

TIJU THOMAS

Interdisciplinary Program, &
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RESEARCH INTERESTS:

Dr. Thomas' research group (*Applied Nanostructures Engineering and Nanochemistry/ANeN*) focuses on developing compositionally complex oxides, oxynitrides and nitrides, and nanometals for energy and environmental engineering related applications. Among the classes of materials identified here, (i) nano-morphology transformations and control, and (ii) high pressure synthesis and processing are being currently pursued.

In particular using functional nanostructures identified above for solar energy harvesting, efficient light emission systems, and environmental remediation have been the group's engineering thrust areas. While doing so, at times, we often stumble upon novel and exciting atomic-scale phenomena (eg., digestive ripening in oxides, chemically-induced nanorod to nanodot transition, luminophores as atomic-scale structural probes). Eco-friendly, green engineering perspectives guide the synthetic chemical and fabrication routes that the group develops for fulfilling its goals. Furthermore correlations between synthesis, materials processes, and device performance is an increasingly common theme in the group's activities.

Brief bio:

Tiju Thomas is an Assistant Professor and head of the “*Applied Nanostructure Engineering and Nanochemistry*” lab at the Department of Metallurgical and Materials Engineering (Indian Institute of Technology Madras, IITM) in Chennai, India. Before coming to IITM, he was working as a Faculty Fellow at the Materials Research Center in the Indian Institute of Science, Bangalore. Prior to that he was on an industry-academia joint project involving University of Toronto (Chemistry, Optical Science), Memorial University of Newfoundland (Physics), and Lumentra Inc. (a start up company, specializing in light emitting devices). He has graduate degrees (MS, PhD; Electrophysics) from the School of Engineering in Cornell University. His work is highly interdisciplinary; he has published with electrical engineers, applied physicists, and polymer and solid state chemists over the years. He also holds a masters degree (M.S (Engg.)) from the Theoretical Sciences Unit in Jawaharlal Nehru Centre for Advanced Scientific Research. His undergraduate degree is in electrical engineering.

EDUCATION:

Jan. 2011 **MS, Ph. D** (Major: Electrophysics, Minors: Materials science and electrical engineering)

Interdisciplinary program run by the ‘*School of Electrical and Computer Engineering*’, Cornell University, Ithaca, NY, USA.

Thesis : Rare Earth Doped Gallium Nitride Powders: Synthesis, Purification, Nanosizing, Luminescence Mechanism, Electrophoretic Deposition, Sintering And Characterization.

Aug. 2007 **MS (Engineering)** (Major: Applied Physics, Minor: Materials Science)
Jawaharlal Nehru Center for Advanced Scientific Research (JNCASR)
Jakkur, Bangalore, India.

Thesis: Polytypes and Stacking Faults in C, Si, Ge and Silicon Carbide

EMPLOYMENT HISTORY:

Jan 2015-current **Assistant Professor**
Interdisciplinary Technology Program, &
Department of Metallurgical and Materials Engineering,
Indian Institute of Technology Madras
Chennai, Tamil Nadu, India

April 2012-Dec 2014 INSPIRE Faculty
Principal Investigator,
Materials Research Centre, Indian Institute of Science (Bangalore)

Feb 2011 - Feb 2012 Joint Postdoctoral researcher with
(a) Department of Physics and Physical Oceanography,
Memorial University of Newfoundland (Prof. Kristin Poduska Group)
&
Institute of Optical Sciences, University of Toronto
(with Dr. Venkat Venkataraman).

(b) Visiting Scientist,
Department of Chemistry,
University of Toronto (Prof. Cynthia Goh Group)

(c) Scientific consultant, Lumentra Inc., Toronto, Canada

Aug. 2007 – Jan 2011 Graduate Research Assistant,
School of Engineering, Cornell University
(Prof. Michael G. Spencer group)

March 2010 – Jun 2010 Research Assistant,
School of Chemistry and Chemical Biology, Cornell University
(Prof. Francis J. DiSalvo group)

Aug. 2005 – Aug. 2007 Research Scholar, Theoretical Sciences Unit,
Jawaharlal Nehru Center for Advanced Scientific Research
(Prof. Umesh Waghmare group)

STRENGTHS:

- Explicit focus on creating a well-functioning, cordial, cross-disciplinary research team that has visible output on a regular basis. This ensures career development of all who associate with us.
- Experience working with students from very diverse backgrounds (chemistry, materials, polymers, electrical, pharmaceutical sciences, physics, nanotechnology, chemical engg., mechanical engg. etc).

- Very student centric approach to pedagogy and research mentoring.
- Complete openness to work with student's strengths and skills, and sensitivity towards her/his weaknesses and/or background.
- Commitment to human resource development for the greater good of the society.
- Willingness to engage with both blue skied academic projects, as well as industrially/socially relevant technological problems.

FELLOWSHIPS/SCHOLARSHIPS/PROFESSIONAL RECOGNITIONS:

- (a) Kishore Vaigyanik Protsahana Yojana (KVPY): A Science Scholarship instituted by Indian Institute of Science given to students in India showing promise as scientists.
- (b) Scholarship from JNCASR given to MS/PhD students based on an all-India written test and individual interviews to test competency in science and engineering research.
- (c) Full Graduate Research support from Cornell University, Ithaca (NY, USA).
- (d) Indian National Science Academy's INSPIRE (Physics) Faculty Fellowship (2011).
- (e) Fast Track Young Scientist Award from Department of Science and Technology, Govt. of India (2016).
- (f) Member, Editorial Advisory Board, Convergence, A Journal by 'Loyola Institute of Frontier Energy (LIFE)', Loyola College, Chennai,

Important outcomes of recent interactions/collaborations with academic colleagues within IITM and our visitors:

- * Co-convended "*Industry-academia*" interaction meeting on Surface Engineering (July 23, 2015). Initiating discussions on A Center for Surface Engineering in IITM (co-convener: Prof. Ganesh Sundararaman, Prof. M. Kamaraj, Prof. A. Subrahmanyam, Dr. Srinivasa Rao Bakshi)
- * *Co-editor* (along with Prof. Manoj Gupta of NUS) for Special Issue on "*Smart Interfaces in Nanostructured Materials*", CSM International (scheduled for Jan 2017)

