

# Curriculum Vitae

## Dr. Pramod P. Pillai

### Contact Information

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Department of Chemistry,  
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### Research Interests

Physical & Material Chemistry, Nanomaterials, Catalysis, Photochemistry & Photophysics, Light Harvesting, Self-assembly, Nano-bio interactions

### Education

#### Ph. D., 2008

National Institute for Interdisciplinary Science and Technology (NIIST), Trivandrum, India

#### M.Sc. Chemistry, 2004

Mahatma Gandhi University, Kottayam, India

#### B. Sc. Industrial Chemistry, 2001

Mahatma Gandhi University, Kottayam, India

### Research Experience/ Employment History

#### Associate Professor

*Indian Institute of Science Education and Research (IISER) Pune, India*

**Oct. 2019 –**

#### Assistant Professor

*Indian Institute of Science Education and Research (IISER) Pune, India*

**Jun. 2014 –  
Oct. 2019**

- Controlling the interplay of forces to improve and impart newer functionalities at nanoscale
- Regulation of nanoparticle – substrate interactions for enhanced catalysis
- Electrostatically driven photoinduced electron and energy transfer processes in eco-friendly quantum dots
- Self-assembly, light harvesting and bio-targeting studies with hybrid nanomaterials

#### Postdoctoral research

*Northwestern University, Illinois, U. S. A*  
*Advisor: Prof. Bartosz A. Grzybowski*

**Feb. 2011 –  
May. 2014**

- Fabricated novel electrically bistable devices based on metal-polymer nanocomposite with controllable dielectric breakdown
- Developed a general strategy to self-assemble colloids and nanomaterials, by modulating magnetic fields at the micron-scale

Designed and developed new family of mixed charge nanomaterials with unique chemical (stability, self-assembly etc.) and biological (antimicrobial, cellular uptake etc.) properties.

#### **Postdoctoral research**

*Technische Universität Dortmund, Germany*

*Advisor: Prof. Dr. Christof M. Niemeyer*

**Dec. 2008 –**

**Dec. 2010**

- Incorporated semiconductor nanomaterials into colloidal silica nanospheres for cell imaging studies
- Bio-functionalized luminescent colloidal silica beads for DNA hybridization studies
- Designed and studied energy transfer process between luminescent silica beads and fluorescent proteins

#### **Ph. D. research**

*NIIST, Trivandrum, India*

*Advisor: Prof. K. George Thomas*

**Apr. 2004 –**

**Dec. 2008**

- Published first report on the covalent functionalization of ruthenium trisbipyridine chromophores on gold nanoparticles and tuned their optoelectronic properties
- Improved the electron accepting properties of single-walled carbon nanotubes through covalent functionalization of metal nanoparticles
- First experimental demonstration for the existence of edge effect in gold nanorods
- Controlled the plasmon coupling in dimers of gold nanorods

#### **Awards**

- Awarded the prestigious *Alexander von Humboldt fellowship* in November 2008
- *Best poster award* in February 2008 for the All India Chemistry Symposium conducted by the Chemical Research Society of India (CRSI)
- Qualified the prestigious all India *CSIR-JRF/NET* exam of the Council of Scientific and Industrial Research, Government of India in June 2003.
- Qualified Graduate Aptitude Test in Engineering (*GATE*) in 2006
- University *second rank* for M.Sc. Chemistry
- University *first rank* (Topper) for B.Sc. Industrial Chemistry

#### **Sponsored R&D Projects**

- DST/SERB/ EMR/2015/001561: (2016 – 2018; Interdigitated Metal-Semiconductor Nanowires as a Platform for Plasmon Sensitized Light Harvesting Devices, 41.9 lakhs (INR))
- DST/ SR/NM/NS-1014/2017: (2018 – 2020; Charge Transport and Mechanical Motion in One Dimensional Nanomaterials: Towards Ultrasensitive Detection and Mechanochemistry, 79.6 lakhs (INR))

#### **Academic Activities**

- Member of American Chemical Society (ACS; Membership No: 30982054)
- Lifetime member of Chemical Research Society of India (CRSI; Membership No: LM1798)

