



# NEWSLETTER

## Poornaprajna Institute of Scientific Research

PROMOTED AND MANAGED BY ADMAR MUTT EDUCATION FOUNDATION (AMEF)  
Recognised by Department of Scientific & Industrial Research (DSIR) Govt. of INDIA and MAHE, Manipal

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### In the news

- ◆ Industry project sponsored by GTC Technology Inc LLC, USA on "design and development of a catalyst and process for selective aromatic alkylation" was successfully completed in June 2019. This was the 9year long project conducted at PPISR with successful development of catalyst and technology for toluene methylation (GTTolAlk technology was announced worldwide).
- ◆ Dr. Nalini G Sundaram received "Awards for Research Publications" (ARP) from Vision Group on Science and Technology Department of IT, BT and S & T, Government of Karnataka, during the year 201819.
- ◆ Dr. A. B. Halgeri received Lifetime Achievement Award in materials science & process development at International Conference on Advances in Materials Research (ICAMR2019), Bengaluru.
- ◆ Dr. Ramagopal's proposal submitted to Bristol Myers Foundation Scholarship Grant titled "Structure based rational design of PDI mutants to create lead molecules for cancer immunotherapy" has been approved.
- ◆ Chairman's residence (Kuteera) was constructed in the PPISR campus and inaugurated by H.H. Vishwapriya Theertha Swamiji on 14th June, 2019.
- ◆ Two students successfully defended their Ph.D viva and were awarded PhD by MAHE, Manipal.



**H. H. Sri Vibudhesha Theertha Swamiji, Founder, (1928 - 2009)**



**H.H. Sri Vishwapriya Theertha Swamiji, Chairman**



**H.H Sri Eshapriya Theertha Swamiji Vice-Chairman**

**Vision :** To promote and nurture excellence in the fundamental and applied sciences for the advancement of scientific knowledge and the benefit of mankind.

## From the Director's Desk



I have great pleasure in presenting 10<sup>th</sup> volume of News Letter highlighting the overall research activities of PPISR. The beginning of New Year started with H.H Sri Vibudhesha Theertha Swamiji second Endowment

Lecture titled "Nobler than Normal - New Crystal forms of Gold" by Prof. Giridhar U Kulkarni, Director, Centre for Nano and Soft Matter Sciences, Bengaluru on February 26<sup>th</sup>, 2019. Subsequently, Founder's Day celebrations started with two-day scientific session on July 4-5, 2019.

Prof. Navakantha Bhat, Chairman, Centre for Nano Science and Engineering (CeNSE) IISc, Bengaluru was the chief guest and also inaugurated the Founder's Day technical session. This was then followed by series of lectures given by eminent scientists from International Centre for Theoretical Physics at TIFR Bengaluru, Shell Technology Centre, Bengaluru, QuNu Labs, Bengaluru, JNCASR, National Centre for Biological Sciences, Bengaluru, IISc. The Valedictory function of founder's day was held in the evening of the second day. Dr. Surendra Kulkarni, Former Dean, Christ University, Former Head of GE/SABIC R&D Centre Bengaluru was the Chief Guest and also gave the valedictory address. Dr. Ramesh, CEO, Karnataka Science & Technology Academy (KSTA) was the Guest of Honor.

Overall, the Founder's day celebration was a grand success. The Institute has published 21 research papers in national and international reputed journals and also obtained one US patent from the collaborative research project with HPCL R&D in the area of Catalysis.

Dr. Pavithra GC, student of Dr. Ramagopal and Dr. Pradeep Shanbogh, student of Dr. Nalini G Sundaram have been awarded PhD degree by MAHE. Based on our ongoing research projects, many of our students and faculty members have presented research papers at various National and International Conferences and won best presentation awards. Several distinguished scientists both from India and Abroad visited our Institute, appreciated the research work carried out in all three areas and also delivered lectures. In order to create interest in basic science in young minds, we had conducted a week long outreach programme for all students of Poornaprajna Schools in Bangalore.

We hope that the various scientific and educational events that have taken place augment our steadily increasing academic and research activities. All these developments would not have been possible without the guidance drawn from H H Sri Vishwapriya Theertha Swamiji, H H Sri Eeshapriya Theertha Swamiji, excellent support from Admar Mutt Education Foundation Management and cooperation from the faculty members, students and staff of PPISR.