Some media coverage of hydrogen energy and water research work from group:

“Room temperature hydrogen production from Hg contaminated water, with desirable throughput, and simultaneous Hg-removal” *(Dec 2017)*

<https://reginnovations.org/key-scientific-articles/room-temperature-hydrogen-production-hg-contaminated-water-desirable-throughput-simultaneous-hg-removal/>

** corresponding patent – available for licensing

PUBLICATIONS / PATENTS/ PRESENTATIONS:

1. Kousika Anbalgan and Tiju Thomas, “Size-dependent disproportionation (in ~2-20 nm regime) and hybrid-Bond-valence derived interatomic potentials for BaTaO₂N”, Applied Nanoscience (just accepted, 2018)
2. G. Sudha Priyanga and **Tiju Thomas**, “Direct band gap narrowing and light-harvesting-potential in orthorhombic In-doped-AlFeO₃ perovskite: A first principles study” , Journal of Alloys and Compounds 750, 312–319 (2018)
3. "Surface enthalpy driven size focussing trends: predictive modelling for digestive ripening of spherical particles", Applied Surface Science (April 2018) (just accepted)
<https://doi.org/10.1016/j.apsusc.2018.04.134>
4. Qian Wu, Xiaojie Wang, Rasaki Sefiu Abolaji, **Tiju Thomas**, Chuanxi Wang, Chi Zhang and Minghui Yang, “Yellow-Emitting Carbon Dots Impregnated Carboxy Methyl Cellulose/Poly-vinyl-alcohol and Chitosan: Stable, Free-Standing, Enhanced Quenching for Cu²⁺ ions Sensor”, Journal of Materials Chemistry C (Mar 2018) (just accepted) DOI: [10.1039/C8TC00660A](https://doi.org/10.1039/C8TC00660A)
5. Santosh Behara, Lalitha Ghatti, Shivani Kanthamani, Malathi Dumpala and Tiju Thomas “Structural, optical, and Raman studies of Gd doped sodium bismuth titanate”, Ceramic International (Mar 2018) (just accepted) <https://doi.org/10.1016/j.ceramint.2018.03.233>
6. Bhusankar Talluri, Edamana Prasad, **Tiju Thomas**, “Critical role of surfactants in the formation of digestively-ripened, ultra-small ($r < 2$ nm) copper oxide quantum dots”, Superlattices and Microstructures, 116, 122-130 (2018) DOI: 10.1016/j.spmi.2018.02.010
7. Fengdong Qu, Shang W, **Tiju Thomas**, Ruan, S. and Yang, M. "Self-template derived ZnFe₂O₄ double-shell microspheres for chemresistive gas sensing." Sensors and Actuators B: Chemical 265, 625-631 (2018).
8. Bingxue Zhang, Xinxin Zhou, Shendan Zhang, Fengdong Qu, **Tiju Thomas**^{C*} and Minghui

- Yang*, "Porous coral-like NiCo₂O₄ nanospheres with promising xylene gas sensing properties", Sensors & Actuators: B. Chemical 261(1), 203-209 (2018)
9. Prasanna Kumar, Nagaraju Kottam, Preetham R, R. Harikrishna, **Tiju Thomas**, "Understanding the photoluminescence behaviour in nano CaZrO₃:Eu³⁺ pigments by Judd-Ofelt intensity parameters", Dyes and Pigments 150, 306-314 (2018)
 10. Fengdong Qu, Shang, W, Wang, D, Du S, **Tiju Thomas**, Ruan, S. and Yang, M., "Coordination Polymers Derived Multi-shelled Mixed Ni-Co Oxides Microspheres for Robust and Selective Detection of Xylene" ACS Applied Materials & Interfaces (just accepted) DOI: 10.1021/acsami.8b03487
 11. Bhusankar Talluri, Edamana Prasad, Tiju Thomas, "Critical role of surfactants in the formation of digestively-ripened, ultra-small ($r < 2$ nm) copper oxide quantum dots" Superlattices and Microstructures 116:122-30 (2018)
 12. Bandi Pallavi, Sneha Sathyan, Takuya Yoshimura, Praveen Balakrishnan, Kousika. Anbalagan, Bhusankar Talluri, Sarathi Ramanujam, Prem Ranjan, and **Tiju Thomas**, "Suppression of red luminescence in wire explosion derived Eu:ZnO", Journal of Electronic Materials 47(3), 1924-1931 (2018).
 13. Rasaki Sefiu Abolaji, Zhang Bingxue, Kousika Anbalgam, **Tiju Thomas*** and Yang Minghui*, "Synthesis and application of nanostructured metal nitrides and carbides: a review", Progress in Solid State Chemistry (2017, accepted; to be published 2018)
 14. Manjunatha S., Harikrishna R., **Tiju Thomas***, Bhabani Shankar Panigrahi, and Dharmaprakash M. S., "Moss-Burstein effect in stable, cubic ZrO₂:Eu⁺³ nanophosphors prepared by rapid microwave-assisted solution-combustion technique", Materials Research Bulletin 98, 139-147 (2018) . <https://doi.org/10.1016/j.materresbull.2017.10.006>
 15. Sathishkumar Kannaiyan, Chitra Boobalan, Avinash Umasankaran, Abhaiguru Ravirajan, Sneha Sathyan, TijuThomas, "Comparison of experimental and calculated thermophysical

properties of alumina/cupric oxide hybrid nanofluids", Journal of Molecular Liquids 244, 469-477 (2017). <https://doi.org/10.1016/j.molliq.2017.09.035>

