/sci/misc/Top100MatSci2000-10/).
- Three performance awards from First Solar (Perrysburg, Ohio) for contributions to materials and process development (2011-2012).

Recent Research Highlights:

- Developed zinc oxide nanotubes using anodic oxidation for the first time using an environmentally benign electrolyte and tailored the properties to develop chemical sensors for detecting breast cancer volatile organic compounds (VOC) for the non-invasive early stage diagnosis of the disease. It was also revealed that carbon nano-onion incorporated graphene could be responsive to VOCs such as acetone (Nano Letters 16, 3014-21, 2016; Carbon, 159, 668 – 685, 2020; ACS Applied Materials & Interfaces, 12, 29594 – 29604, 2020).
- Revealed the genotoxic behavior of titania nanotubes at low concentrations suggesting its use in destroying cancer cell. Demonstrated destruction of breast cancer cells using photonecrosis via near-infrared laser irradiation on $(NH_4)WO_3$ nanorods. (Scientific Reports, 7, 41844, 2017; Nanoscale, 11, 10209 – 10219, 2019).
- Achieved for the first time broad spectrum light absorption and high quantum efficiency in the visible light region of the solar spectrum in PEC water splitting cells consisting of heterostructured fluorinated hexagonal boron nitride quantum dot (QD)/TiO¬2 photoelectrodes. (Particle and Particle Systems Characterization 36, 1800346, 2019)
- For the first time heterostructured electrodes were developed using new non-van der Waals 2D materials such as hematene (2D-Fe_2O_3), Ilmenene (2D-$FeTiO_3$) and manganese telluride (2D-MnTe) and 1D materials such as nanotubes of titanium dioxide for broad spectrum light absorption and improved stability for photoelectrochemical (PEC) fuel

generation. (Nature Nanotechnology 13, 602-609, 2018; Chemistry of Materials, 30, 5923-5931, 2018; ACS Applied Nano Materials, 1, 6427-6434, 2018).

- Developed radially aligned titania nanotubes on titanium wire for enhanced phosphorylated protein separation and demonstrated that the material could perform at par with the standard expensive materials used in the field and would be a low cost alternative (US Patent #10478800, 2019; ACS Applied Materials & Interfaces 7, 11155-11164, 2015)

Lab Facilities / Expertise:

PI's group has its research focused on developing thin films and nanostructured materials, particularly nano-architectures of metals as well as oxide semiconductors, conducting fundamental studies and engineering the materials for various applications. The areas of primary interest are inorganic and organic/inorganic hybrid solar cells, solar photocatalytic and photoelectrochemical (PEC) fuel generation, chemical sensors for early diagnosis of cancer and infectious diseases and materials for ultrahigh temperature applications and medical treatment. Following are the facilities in the lab.

- A fume hood
- A glove box
- A chemical sensor characterization set up
- A Kurt J. Lesker CMS-18 ultra-high vacuum magnetron dc sputtering system
- Three high temperature (up to 1200 °C) furnaces
- A Leica SCD050 dc sputter coater
- DC power supplies
- Two recirculating chiller/heater baths
- A Keithley picoammeter
- A Keithley source meter
- Two Keithley multimeters
- A wire bonder
- Shimadzu GC 2014 gas chromatograph
- Xe arc lamp light source
- A monochromator (Newport)
- Optical power meter (Newport)
- CHI 604E potentiostat/galvanostat
- A Rf power generator
- A Critical point dryer
- Solvothermal reactors
- An Oven
- An optical microscope
- An optical spectrometer (ASEQ instruments)
- An optical bench (4'x 8', Newport)
- Vacuum pumps (Scroll and rotary)
- Two mass flow control systems (MKS)
- An electromagnet for Hall effect studies

Five Selected Publications/Link to full list via SciFinder, Google Scholar, etc.:
https://scholar.google.co.in/citations?hl=en&user=nhIMoTsAAAAJ&view_op=list_works&sortby=pubdate

1. J. B. Souza Jr, F. L. Souza, L. Vayssieres and O. K. Varghese, On the relevance of understanding and controlling the locations of dopants in hematite photoanodes for low-cost water splitting, Applied Physics Letters, 119, 200501 (2021).

2. S. Alancherry, K. Bazaka, I. Levchenko, A. Al-jumaili, B. Kandel, A. Alex, F. C. R. Hernandez, O. K. Varghese and M. V. Jacob, Fabrication of nano-onion structured graphene films from Citrus sinensis extrac and their wetting and sensing characteristics, ACS Appl. Mater. Interfaces 12 29594-29604 (2020).

3. J. Hou, Y. Du, T. Zhang, C. Mohan and O. K. Varghese, PEGylated $(NH_4)_x WO_3$ nanorod mediated rapid photonecrosis of breast cancer cells, Nanoscale, 11, 10209-10219 (2019).

4. A. P. Balan et al. Exfoliation of a non-van der Waals material from iron ore hematite, Nature Nanotechnology, 13, 602-609 (2018).

5. P. Qin, M. Paulose, M. I. Dar, T. Moehl, N. Arora, P. Gao, O. K. Varghese, M. Gratzel and M. K. Nazeeruddin, Stable and efficient perovskite solar cells based on titania nanotube arrays, Small, 11, 5533- 5539 (2015).