**Dr. A. B. Halgeri**



It's a great pleasure in editing this issue of newsletter. Starting with workshop on leadership skills, outreach activities for high school students, founder's day celebrations etc. This newsletter gives the gist of our scientific achievements and many other activities that are relevant to any research institute with a

healthy growth. Events such as industry-academia collaborations continued with new projects initiated and also grants sponsored by government agencies such as VGST and so forth. Visits by eminent scientists from academia and

from industry to PPISR as well as participation of our scientists in scientific meetings are also covered. Overall, this newsletter highlights the activities at PPISR that encompass unique combination of both applied and basic science. Also covered are the events celebrated at PPISR. As you glance through this newsletter, we believe you will realize that PPISR is on the right path in realizing Paramapoojya Sri Vibudhesha Theertha Swamiji's dream of creating vibrant and flourishing institutional environments for scientists and research students. Hope you enjoy reading this newsletter.

**Dr. Sanjeev P. Maradur**



## H. H. Sri Vibudhesha Theertha Swamiji Memorial 2<sup>nd</sup> Endowment Lecture



The second Endowment lectures series in the name of H H Sri Vibudhesha Theertha Swamiji was organised at Bidalur Campus on the 26<sup>th</sup> February, 2019. Prof. Giridhar U Kulkarni, Director, Centre for Nano and Soft Matter Sciences, Bengaluru delivered the endowment lecture on “Nobler than Normal: New Crystal forms of Gold”.

H H Sri Vishwapiya Theertha Swamiji presided over the function. Dr Halgeri, Director PPISR, Prof K. Shrihari, Secretary, AMEF, Shri P. Sreenivasa Rao, Financial Advisor, AMEF, Faculty, students and other invited guests from poornaprajna institutions, trustee members were present during the session. Also, the newly renovated Library was also inaugurated on the same day by H.H. Sri Swamiji



## Founder's Day – 2019

PPISR celebrates Founder's Day in the memory of HH Sri Vibudhesha Theertha Swamiji in the first week of July every year. Founder's Day-2019, started with two-day scientific session on 4-5<sup>th</sup> July 2019. Eminent scientists from various institutes were invited to give lectures covering various aspects of biology, chemistry and theoretical physics. The scientific session was inaugurated by renowned scientist Prof. Navakantha Bhat, Chairman, Centre for Nano Science and Engineering (CeNSE) IISc, Bengaluru, by lighting the lamp on the occasion and delivering the keynote address on “Nanotechnology from materials to systems”. After the keynote address, the technical session on the first day was started by Dr. G V. Shanbhag, PPISR giving a overview of research activities of materials science division followed by the invited talk from Dr. Mary Hyacinth Bastian, Shell Technology Centre, Bengaluru on “Long range research activities in Shell Technology Centre. The post lunch session had three talks started with Dr. R. Srikanth giving a talk on the overview of research activities of theoretical Science division. Prof. Chandan Dasgupta, International Centre for Theoretical Physics at TIFR Bengaluru gave a talk on “Stastical Physics of Nonequilibrium Systems”. The last talk of the first day of the technical session was delivered by Dr. Anindita Banerjee, Quantum Security Specialist, QuNu Labs, Bengaluru on “Experimental quantum cryptography on a fibre based system”. The second day of the Founder's day celebration started

with talk by the invited speaker, Dr. Ravi Manjithaya, Associate Professor, MBGU, JNCASR on “ The Role of Autophagy in Health and Disease”. Dr. U. A. Ramgopal gave a overview of research activities of biological science division. Dr Vinoth Kumar

K. R. Asst. Professor, National Centre for Biological Sciences, Bengaluru gave a talk on “Realizing the full potential of Electron Cryo Microscopy”. The last talk of the technical sessions was delivered by Prof. Anjali Anoop. Karande (Retd), IISc on “Life-threatening, yet life-saving: use of the lethal toxin in therapy”. The Valedictory function of the founder's day celebration was held in the evening of the second day. Dr. Surendra Kulkarni, Former Dean, Christ University, Former Head of GE/SABIC R&D Centre Bengaluru was the chief guest of the function and gave a valedictory address. Dr. Ramesh, CEO, Karnataka Science & Technology Academy (KSTA) was the guest of honour. The two day Founder's day 2019 celebration was a grand success.