16. Abhishek Sarkar, Christoph Loho, Leonardo Velasco, **Tiju Thomas**, Subramshu S. Bhattacharya, Horst Hahn, and Ruzica Djenadic, "*Multicomponent equiatomic rare earth oxides with narrow band gap and associated praseodymium multivalency*", RSC Dalton Transactions 46, 12167-12176 (2017). doi: 10.1039/C7DT02077E
17. Mingming Zou, Erum Pervaiz, Lu Feng, **Tiju Thomas**, and Minghui Yang, "*Amine coupled Ordered Mesoporous (Co-N) co-doped TiO₂: Green Photocatalyst for Selective Aerobic Oxidation of Thioether*" RSC Catal. Sci. Technol. (2017). Doi: 10.1039/C7CY00946A
18. Bhusankar Talluri and Tiju Thomas, "*Indications of hard-soft-acid-base interactions governing formation of ultra-small ($r < 3$ nm) digestively ripened copper oxide quantum-dot*", Chemical Physics Letters 685, 84-88 (2017). doi: 10.1016/j.cplett.2017.07.041
19. Argha Sarkar Santanu Maity Aneesh M. Joseph S Chakraborty and **Tiju Thomas**, "*Methane-Sensing Performance Enhancement in Graphene Oxide/Mg:ZnO Heterostructure Devices*", Journal of Electronic Materials: 1-7. DOI: 10.1007/s11664-017-5619-1 (2017)
20. Abdul Malek, Edamana Prasad, and **Tiju Thomas**, "*Chimie douce hydrogen production from Hg contaminated water, with desirable throughput, and simultaneous Hg-removal*", International Journal of Hydrogen Energy, 42 (24), 5724-15730 (2017).
21. Mingming Zou, Fengqiang Xiong, Ayyakannu Sundaram Ganeshraja, Xiaohua.Feng, Chuanxi.Wang, **Tiju Thomas*** and Minghui Yang, "*Visible light photocatalysts (Fe, N):TiO₂ from ammonothermally processed, solvothermal self-assembly derived Fe-TiO₂ mesoporous microspheres*", Materials Chemistry and Physics 195, 259-267 (2017). DOI: 10.1016/j.matchemphys.2017.04.035

22. Xiong Feng-Qiang, Lipeng Wan, Yue Li, **Tiju Thomas**, Francis Joseph DiSalvo, and Minghui Yang, "Crucial role of donor density in the performance of oxynitride perovskite LaTiO_2N for photocatalytic water oxidation reaction", *ChemSusChem* 10 (5), 930-937 (2017).
23. Zou Mingming, Honghong Liu, Lu Feng, **Tiju Thomas**, and Minghui Yang, "Enhanced visible light photocatalytic activity in N-doped edge-and corner-truncated octahedral Cu_2O ", *Solid State Sciences* 65, 22-28 (2017).
24. Bhusankar Talluri, Edamana Prasad, and **Tiju Thomas**, "Ultra-small ($r < 2$ nm), stable (> 1 year), mixed valence copper oxide quantum dots with anomalous band gap", arXiv:1706.01261 (2017)
25. Zou Mingming, Honghong Liu, Lu Feng, Fengqiang Xiong, Tiju Thomas, and Minghui Yang. "Effect of nitridation on visible light photocatalytic behavior of microporous (Ag, Ag_2O) co-loaded TiO_2 ", *Microporous and Mesoporous Materials* 240 (2017): 137-144.
26. Wan, Lipeng, Feng-Qiang Xiong, Yue Li, **Tiju Thomas**, Ruxin Che, and Minghui Yang. "Low Defect Density, High Surface Area LaNbON_2 Prepared via Nitridation of La_3NbO_7 " *Materials Letters* 188, 212–214 (2017). <http://dx.doi.org/10.1016/j.matlet.2016.11.012>
27. Xin Liu, Nan Yin, **Tiju Thomas**, Minghui Yang, Junhu Wang and Quan Shi, "Effect of nitrogen substitution on the structural and magnetic ordering transitions of NiCr_2O_4 ", *RSC Advances* 6, 112140-112147 (2016); DOI: 10.1039/C6RA22773B
28. Prakashbabu, D., H. B. Ramalingam, R. Hari Krishna, B. M. Nagabhushana, R. Chandramohan, C. Shivakumara, J. Thirumalai, and **Tiju Thomas**, "Charge compensation assisted enhancement of photoluminescence in combustion derived Li^+ co-doped cubic $\text{ZrO}_2: \text{Eu}^{3+}$ nanophosphors", *Physical Chemistry Chemical Physics* 18, no. 42 (2016): 29447-29457. DOI: 10.1039/c6cp04633a.
29. Malek, Abdul, **Tiju Thomas**, and Edamana Prasad, "Visual and Optical Sensing of Hg^{2+} , Cd^{2+} , Cu^{2+} , and Pb^{2+} in Water and Its Beneficiation via Gettering in Nanoamalgam Form," *ACS Sustainable Chemistry & Engineering* 4(6) : 3497-3503 (2016).

30. Jian Zheng, Feng-Qiang Xiong, Mingming Zou, **Tiju Thomas**, Heng Jiang, Ying Tian, Minghui Yang, "Enhanced photocatalytic degradation of rhodamine B under visible light irradiation on mesoporous anatase TiO₂ microspheres by codoping with W and N", Solid State Sciences 54, 49-53 (2016)
31. Abhijit Kalaskar, **Tiju Thomas**, Rajeev Ranjan, "Electric field induced short range to long range structural ordering and its influence on the Eu⁺³ photoluminescence in the lead-free ferroelectric Na_{1/2}Bi_{1/2}TiO₃", Journal of Applied Physics 117 (24) , 244106 (2015).
32. R. Hari Krishna, B. M. Nagabhushana, H. Nagabhushana, N. Suriya Murthy, C. Shivakumara, Babu Rao, **Tiju Thomas**, "Luminescence enhancement in monoclinic CaAl₂O₄:Eu²⁺, Cr³⁺ nanophosphor by fuel-blend combustion synthesis", Chemical Engineering Journal 267, 317-323 (2015).
33. Niya Mary and **Tiju Thomas**, "Nanorod to quantum dot conversion in ZnO dispersions with co-surfactants", RSC Advances 5 (20), 15154-15158 (2015).
34. Aakanksha Chaudhary, Poshit Nag, **Tiju Thomas**, N. Ravishankar, Manish Jain, SrinivasanRaghavan, "Synergistic effect of Mo+Cu co-doping on the photocatalytic behavior of metastable TiO₂ solid solutions", ACS Journal of Physical Chemistry C 118 (51), 29788-29795 (2014).
35. Arun D Rao, Suresh Karalatti, Praveen C Ramamurthy, **Tiju Thomas**, "Self-assembled, aligned ZnO nanorod buffer layers for high current density, inverted organic photovoltaics", ACS Applied Materials and Interfaces 6(19), 6792-16799 (2014)
36. D. L. Monika, H. Nagabhushana, R. Hari Krishna, B. M. Nagabhushana, S. C. Sharma, Tiju Thomas, "Synthesis and photoluminescence investigations on Li⁺ co-activator based Sr₂CeO₄:Dy³⁺ nanophosphor – a viable potential white light phosphor", RSC Advances 4(73), 38655-38662 (2014).