## Publications

### As Independent Researcher

- 1) Rao, A.; Kumar, G. S.; Roy, S.; Rajesh, A. T.; Devatha, G.; **Pillai, P. P.\*** “Turn-On Selectivity in Inherently Nonselective Gold Nanoparticles for Pb<sup>2+</sup> Detection by Preferential Breaking of Interparticle Interactions” *ACS Appl. Nano. Mater.* **2019**, *2*, 5625 – 5633.
- 2) Devatha, G.; Rao, A.; Roy, S.; **Pillai, P. P.\*** “Förster Resonance Energy Transfer Regulated Multicolor Photopatterning from Single Quantum Dot Nanohybrid Films” *ACS Energy Lett.* **2019**, *4*, 1710-1716.
- 3) Chakraborty, I. N.; Roy, S.; Devatha, G.; Rao, A.; **Pillai, P. P.\*** “InP/ZnS Quantum Dots as Efficient Visible-Light Photocatalysts for Redox and Carbon–Carbon Coupling Reactions” *Chem. Mater.* **2019**, *31*, 2258–2262.
- 4) Roy, S.; Roy, S.; Rao, A.; Devatha, G.; **Pillai, P. P.\*** “Precise Nanoparticle–Reactant Interaction Outplays Ligand Poisoning in Visible-Light Photocatalysis” *Chem. Mater.* **2018**, *30*, 8415-8419.
- 5) Xavier, J. A. M.; Devatha, G.; Roy, S.; Rao, A.; **Pillai, P. P.\*** “Electrostatically Regulated Photoinduced Electron Transfer in “Cationic” Eco-friendly CuInS<sub>2</sub>/ZnS Quantum Dots in Water” *J. Mater. Chem. A.* **2018**, *6*, 22248 – 22255.
- 6) Muduli, S.; Pandey, P.; Devatha, G.; Babar, R.; Kothari, D. C.; Kabir, M.;\* **Pillai, P. P.\*** Ogale, S.\* “Photoluminescence Quenching in Self-Assembled CsPbBr<sub>3</sub> Quantum Dots on Few-Layer Black Phosphorus Sheets” *Angew. Chem. Int. Ed.* **2018**, *57*, 7682-7686.
- 7) Roy, S.; Rao, A.; Devatha, G.; **Pillai, P. P.\*** “Revealing the Role of Electrostatics in Gold Nanoparticle Catalyzed Reduction of Charged Substrates” *ACS Catal.* **2017**, *7*, 7141-7145.
- 8) Devatha, G.; Roy, S.; Rao, A.; Mallick, A.; Basu, S.; **Pillai, P. P.\*** “Electrostatically Driven Resonance Energy Transfer in “Cationic” Biocompatible Indium Phosphide Quantum Dots.” *Chem. Sci.* **2017**, *8*, 3879-3884.
- 9) Rao, A.; Roy, S.; Unnikrishnan, M.; Bhosale, S. S.; Devatha, G.; **Pillai, P. P.\*** “Regulation of Interparticle Forces Reveals Controlled Aggregation in Charged Nanoparticles” *Chem. Mater.* **2016**, *28*, 2348-2355.
- 10) Rao, A.; S.; Govind; Roy, S.; Rajesh, A. T.; Devatha, G.; **Pillai, P. P.\*** “Emergence of Selectivity in Inherently Nonselective Gold Nanoparticles Through Preferential Breaking of Interparticle Interactions” **2018**  
*ChemRxiv DOI.org/10.26434/chemrxiv.7195817.v1.*

### With IISER Pune affiliation

- 11) Timonen, J. V. I.; Raimondo, C.; Pilans, D.; **Pillai, P. P.;** Grzybowski, B. A. “Trapping, Manipulation, and Crystallization of Live Cells using Magnetofluidic Tweezers.” *Nanoscale Horiz.*, **2017**, *2*, 50-54.
- 12) **Pillai, P. P.;** Kowalczyk, B.; Kandere-Grzybowska, K.; Borkowska, M.; Grzybowski, B. A. “Engineering Gram Selectivity of Mixed-Charge Gold Nanoparticles by Tuning the Balance of Surface Charges” *Angew. Chem. Int. Ed.* **2016**, *55*, 8610-8614.
- 13) **Pillai, P. P.;** Kowalczyk, B.; Pudlo, W. J.; Grzybowski, B. A. “Electrostatic Titrations Reveal Surface Compositions of Mixed, On-Nanoparticle Monolayers Comprising Positively and Negatively Charged Ligands” *J. Phys. Chem. C* **2016**, *120*, 4139-4144.