## Organizational Development Workshop



A one day Organisational Development workshop was organised on 15<sup>th</sup> January 2019 at the Bidalur Campus on sustainability leadership roles in building up the organization. A day long programme dealt with some of the major challenges in health, inequality and the environment that the society is facing today. There were panel discussions on how the organization has to survive, thrive and prosper in the future by training the young scientists to professionally manage intellectual resources originating from diverse sectors across different frontiers aligned for the needs of tomorrow. Dr. Suresh Rao and his team of facilitators Dr. Vidya Pratap, Associate Professor of Managerial Communications, TA Pai Management Institute, Manipal, Dr Vanishree Acharya Founder Director, Kromaspects SciTec Solutions, Bangalore, Dr. Ram Chillarege (TBC) Software Development Analytics USA, and Mr. Ramesh Rao, Chairman & MD, Synergomachines Private Limited, Bangalore conducted the programme. Dr. A. B. Halgeri, Director PPISR. Prof K. Shrihari, Secretary AMEF, All the faculty, students and staff participated in the workshop.

## Visit of Indo-Korea Institute of Science and Technology Scientists



Prof. Seung Cheol Lee, Director Indo- Korea Institute of Science and Technology and Dr. Sandeep Bhattacharjee, visited the campus on 22<sup>nd</sup> January 2019. Dr. Halgeri gave an overview of PPISR research activities followed by Prof Lee's presentation of I-KIST research activities. All the faculty members of PPISR were present during the meeting. There were discussions on collaborative research programs between the two institutes. And memorandum of understanding is soon going to be signed for research

collaboration and student exchange programs.

## Science Day Celebration at PPISR



Science Day was celebrated on 28<sup>th</sup> February 2019 by inviting Prof. Mukunda N, a renowned scientist, (Former Professor at Centre for Theoretical Studies, IASc). Prof. Mukunda delivered a lecture on "Science and the Human Predicament" which in broad terms the increase in scientific knowledge and conceptual advances in our understanding of the physical universe in recent times. Post Lunch session started by two moderate debates on Artificial Intelligence boon or bane? And Human Cloning pros v/s cons.

## Inauguration of Chairman's Kuteera



The newly constructed kuteera for the Chairman of AMEF/PPISR was inaugurated by HH Sri Vishwapriya Theertha Swamiji on 14<sup>th</sup> June 2019 at the Bidalur Campus. The ceremony also saw the installation of Lord Krishna by HH Sri Swamiji as a place of sanctum. Now onwards HH Sri Swamiji will reside in the campus during his visit to Bengaluru



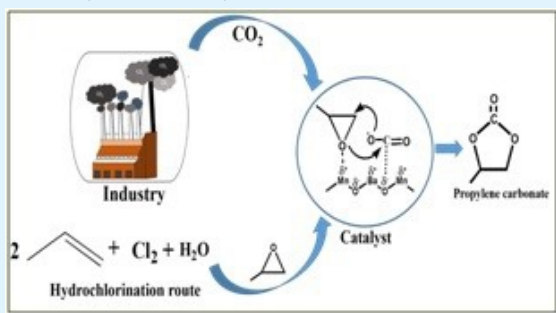
# Lifetime Achievement Award to Dr. A B. Halgeri



Dr. A. B. Halgeri was felicitated with Lifetime Achievement Award in Materials Science and Process Development at International Conference on Advances in Materials Research (ICAMR-2019) held at M. S. Ramaiah Applied University, Bengaluru, on 25<sup>th</sup> July 2019. Dr. A B Halgeri was honored by Dr. Sivaguru S Sirtharan, Vice Chancellor, M S Ramaiah University of Applied Sciences, in the presence of Prof Navakanta Bhat, Professor and Chairperson, Centre for Nano Science and Engineering, IISc and Prof Govind R Kadambi, Pro Vice Chancellor – Research, M S Ramaiah University of Applied Sciences.