37. Niya Mary Jacob and **Tiju Thomas**, "Digestive ripening and green synthesis of ultra-small ($r < 2\text{nm}$) stable ZnO quantum dots." *Ceramics International* 40.9 (2014): 13945-13952. <http://dx.doi.org/10.1016/j.ceramint.2014.05.116>)
38. R. Hari Krishna, B. M. Nagabhushana, H. Nagabhushana,, D. L. Monika, R. Sivaramakrishna, C. Shivakumara, R. P. S. Chakradhar, **Tiju Thomas**, "*Photoluminescence, thermoluminescence and EPR studies of solvothermally derived Ni²⁺ doped Y(OH)₃ and Y₂O₃ multi-particle-chain microrods*", *Journal of Luminescence* 155,125-134 (2014).
39. Niya Mary, Giridhar Madras, Nagaraju Kottam and **Tiju Thomas**, "*Multivalent Cu doped ZnO nanoparticles with full solar spectrum absorbance and enhanced photoactivity*" *ACS Industrial and Engineering Chemistry Research* 53 (14): 5895–5904 (2014).
40. R. Hari Krishna, B. M. Nagabhushana, H. Nagabhushana, N. Suriya Murthy, R. Sivaramakrishna, C. Shivakumara, R. P. S. Chakradhar, **Tiju Thomas**, "*Combustion synthesis approach for spectral tuning of Eu doped CaAl₂O₄ phosphors*", *Journal of Alloys and Compounds* 589 : 596-603 (2014).
41. R. Hari Krishna, B. M. Nagabhushana, H. Nagabhushana, R. Sivaramakrishna, C. Shivakumara, R. P. S. Chakradhar, **Tiju Thomas** , "*Auto-ignition based synthesis of Y₂O₃ for photo- and thermo-luminescent applications*", *Journal of Alloys and Compounds* 585: 129-137 (2014) . (<http://dx.doi.org/10.1016/j.jallcom.2013.09.037>)
42. Niya Mary Jacob, Praveena Kuruva, Giridhar Madras and **Tiju Thomas**, "*Room temperature synthesized ZnO, (Zn,Cu)O and cobalt ferrite based versatile adsorbents*", *ACS Industrial and Engineering Chemistry* 52 (46), 16384–16395 (2013) (<http://dx.doi.org/10.1021/ie402727z>)
43. Rajesh Kumar Prusty, Praveena Kuruva, U. Ramamurty, **Tiju Thomas**, "*Correlations between photoluminescence and mechanical modulus trends in Eu doped sodium bismuth titanate*", *Solid State Communications* **173**, 38-41 (2013). <http://dx.doi.org/10.1016/j.ssc.2013.09.002>

44. Praveena Kuruva, S. Srinath, B. Radhika and **Tiju Thomas**, “*Magnetic property optimization in size-controlled cobalt ferrite nanoparticles prepared using an aqueous chemical route*”, IEEE Transactions on Magnetics (2013) (<http://dx.doi.org/10.1109/TMAG.2013.2283467>)
45. **Tiju Thomas** and Nagaraju Kottam, “*Combining “chimiedouce” and green principles for the developing world: improving industrial viability of photocatalytic water remediation*”, Chemical Engineering Science (letter to the editor) (2013) **102**, 283-288 (<http://dx.doi.org/10.1016/j.ces.2013.08.004>)
46. **Tiju Thomas**, Shawn Chatman, Jake Wells, Lisa Emberley, Muhammad Asim Rasheed and Kristin M. Poduska, “*Lateral heterogeneities in ZnO Electrodeposits and Their Impact on Electrical and Optical Properties*”, ECS Solid State Letters 1 (2), P35-P37 (2012).
47. **Tiju Thomas**, Xiaomei Guo, Junxia Shi, Lori Lepak, MVS Chandrashekhar, Kewen Li, Francis DiSalvo and Michael G Spencer, “*Gallium nitride powders: mechanism of ammonothermal synthesis, ball-mill assisted rare earth doping and uniform electrophoretic deposition*”, Journal of Crystal Growth, 316, 90-96 (2011).
48. W. M. Jadwisieniczak, K. Wisniewski, M. Spencer, **Tiju Thomas** and D. Ingram, “*Optical properties, luminescence quenching mechanism and radiation hardness of Eu doped GaN powder*”, Radiation Measurements, 45, 500-502 (2010).
49. **Tiju Thomas**, XiaomeiGuo, MVS Chandrashekhar, Carl B. Poitras, William Shaff, Mark Dreibelbis, Jesse Reiherzer, Kewen Li, Francis J. DiSalvo, Michal Lipson and M.G. Spencer,”*Purification and mechanical nanosizing of Eu-doped GaN*”, Journal of Crystal Growth, 311, 4402-4407 (2009).
50. K. Wisniewski, W. Jadwisieczak, **Tiju Thomas** and M. Spencer, “*High pressure luminescence studies of europium doped GaN*”, Journal of Rare Earths **27**, 667 (2009).
51. Wojciech M. Jadwisieniczak, Saleem Ramadan, **Tiju Thomas**, Michael G. Spencer, Nelson Y. Garces, Evan R. Glaser and Krzysztof Wisniewski, “*Luminescence and Excitation Mechanisms of Eu-doped GaN Phosphors*”, MRS Proceedings, **1111**, 1111-D02-07 (2009).