- 14) **Pillai, P. P.**; Kowalczyk, B.; Grzybowski, B. A. "Self-assembly of Like-Charged Nanoparticles into Microscopic Crystals" *Nanoscale* **2016**, 8, 157-161.

**From PhD and Postdoc.**

- 15) Yan, Y.; **Pillai, P. P.**; Timonen, J. V. I.; Emami, F. S.; Vahid, A.; Grzybowski, B. A. "Synthesis of Toroidal Gold Nanoparticles Assisted by Soft Template" *Langmuir* **2014**, 30, 9886-9890.
- 16) Zhuang, Q.\*; Warren, S. C.\*; Baytekin, B.; Demirörs, A. F.; **Pillai, P. P.**; Kowalczyk, B.; Grzybowski, B. A. "Mechanical Control of Surface Adsorption by Nanoscale Cracking" *Adv. Mater.* **2014**, 26, 3667-3672.
- 17) Demirörs, A. F.; **Pillai, P. P.**; Kowalczyk, B.; Grzybowski, B. A. "Colloidal Assembly Directed by Virtual Magnetic Moulds" *Nature* **2013**, 503, 99-103.
- 18) **Pillai, P. P.**; Huda, S.; Kowalczyk, B.; Grzybowski, B. A. "Controlled pH Stability and Adjustable Cellular Uptake of Mixed-Charge Nanoparticles" *J. Am. Chem. Soc.* **2013**, 135, 6392-6395.
- 19) **Pillai, P. P.**; Paćławski, K.; Kim, J.; Grzybowski, B. A. "Nanostructural Anisotropy Underlies Anisotropic Electrical Bistability" *Adv. Mater.* **2013**, 25, 1623-1628.
- 20) **Pramod, P.**; Soumya, C. C.; Thomas, K. G. "Gold Nanoparticle-Functionalized Carbon Nanotubes for Light-Induced Electron Transfer Process" *J. Phys. Chem. Lett.* **2011**, 2, 775-781.
- 21) **Pillai, P. P.**; Reisewitz, S.; Schroeder, H.; Niemeyer, C. M. "Quantum Dot- Encoded Silica Nanospheres for Nucleic Acid Hybridization" *Small* **2010**, 6, 2130- 2134.
- 22) **Pramod, P.**; Thomas, K. G.; George, M. V. "Organic Nanomaterials: Morphological Control for Charge Stabilization and Charge Transport" *Chem. Asian J.* **2009**, 4, 806-823.
- 23) **Pramod, P.**; Thomas, K. G. "Plasmon Coupling in Dimers of Au Nanorods" *Adv. Mater.* **2008**, 20, 4300-4305.
- 24) **Pramod, P.**; Joseph, S. T. S.; Thomas, K. G. "Preferential Functionalization of Au nanorods Through Electrostatic Interactions" *J. Am. Chem. Soc.* **2007**, 129, 6712-6713.
- 25) Jebb, M.; Sudeep, P. K.; **Pramod, P.**; Thomas, K. G; Kamat, P. V. "Interaction of thiol derivative of Ru(II)trisbipyridyl complex with gold nanorods. Morphological changes and excited state interactions" *J. Phys. Chem. B* **2007**, 111, 6839-6844.
- 26) **Pramod, P.**; Sudeep, P. K.; Thomas, K. G.; Kamat, P. V. "Photochemistry of Ruthenium Trisbipyridine Functionalized on Gold Nanoparticles" *J. Phys. Chem. B* **2006**, 110, 20737-20741.
- 27) Joseph, S. T. S.; Ipe, B. I.; **Pramod, P.**; Thomas, K. G. "Gold Nanorods to Nanochains: Mechanistic Investigations on their Longitudinal Assembly Using  $\alpha,\omega$ -Alkanedithiols and Interplasmon Coupling" *J. Phys. Chem. B* **2006**, 110, 150-157.