## Highlights of Research progress Materials Science & Catalysis Division

### Catalysis Group

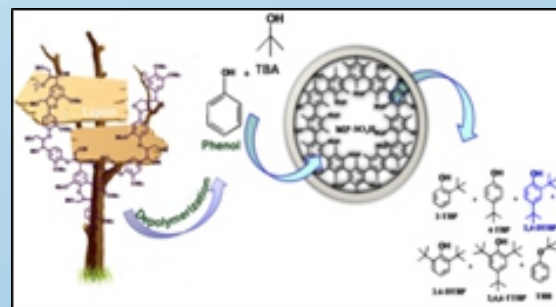


Dr. Ganapati Shanbhag and his group is working on frontier areas of research such as design of novel catalysts for green chemical processes, catalytic conversion of CO<sub>2</sub> into value-added chemicals, conversion of biomass byproducts like glycerol and furfural to value-added chemicals etc. During last six months, the group has worked on several research schemes including designing novel catalysts for synthesis of substituted urea, cyclic urea from CO<sub>2</sub> reactions and conversion of furfural to furfuryl alcohol and alkyl levulinate and furfuryl esters. An article on “Identification and tuning of active sites in selected mixed metal oxide catalysts for cyclic carbonate synthesis from epoxides and CO<sub>2</sub>” was published in reputed

“Journal of CO<sub>2</sub> Utilization”. A book chapter on “Application of tin oxide based materials in catalysis” was written by Dr. Shanbhag and Manjunathan P. by invitation in a book “Tin Oxide Materials--Synthesis, Properties, and Applications” (Elsevier) published in October 2019. Dr. Shanbhag gave an invited talk on his research work titled “Novel mesoporous tin phosphate/oxide as catalyst for valorization of biomass derivatives” at prestigious 5<sup>th</sup> Indo-French symposium at National Chemical Laboratory (NCL), Pune in February 2019.

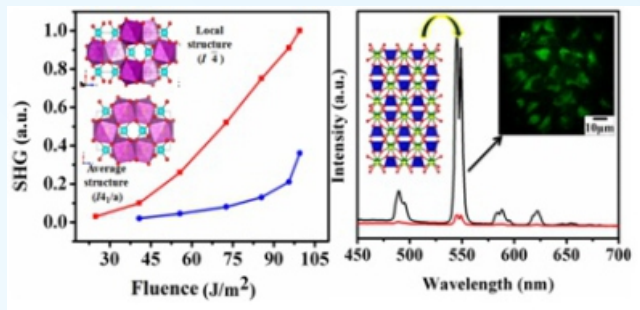
A sponsored project on “Chemical fixation of CO<sub>2</sub> by converting into useful chemicals using metal modified nanoporous catalysts” under CESEM grant by VGST, Govt. of Karnataka is also under progress with Dr. Shanbhag as Programme Coordinator. Among, sponsored projects, Industry project on “design and development of a catalyst and process for selective aromatic alkylation” sponsored by GTC Technology Inc LLC, USA is successfully completed. Another industry project sponsored by Deepak Novochem Technologies Ltd (DNTL), Pune on catalyst and process development on alkylation of aromatics is under progress. Dr. Shanbhag is PI and Dr. Maradur is Co-PI for the industry sponsored projects.

Dr. Sanjeev Maradur's group is working on biomass value addition projects. Mr. Satyapal, PhD student of Dr. Maradur has been awarded Senior Research Fellowship from CSIR, Govt of India for a period of 2 yrs from 2019. Dr. Maradur's group in collaboration with Scientists from Hindustan Petroleum Green R&D Centre has developed a polymer based adsorbent for crude oil spill recovery and reuse which efficiently uptake the oil from oil-water mixture at room temperature. Further this adsorbent developed has a potential to be used in real time crude oil spill cleanup and recovery purposes thus helping the Sea water to get rid of the toxic oil which affect the marine animals. The major finding of this work has been published in Chemical Engineering Journal, an international journal of high repute with an impact factor of 8.344. Another work on conversion of phenol to value added products has been published in Microporous and Mesoporous Materials a journal of international repute.



One Industry sponsored project from Deepak Nitrite Ltd, Vadodara was initiated from 1<sup>st</sup> March 2019 to work on selective nitration of alkyl aromatics with Dr Maradur as PI and Dr. Shanbhag as Co-PI. One project fellow has joined to work in the said project. Dr. Maradur's group carried out process feasibility work in order to take up another industry sponsored project from Deepak Phenolics, Vadodara. Project proposal has been submitted and the technically got approved and it will be initiated by November 2019. Two students from Department of Petroleum Engineering, Presidency University Bengaluru worked under the guidance of Dr. Maradur for a period of two months as part of their Industrial Practice Course from June till August 2019. One Student from St. Aloysius College Mangalore worked as summer intern for a period of two months from May till July 2019.