52. **Tiju Thomas**, Dhananjai Pandey and Umesh V. Waghmare, “*Soft modes at the stacking faults in SiC crystals: First principles calculations*”, Physical Review B, **77**, 121203 (Rapid Communication) (2008).
53. Assa Aravindh, Shobhana Narasimhan, **Tiju Thomas** et al. “*Si_xC_{1-x}O₂ alloys: A possible route to stabilize carbon-based silica like solids?*”, Solid State Communications **144**, 273-276 (2007).

a. Manuscripts currently under review with IITM affiliation

- Sai Srikanth Arvapalli, Bhushankar Talluri, Kousika Anbalagan, and **Tiju Thomas**, “*Role of pinning mechanism in co-precipitation derived cobalt rich, cobalt ferrite nanoparticles*”.
- Kousika Anbalagan and **Tiju Thomas**, “*Suppression of degassing in BaTaO₂N nanoparticles via doping of high vapor pressure elements: a hybrid-Bond Valence MD study*”.
- Sritama Mukherjee, Tanvi Gupte, S. Jenifer, **Tiju Thomas*** and Thalappil Pradeep, “*Arsenic in Environment: Sources, Contamination and Removal*”, Wiley Encyclopaedia (just submitted)
- Sritama Mukherjee, Tanvi Gupte, S. Jenifer, **Tiju Thomas*** and Thalappil Pradeep, “*Arsenic in Environment: Sensing and Remediation*”, Wiley Encyclopaedia (just submitted)
- Abdul Malek, **Tiju Thomas**, Edamana Prasad, “*Evidence of Nano-galvanic Couple Formation on in-situ Formed Nanoaluminum-amalgam Surfaces for Passivation-bypassed Water Splitting*”, IJHE (under review)
- Bingxue Zhang, Xinxin Zhou, Shendan Zhang, Fengdong Qu, **Tiju Thomas** and Minghui Yang, “*Porous coral-like NiCo₂O₄ nanospheres with promising xylene*

gas sensing properties”, Sensors and Actuators B

- Bhusankar Talluri, Edamana Prasad, **Tiju Thomas**, “*Impact of solvent in ceramic digestive ripening: a case of CuO*” (under review)
- Nanocluster team @ NIT-Trichy, Bhusankar and **Tiju Thomas**, “*Implication of a unified Lee-Clark mechanistic model for DR in ceramic nanoparticles*”
- Santanu Maiti and **Tiju Thomas**, “*Hybrid organic photovoltaic-device (with improved stability; $\eta \sim 11\%$, $\eta_{\text{internal}} \sim 89\%$) fabricated on sputter-deposited Mg:ZnO nanopillars*”
- Santanu Maiti and **Tiju Thomas**, “*Broadband-UV, hybrid-organic-photodetector containing chemically-treated ZnMgO layer with promising detectivity, responsivity and low dark current*” (under preparation)
- 2 papers with SREC collaborators on colloidal and interface science

Manuscripts under preparation (with IITM affiliation)

“*Nanocrystalline multicomponent equiatomic rare earth oxides as new hydrogen storage systems*”, Abhishek Sarkar, Christoph Loho, **Tiju Thomas**, Subramshu S. Bhattacharya, Horst Hahn, and Ruzica Djenadic (under preparation)

“*Phase behavior of ultra-small, stable, digestively ripened, ZnO QDs ($r < 2$ nm) in discotics*”, Bhusankar Talluri, Niya Mary, Sandeep Kumar, and **Tiju Thomas**, (under preparation)

“*Barium tantalum oxides: phase stability and optical band gap studies on solution-combustion derived systems, and band structure evaluations*”, Kousika A, R Harikrishna, and **Tiju Thomas**

“*Nitridation kinetics in solution-derived barium tantalum oxides and systematic study of band structure modification through high pressure nitridation*”, Kousika A, R Harikrishna, and **Tiju Thomas**

“*Barium tantalum oxynitride: thermophysical computations and empirical dielectric dispersion studies*”, Kousika A, R Harikrishna, and **Tiju Thomas**

“Electronic structure modification of BiVO₄ through high pressure, ammonothermal processing, for photoanode applications”, A Malek, A Kousika, Bhusankar T, **Tiju Thomas**

“Gadolinium doped sodium bismuth titanate – optical and spectrochemical investigation ”, Santosh Behera Kumar, Lalitha G, et al

“Systematic optical property investigation in Na_{0.5}Bi_{0.5-x}Eu_xTiO₃”, Wojciech Jadwicienczak, Praveena Kuruva, and **Tiju Thomas**, (under preparation)

“Ab-initio studies on thermoelectric properties of Eu doped sodium bismuth titanate”, Mousumi U. Kahaly, and **Tiju Thomas** (under preparation)

“Photocatalytic disinfection of water from Nairobi using Cu doped ZnO”, Vincent O. Madadi, **Tiju Thomas**, and Shem O Wandiga, (under preparation)

“Atmospheric pressure dielectric breakdown as a means of recycling water remediation materials”, Yoon Kee Kim, and **Tiju Thomas**, (under preparation)

“Photoluminescence studies on calcium tungstates”, R Harikrishna, BM Nagabhushana and **Tiju Thomas**

“Nano Si and Si:CNT in-situ, arc-discharge synthesis and electrochemical characterization”, Sneha S, Madhubala, Raja A, Bhusankar T, Kousika A, **Tiju Thomas**

Papers on (i) replacement of sodium borohydride in amalgam based hydrolytic processes, (ii) QD seeded monodisperse nanoparticles, (iii) QD-polymer **electrospun composites for electrochemical liquid phase sensing**, (iv) unified **mechanistic modeling** of DR in ceramic nanoparticles (Lee-Clark hybrid model; anisotropy; enthalpic and electrostatic corrections; defect chemistry; predictive modeling), (v) Bond Valence method for **sintering dynamic simulations** in complex ceramic, (vi) As sensor using rGO/MnOx system, (vii) band gap engineering in Bismuth oxide derivatives and photoactive aluminates – **electronic structure/ ab initio studies** and engineering simulations, (viii) As detection and remediation technologies – materials and **nano-biotechnology** approaches

A review articles on (i) “Synthesis of pnictide and chalcogenide superconductors” and “Oxynitride and multiphase materials for supercapacitor applications” is underway.