Selected  
Talks and  
Presentations

- 1) Surface Ligand Directed Catalysis and Light Harvesting by Nanoparticles, In International Conference on Energy and Environment (ICEE 2k19)” held at T.K.M. College of Arts & Science, Kollam Kerala (India) December 12-14, 2019.
- 2) Surface Ligand Directed Catalysis and Light Harvesting by Nanoparticles, in Institut Charles Sadron (ICS) – CNRS at University of Strasbourg, Strasbourg, (France) June 18, 2019.
- 3) Crafting Advanced Nanoparticle Functions through Interplay of Forces and Interactions, in Institut de Science et d'Ingénierie Supramoléculaires (ISIS) at University of Strasbourg, Strasbourg, (France) June 17, 2019.
- 4) Regulation of Interparticle Interactions: In Search of Advanced Nanoparticle Functions, at Donostia International Physics Center (DIPC), San Sebastian, (Spain) June 13, 2019.
- 5) Transformations on the Surface of Nanoparticles: Not all Ligands are ‘Poisonous’ for Catalysis, in *Students Seminar Organized by SFB 838* at Westfälische Wilhelms-Universität (WWU, SFB 858), Muenster, (Germany) June 05, 2019.
- 6) Regulation of Interparticle Interactions: In Search of Advanced Nanoparticle Functions, Westfälische Wilhelms-Universität (WWU), Muenster, (Germany) June 04, 2019.
- 7) Regulation of Interparticle Forces for Advanced Nanoparticle Functions, in *Institute for Biological Interfaces I (IBG-1)* at Karlsruhe Institute of Technology (KIT), (Germany) May 15, 2019.
- 8) Regulation of Interparticle Forces for Advanced Nanoparticle Functions, In “*1<sup>st</sup> Indian Materials Conclave and 30<sup>th</sup> Annual General Meeting of MRSI*” held at IISc Bangalore, (India) February 12-15, 2019.
- 9) Regulation of Interparticle Forces for Advanced Nanoparticle Functions, In “*Humboldt Kolleg 2019*” held at Kashid, Maharashtra, (India) 31<sup>st</sup> January – 02<sup>nd</sup> February 2019.
- 10) Regulation of Interparticle Forces for Advanced Nanoparticle Functions, In “*International Conference on Chemistry and Physics of Advanced Materials - III*” held at IISER Pune, (India) October 08-09, 2018.
- 11) Regulation of Interparticle Forces for Advanced Nanoparticle Functions, In “*Gordon Research Conference on Noble Metal Nanoparticles*” held at South Hadley, Boston, (U. S.A.) June 17-23, 2018.
- 12) Controlling the Interparticle Interactions for Advanced Nanoparticle Functions, In “*International Conference on Advanced Nanostructures (ICAN 2018)*” held at Catholicate College, Kerala, (India) March 12-14, 2018.
- 13) Controlling the Interparticle Interactions for Advanced Nanoparticle Functions, In “*IISER-Weizmann Institute of Science scientific workshop*” held at IISER Pune, (India) January 18-19, 2018.
- 14) Exploring Nanoscience - How BIG is Small , As a resource person in “*Inspire Internship Camp*” held at Sacred Heart College, Kochi, Kerala, (India) January 09-13, 2018.
- 15) Crafting Advanced Nanoparticle Functions through Interplay of Forces, In “*Inter IISER & NISER Chemistry Meet (IINCM-2017)*” held at NIISER Bhubaneswar, Orissa, (India) December 22-24, 2017
- 16) Crafting Advanced Nanoparticle Functions by Controlling Interparticle Interactions,

In “*Humboldt Colloquium*” held at Bengaluru, (India) November 23–25, 2017

- 17) Crafting Advanced Nanoparticle Functions by Controlling Interparticle Interactions, In “*International Conference of Young Researchers in Advanced Materials (IUMRS-ICYRAM 2016)*” held at IISc Bangalore, (India) December 11-15, 2016
- 18) Coding Nanoparticle Functionalities by Tuning the Nanoscale Forces, In “*Gordon Research Conference on Noble Metal Nanoparticles*” held at South Hadley, Boston, (U. S.A.) June 19-25, 2016.
- 19) Regulation of Interparticle Interactions: In Search of Advanced Nanoparticle Functions, at Department of Chemistry, University of North Carolina at Chapel Hill, North Carolina, USA on June 17, 2016.
- 20) Regulation of Interparticle Interactions: In Search of Advanced Nanoparticle Functions, at Radiation Laboratory, University of Notre Dame, Notre Dame, Indiana, USA on June 14, 2016.