## Functional Energy Nanomaterials Group

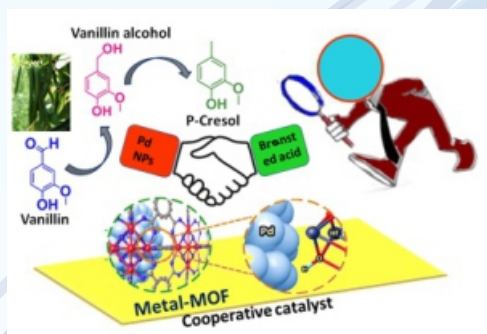


Dr. Nalini's group were successful in designing  $\text{NaCe}(\text{WO}_4)_2$  nanoparticles by an efficient and simple solvothermal method. Rietveld refinements using powder neutron diffraction data (ORNL) confirms that nanoparticles crystallize in Scheelite like tetragonal ( $I4_1/a$ ). However, local structure analysis via total scattering atomic pair distribution function (PDF) refinements in shorter 'r' range (1.5 to 10 Å) established non-centrosymmetric  $I4$  space group where  $\text{Na}/\text{CeO}_8$  polyhedra are slightly distorted, distributed in 2b and 2d

sites. This interesting observation of non-centrosymmetry locally is supported by nonlinear second harmonic generation (SHG) measurements.

In addition, bright narrow green emission was observed up on UV excitation with no considerable change in emission intensity with respect to solvent. Thus sharp green light emission and SHG properties makes the  $\text{NaCe}(\text{WO}_4)_2$  a potential candidate for solid state display and optical nonlinear applications. On the other hand, our group has also designed  $\text{NaTb}(\text{WO}_4)_2$  nanoparticles by simple glycothermal method and rightly proved their biocompatibility with several microorganisms and mammalian HeLa cell lines for the first time. Further size dependent green fluorescence, excellent biocompatibility and localization of these nanoparticles in the cytoplasm of the cell highlights the novelty of the work as bio-active fluorescent oxide nanoprobe for *in vitro* cell-imaging applications in contrast to traditional organic fluorophores and dyes. In addition our group also works on Pervoskite and  $\text{SnO}_2$  based composite materials for gas sensing applications where we successfully designed novel  $\text{La}_{1-x}\text{Ca}_x\text{FeO}_3$  thin film sensors which can detect  $\text{SO}_2$  gas at very low concentration and low operating temperatures. Similarly,  $\text{SnO}_2$ -based composite materials are also capable of detecting target gas at very low operating temperatures.

## Material Design Group Research



Dr.K.Suresh Babu's group is currently working on designing of multifunctional metal-MOF hybrid materials for cooperative catalysis. Cooperativity between the active sites (Pd and  $\mu_3$ -OH) present at the metal-MOF interface has been demonstrated for vanillin hydrodeoxygenation (biomass based platform molecules) into value-added 2-methoxy-4-methylphenol. Over a Pd@UiO-66 (Hf) core-shell catalyst, cooperativity between Brønsted acidic  $\mu_3$ -OH groups and Pd active sites present at the interface has rendered a catalytic performance of >99% vanillin conversion and >99% 2-methoxy-4-methylphenol selectivity at 90 °C under 3 bar  $\text{H}_2$  in water. An enhanced cooperative effect has been observed over a

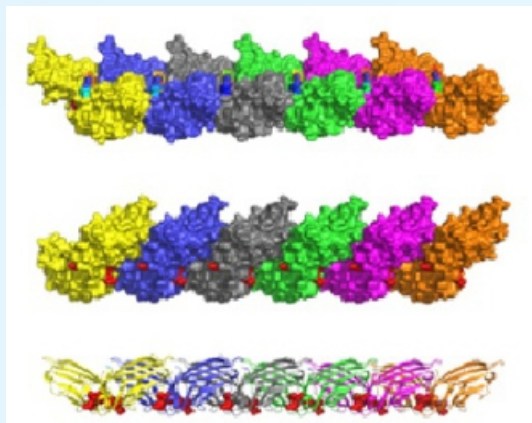
core-shell catalyst compared to a support catalyst. Recently, this work was published in Dalton Trans., 2019, 48, 8573-8577. Recently our group worked on review of metal-organic frameworks for hydrogen energy applications and their advances and challenges. It was published in ChemPhysChem, 2019, 20, 1177-1215. Also involved in developing chemiresistive based hydrogen sensor via a novel approach of ultra high dispersion of palladium over two dimension conductive MOFs.