(more Malek, Kousika, Bhusankar, Santosh, Tanvi, Dr. Sudhapriyanka collaborations planned)

Conference publications

1. Jingzhou Wang, Praveena Kuruva, **Tiju Thomas**, Wojciech M. Jadwisienczak, “*Optical Studies of Na_{0.5}Bi_{0.5-x}Eu_xTiO₃ Perovskite Red Phosphor with High Europium Content*”, International Workshop on Advanced Spectroscopy and Optical Materials, Gdańsk, Poland (July 2013) (peer reviewed paper).

2. Arun D Rao, Suresh Karalatti, Arul Varman K, **Tiju Thomas** and Praveen C Ramamurthy, “*Organic solar cell using vertically aligned nanostructured ZnO nanorods*”, IEEE Conference, Boston, US.A (July 2013). (**Invited Contribution**) (peer reviewed paper)

3. Jingzhou Wang, Praveena Kuruva, **Tiju Thomas**, Adam Brant, Wojciech M. Jadwisienczak, “*Optical Characterization of Eu Doped Mixed A-site Perovskite $Na_{0.5}Bi_{0.5}TiO_3$ Red Phosphor*”, International Conference on Rare Earths, Ganzhou City, Jiang Xi Province, China (August 2013). (peer reviewed paper)

4. Xiaomei Guo, **Tiju Thomas**, Kewen K. Li, Jifa Qi, Yanyun Wang, Xuesheng Chen, Michael G. Spencer, Hua Zhao, Kevin Y. Zou, Hua Jiang and Baldassare D. Bartolo, “*Size reduction and rare earth doping of GaN powders through ball milling*”, MRS Proceeding, **1202**, 1202-I09-12 (2009).

5. Wojciech M. Jadwisienczak, Saleem Ramadan, **Tiju Thomas**, Michael G. Spencer, Nelson Y. Garces, Evan R. Glaser and Krzysztof Wisniewski, “*Luminescence and Excitation Mechanisms of Eu-doped GaN Phosphors*”, MRS Proceedings, **1111**, 1111-D02-07 (2009).

6. **Tiju Thomas**, MVS Chandrashekhar, Carl B. Poitras, Junxia Shi, Jesse C. Reiherzer, Francis J. DiSalvo, Michal Lipson and M. G. Spencer, “*Photoluminescence enhancement in Eu doped GaN powder by oxidative passivation of the surface*”, MRS Proceedings, **1111**, 1111-D04-01 (2008).

7. 2 paper by Bhusankar and Kousika in IIT Roorkee Materials conference (to appear soon)

Journals I have refereed/am refereeing for: RSC Physical Chemistry Chemical Physics, RSC Crystal Engineering Communication, Materials Chemistry and Physics, Plasmonics, Journal of Electrochemical Society, Journal of Hazardous Materials, Inorganics, IEEE Magnetics, Materials Research Symposium Proceedings, Research on Chemical Intermediates, Korean Journal of Chemical Engineering, Solar Energy, Transactions of Indian Institute of Metals, Scientific Reports (a journal from the Nature Publishing Group), Journal of Industrial and Engineering Chemistry, Materials Physics and Chemistry.

PROFESSIONAL AFFILIATIONS: Materials Research Society, IEEE, American Chemical Society, Electron Microscopy Society of India (Life member), Rare Earth Society of India (Life member).

Patents

1. “*A perovskite $Na_{0.5}A_{0.5-x}RE_xZO_3$ and a process thereof*”, Indian Patent (application no. 2211/CHE/2013)

2. “*Soft, self-assembly process of low dimensional Au nanostructures using slanted-substrate method*” (2016,) Indian Patent (application no. 201641033963); filing date: 04/10/2016.

3. "Hydrogen generation from waste water via galvanic corrosion of in-situ formed aluminum amalgam" (2016) (Indian Patent application no. 201641027502; International application no: PCT/IN2017/ 050334
4. "Digestively-ripened seed/nucleus-driven rapid and high yield synthesis of monodispersed ceramic/compound semiconductor nanoparticles" (2017) (IIT Madras IDF- 1567 – Indian Patent filed)

Ongoing Projects (with IITM affiliation)

Project No	Agency	Title	Start Date	Close Date	Value Rs. In Lakhs
MET1617146DSTXTIJU	Department Of Science & Technology	Morphology Transitions In Nanostructures Of Transition/rare Earth Metal Compounds And Their Applications	24-04-2016		24.14
MET1516139DSTXTIJU	Department Of Science & Technology	Liquid crystal nanoscience: new directions in hybrid materials research Full solar spectrum absorbers for photovoltaic applications	01-01-2015	08-11-2019	24.26
MET1415832NFIGTIJU	New Faculty Initiation Grant	Complex Oxides And Oxynitrides	02-04-2015	02-03-2017	5.00
MET1516655NFSTIJU	New Faculty Scheme	Self-assembled And Nitride Transition Metal Compound Nanostructure For Charge Transfer (in Energy Harvesting, Sensing Platforms) And Remediation Related Applications	15/05/2015	14/05/2018	35.00

Oral and Poster Presentations

“Inclusive education – preparing everyone for thriving in our society”, Teaching Learning Center, II Madras (17 Nov, 2017) (Invited Talk)

“Developing a balanced – technically and ethically sound – proposal”, Loyola College, Chennai (23 Oct, 2017)

“Science and Engineering of - Nitrides & Nanostructures”, Guindy College of Engineering (Mar 13, 2017) (Invited Talk)

“Science and Engineering of - Nitrides & Nanostructures”, Sri Ramakrishna Engineering College (Feb 17, 2017) (Invited Talk)

“Science and Engineering of - Nitrides & Nanostructures”, DST-INSPIRE Meeting, Chandigarh University (Feb 9-10, 2017) (Poster)

“(Nano) Materials Challenges at the Energy-Environment nexus” UGC- Refresher at the University of Madras (Nov 15 2016) (Invited Talk)

“(Nano) Materials Challenges at the Energy-Environment nexus” Valedictory Speech at end of a Certification Program, Center for Research in Science and Technology (CRIST), Stella Maris College, Chennai (March 11 2016) (Invited Talk)

“(Nano) Materials Challenges at the Energy-Environment nexus” ZnO JSPS-DST meetings, IITM, Chennai (Jan 2016) (Invited Talk)

“(Nano) Materials Challenges at the Energy-Environment nexus”, Recent Advances in Nano- and Bio-Inorganic Materials (RANBM 2015), MSRIT, Bangalore, Karnataka (Jul 16, 2015) (Invited Talk)

“(Nano) Materials Challenges at the Energy-Environment nexus”, Department of Physics and Nanotechnology, SRM University, Tamil Nadu (Jul 2, 2015) (Invited Talk)

“Materials Challenges at the Energy-Environment nexus”, Dalian Institute of Chemical Physics – Chinese Academy of Sciences (Oct, 2014) (Invited Talk)

“Water remediation using room temperature synthesized oxides”, International Conference in Asia-IUMRS (December 2013) (Oral presentation).

“Materials Challenges at the Energy-Environment nexus”, Institute of Metals Lecture, Indian Institute of Technology (Madras) Oct 2013. (Invited Talk)

“Fabrication of periodic array of 1-D Au using self-assembly, electron beam and focused ion beam lithography”, International Conference in Asia-IUMRS (December 2013) (Poster)

“One step Synthesis and Characterization of a Single-Composition Trichromatic White-Light $Y_2O_3:Eu^{3+},Zn^{2+},Bi^{3+}$ phosphor”, International Conference in Asia-IUMRS (December 2013)(Poster)

“Removal of malachite green from aqueous solution by adsorption onto combustion derived nano CuFe₂O₄”, International Conference in Asia-IUMRS (December 2013) (Poster).

“Design, development and analysis of functional materials”, M. S. Ramaiah Institute of Technology, Bangalore, Apr 2013.(Invited Talk)

“Functional Materials for a sustainable future”, JNCASR-Cambridge Winter School, Bangalore, Dec 2012.(Poster)

“Complex synthesis-photoactivity correlations in functional oxides”, American Chemical Society-IISc meeting, Bangalore, Oct 2012.(Poster)

“Design, development and analysis of functional materials”, Indian National Science Academy, Delhi, India, Nov 2011.(Invited Talk)

"Trends in electrical properties and optical profiles of electrodeposited ZnO/metal posters and presentations contacts", Canadian Association of Physics, St. John's, Newfoundland, Jun 2011. (Poster)

"Nanoparticle synthesis of luminescent materials: high temperature, mechanical and aqueous solution growth methods", Chemical Biophysics conference, Toronto, Mar 2011. (Talk)

"Gallium Nitride powders: a prospective low cost material for optoelectronic, high pressure and radiation specific applications?", Cornell Electron Devices Society Seminar, Ithaca, April 2010. (Talk)

“Purification and luminescence enhancement in Europium doped GaN powders”, Materials Research Symposium, Boston, December 2008. (Poster)

“Synthesis and Characterization of Europium doped GaN”, Cornell Engineering Research Conference, Ithaca, September 2008. (Talk)

“Polytypes and Stacking Faults in C, Si, Ge and SiC”, JNCASR, Bangalore, June 2007. (Poster)

“Stacking Faults in Silicon Carbide”, ICMR-JNCASR Winter School in Chemistry and Physics of Materials, Bangalore, 2006. (Poster)

Professional services to IITM so far (Jan 2015 - date):

(i) **Doctoral examiner** (internal) for Radha Gobinda Bhui (Registration no. CY10D047); date: 6th July 2015

(ii) Frequently serve in the **Institute Postdoc Selection Committee**.

(iii) **Advisor** for IITM summer fellows: Akshay Chaudhary (IITM; March-July 2015)

(iv) **Advisor** to doctoral students: Kousika (MM15D408); Malek A. (Chemistry students; jointly advised with Prof. Edamana Prasad); Bhusankar Talluri (jointly advised with Prof. Edamana Prasad), Tanvi Gupte (jointly with Prof. Pradeep), Santosh Bahera

(v) **Graduate test committee**/doctoral committee members of students from across several departments (Physics, Chemistry, EE, Materials) in IITM. (a) Annu Sharma (MM15D405); (b) Sonia

Sharma (MM13D017), (d) Khadambari B (PH15D303); (e) Anupama PP (CY14D032), (f) Nithin George (EE15S008), several others from new batches (>14 DC committees)

(vi) (a) **Materials Processing** Lab guidance for: Arvapalli Sai Srikanth (MM12B004); Bommidi Jaswanth (MM12B008) .

(b) **Bachelors and DD thesis supervision:** Diwakar Mandloi, Jithu K Das, Sai Srikar

(vii) **Reviewed** 2 institute postdoctoral application (1 to MME, 1 to Physics)

(viii) **Core Member** of the "**Teaching Learning Center (TLC)**".

(ix) Advisor to **exchange international students:** (a) Mr. Takuya (from Nagaoka Institute of Technology, Japan; Visiting Research Student; Sep 2015 - Feb 2016); (b); Visiting student for coursework; Aug-Dec 2015); Mr. Macdonald from Harare Institute of Technology, Zimbabwe (currently)

(x) Initiated **academic exchange** with Prof. Raju Ramanujam (NTU, Singapore) to begin the process of joint-research work.

(xi) Initiated and coordinated the **comprehensive exam revamp** for MME department.

(xii) Department representative in the **Interdisciplinary Research Program (IDRP) Committee** of IITM.

(xiii) Taught (a) Introduction to Research (ID 6020, ID6021), (b) Advanced Materials and Processes (MM3180), (c) Physical Ceramics

(xiv) Proposed

(a) updating the syllabus of "Advanced Materials and Processes - MM3180" (opened up this course for students from all branches; eliminated stipulations concerning number of participants)

(b) a **new ID course "Chemical Physics of Technical Ceramics - ID6XXX"**. (approval awaited from BAC). This course will be available for all MS/doctoral students or aspiring materials researchers from any science or engineering background.