## Highlights of Research Progress – Theoretical Sciences Division

For the first time in the group, interaction was initiated with the industry / corporate world in terms of an MoU signed with QuNu Labs, a quantum technology startup in Bengaluru, and another MoU signed with Depa Solutions Ltd., a Bengaluru-based machine learning / AI, education and research startup. One of the group students had interned for a month as part of the activity envisaged in the former MoU. Problems studied by the group of Prof Sujit Sarkar include Emergence of Parity Time Symmetric Quantum Phase Transition, A Study of bulk-boundary correspondence for the topological state of matter for a quantum Ising chain with long range interaction, Renormalization Group Theory for  $\text{SO}(5)$  Symmetry. Prof R Srikanth and his group have studied, among others, revisiting the quantum dynamical semigroup as a stronger definition of Markovianity, Counterfactual cryptography with non-counterfactual bits, Deterministic quantum key distribution using a Michelson interferometer, possible absence of a resource theory for non-Markovian evolutions, Leggett-Garg inequality violation under non-Markovian noise. New activity in the area of quantum computational logic has been initiated with the joining of an RA in the group.



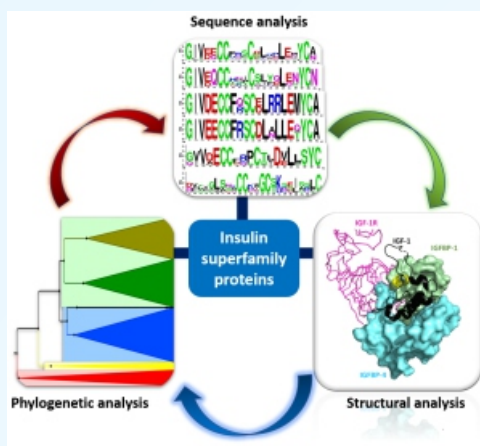
## Highlights of Research Progress – Biological Sciences Division



Structural Biology group headed by Dr. Ramagopal works on two main themes (1) medicinally and biologically important enzymes (2) cancer immunotherapy using modified version of T-cell checkpoint blockade molecules. Modification of co-stimulatory molecules B7-1 and PD-1, is an exiting area directed towards creating lead molecules for cancer immunotherapy. A novel concept called “antibiotic resistance breakers” where instead of looking for new antibiotics, that is, molecules that confer antibiotic resistance to bacteria are also targeted. One such class of antibiotic resistance conferring enzymes that is under study is a methyltransferase (Mtase) which modifies 23S rRNA.

Dr. Ramagopal's group is also working on purine phosphoribosyl transferases from pathogenic bacteria to understand the structure and functions of these key enzymes involved in purine recycling. The most interesting result in the last few months is the zipper like clustering of B7-2 forming 1D nanowire (See figure), that provides insights on long-standing question, how B7-2 molecules cluster on the cell surface?. Although, critical role of B7-2 clustering is known, the exact reason for association was an enigma. This work lead to a novel concept that probably resolves two opposite views in the filed, that is, “lipid-raft v/s protein-protein interactions”. Further, several molecules manipulating CTLA-4/CD28:B7-1/B72 pathway of immunological synapse is highly expensive FDA approved drugs (antibodies) for cancer treatment. To produce economically viable alternative lead molecules, modified and HEK293 expressed B7-2/B7-1 molecules that can differentiate CTLA-4 from CD28 are under study. Further, based on the structural analysis of several immune receptors complexes, we have derived insights on modification of immune receptor for therapeutic use

## Microbiology Group



Dr. Ananda K and group are working with medicinal plants and their endophytic fungi for the natural molecules which could be an inhibitor of alpha glucosidase enzymes. The other field of research in this group includes modification of insulin for the therapeutic applications. In this area, they are trying to make chemical modifications to insulin to increase its half life after bio-conjugating with circulating plasma protein, such that these molecules help in controlling diabetes. They have isolated few natural alpha glucosidase inhibitors and characterized them. The related manuscripts are under communication in different peer reviewed journals.

Modification of insulin was achieved by conjugation chemistry or mutation in the insulin sequence. These modified insulin molecules are being studied for their structural and functional characterization. One of the students working on laccase enzyme of endophytic fungi, studied the effect of gamma radiation on the sequence of laccase gene by carefully sequencing the laccase gene.