(xv) Institute Committee to determining modalities for the newly conceived Dual Degree (BTech + MTech) in Energy Science and Engineering

(xvi) Inter-Domain Coordinator for the proposed **Southern Solar Hub @ IITM**

(xvii) Active **research engagement/collaboration** with faculty from (a) Chemistry (Prof. Edamana Prasad, Prof. Ranga Rao, Prof. T. Pradeep), (b) Physics, (c) Electrical Engineering, (d) Chemical Engineering, (e) Metallurgical and Materials Engineering (Prof. Balasubramaniam, Prof. Somnath Bhattacharyya, Prof. S. S. Bhattacharya), (f) Engineering Design (Prof. Nilesh J Vasa)

(xviii) Participated for Michigan State University-IITM talks between Jan 20-23, 2017. This was done with the intention of creating a plan for Joint Doctoral Programs (JDPs).

(xix) Off-campus engagements with (a) Dalian Institute of Chemical Physics (Prof. Minghui Yang), Guindy College of Engineering, MSRIT (Bangalore), BMS Institute of Technology (Bangalore), Indian Institute of Science (Bangalore), Karlsruhe Institute of Technology (Germany), Ohio University (USA), Nagaoka Institute of Technology (Japan), Nanyang Technological University (Singapore), National University of Singapore.

(xx) Industrial Consultancy and Sponsored Research, IITM - Board Member

(xxi) Creation of new courses: ID 6050 "Chemical Physics of Technical Ceramics" and a new course on "Materials for energy storage and conversion".

(xxii) Updates contents for the course titled "Advanced Materials and Processes" (MM3180).

(xxiii) Coordinator of institute wide 'Introduction to research' (produced a comprehensive document that highlights means by which students can ensure a positive research experience)

INDUSTRIAL EXPERIENCE and OUTREACH:

(a) Co-convended "*Industry-academia*" interaction meeting on Surface Engineering (July 23, 2015). Initiating discussions on A Center for Surface Engineering in IITM (co-conveners: Prof. Ganesh

Sundararaman, Prof. M. Kamaraj, Prof. A. Subrahmanyam, Dr. Srinivasa Rao Bakshi)

(b) Currently collaborating with Dr. Vijay Kanuru (CEO, Applied Nanomaterials Inc., Mumbai).

(c) Co-founded IISc's Entrepreneurship Group (EntIISc), which aimed to provide support for members of the IISc community who wish to use their experience gained on-campus for starting firms/companies of their own. (2013)

(d) Developed proprietary LED phosphor technologies for Lumentra Inc. (Toronto, ON, Canada). (2011)

(e) Started MUNTech (Memorial University's Technology Entrepreneur club), a forum for highly trained engineering and science students to work together to develop marketable technologies. In near future, the club also aims to commercialize technologies developed through entrepreneurial ventures. (2011)

(f) Built an electrophoretic set up to achieve uniform deposition of nanophosphors for large screen display technologies. Currently pursuing commercialization of this technology with Versatls Inc. (Vermont, USA). (2011)

(g) Demonstrated a simple mechanical method to achieve rare earth doping in GaN, in collaboration with Boston Applied Technologies Inc. (Boston, MA, USA), (2010, 2009).

(h) Worked collaboratively with Primet Technologies Inc. (Ithaca, NY, USA) towards nanosizing rare earth doped GaN, for phosphor applications. (2008)

SOCIAL OUTREACH:

1. Amalgam 2015 ; member of panel of judges for the extempore competition on materials science topics (GD challenge).
2. Consistent engagement with colleagues in MSRIT, and publishing papers with them.
3. Ongoing efforts to develop research ties ups with SRM University, VIT in Chennai, SREC, Michigan State University, Nagaoka Institute of Technology (NUT), Nanyang Technological University and National University of Singapore, Karlsruhe Institute of Technology (Germany).
4. Engaging in an interesting teaching-research engagement exercise through the creation of a "virtual" undergrad students group called the "***Nanostructures Cluster***". This group engages students from many institutions on problems to do with theoretical science of nanostructures.
5. A large number of students (~20) from various institutions work with us on ad hoc basis on various projects resulting in highly multidisciplinary projects which are oftentimes publishable.

TEACHING EXPERIENCE:

- Currently teaching "***Physical Ceramics***", "***Advanced Materials and Processes***", and "***Introduction to Research***" and "***Chemical Physics of Modern Technical Ceramics***" in IITM to senior undergrads, and beginning and advanced level graduate students.
- Taught AICTE-Faculty Development Program -- ~35 hour course/workshop on "***Materials Chemistry: Semiconductor, Solids, and Nanomaterials***". 15 College teachers, most of them on PhD track benefitted from this course. (Oct 30-Nov 5, 2017)
- Offer "***Academic Writing***" and "***Lab safety***" modules, as part of the departmental component of "***Introduction to Research***" course.
- Coordinated campus wide "Introduction to research" Fall 2017 (***with >550 students***, from across all departments).
- Advisor to students taking the "***Materials Processing Laboratory***".
- Developed study materials for the course "***Materials Characterization***" for AMIE (Associate Member of Institution of Engineers) students.

- Undergraduate summer research supervision for Physics students of Memorial University of Newfoundland, Canada.
- Informally tutored (i.e outside the university setting) undergraduate level solid state science, physical chemistry, signals and systems, general chemistry, electricity and magnetism (to students from VTU, Cornell University).
- Interacted extensively with visiting scientists and new students in JNCASR and Cornell aiding in their smooth transition to research in their new setting.

Examples of undergraduate and graduate courses/modules that I can offer or improve in near future based on academic needs of IITM and/or industrial requirements:

- Innovation and entrepreneurship in materials technology
- Quantum mechanics and statistical mechanics for engineers
- Advanced Materials and Processes
- Physical Ceramics
- Physico-chemical principles in Ceramic Science
- Functional Materials
- Solid State electronic materials and devices
- Materials for energy and environmental applications
- Physics of Engineering Materials
- Materials Chemistry for engineers - solids, nanomaterials, and semiconductors
- Materials synthesis and characterization
- Energy materials and devices
- Materials Science for Engineers
- Chemical Physics of Technical Ceramics
- Materials for energy storage and conversion
- Introduction to research

ENTREPRENEURSHIP

Co-founder and Advisor (Technology and Education) of *Art of Programming Edulabs LLP*.

REFERENCES:

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