The exciting results obtained from the studies on effect of gamma irradiation on laccase production being communicated to a journal of international repute. We have already published some of these works related to laccase enzyme and its applications in peer reviewed journals. They are also working in collaboration with scientists from other institutes and universities, which lead to a good publication recently.

# Research Publications-2019

## Book Chapter:

Chapter 18: "Application of tin oxide based materials in catalysis" Manjunathan P and Ganapati Shanbhag\* Book Title: "Tin Oxide Materials--Synthesis, Properties, and Applications" Elsevier Publisher, Date: October 1, 2019.

## Publications

1. "Porous polydivinylbenzene (PDVB) as an efficient adsorbent for hydrocarbons: Effect of porogens on adsorption capacity". Sathyapal R Churipard, Kempanna S Kanakikodi, Dheer A Rambhia, Ch Siva Kesava Raju, AB Halgeri, Nettem V Choudary, Gandham Sri Ganesh, Raman Ravishankar, Sanjeev P Maradur *Chemical Engineering Journal* 380 (2020) 122481
2. "Catalytic tertiary butylation of phenol over sulfonated mesoporous polymer catalyst (MP-SO<sub>3</sub>H): Exceptional selectivity towards 2, 4-di-t-Butylphenol". Kempanna S Kanakikodi, Sathyapal R Churipard, AB Halgeri, Sanjeev P Maradur., *Microporous and Mesoporous Materials* 286 (2019) 133
3. "Exploring the Brønsted acidity of UiO-66 (Zr, Ce, Hf) metal-organic frameworks for efficient solketal synthesis from glycerol acetalization". Vasudeva Rao Bakuru, Sathyapal R Churipard, Sanjeev P Maradur, Suresh Babu Kalidindi. *Dalton Transactions* 48 (2019) 843
4. "Identification and tuning of active sites in selected mixed metal oxide catalysts for cyclic carbonate synthesis from epoxides and CO<sub>2</sub>". Nagendra Kulal, Vaishnavi Vasista, Ganapati Shanbhag, *Journal of CO<sub>2</sub> Utilization*, 33 (2019) 434
5. "Enzymatic degradation of chloramphenicol by laccase from *Trametes hirsuta* and comparison among mediators". Kavitha Keshava Navada and Ananda Kulal, *International Biodeterioration & Biodegradation* 138, (2019) 63.
6. "Scheelite like NaTb (WO<sub>4</sub>)<sub>2</sub> nanoparticles: Green fluorescence and in vitro cell imaging applications." Munirathnappa, Archana K., Sachin Kumar Maurya, Kaushal Kumar, Kavitha Keshava Navada, Ananda Kulal, and Nalini G. Sundaram. *Materials Science and Engineering C* (2019) 110182.
7. "An interplay of topology and quantized geometric phase for two different symmetry-class Hamiltonians". Rahul S Ranjith Kumar R, Y R Kartik, Amitava Banerjee and Sujit Sarkar, *Physica Scripta* 94 (2019) 115803.
8. "Measure of not-completely positive qubit maps: The general case". Vinayak Jagadish, R. Srikanth and Francesco Petruccione *Phys. Rev. A* 100 (2019) 012336
9. "Superunsteerability as a quantifiable resource for random access codes assisted by Bell-diagonal states". Jebaratnam, C., Debarshi Das, Som Kanjilal, R. Srikanth, Debasis Sarkar, Indrani Chattopadhyay, and A. S. Majumdar. *Phys. Rev. A* 100 (2019) 012344
10. "Measure of positive and not completely positive single-qubit Pauli maps". Vinayak Jagadish, R. Srikanth and Francesco Petruccione *Phys. Rev. A* 99 (2019) 022321.
11. "Maximally nonlocal subspaces". Akshata Shenoy H and R. Srikanth *J. Phys. A: Math. Theor.* 52 (2019) 095302.
12. "Contextuality and nonlocality of indistinguishable particles". Debajyoti Gangopadhyay and R. Srikanth **Accepted in Physica Scripta** DOI: 10.1088/1402-4896/ab2c9c (2019).
13. "Hierarchical axioms for quantum mechanics". S. Aravinda, Anirban Pathak and R. Srikanth *European Physical Journal D* 73 (2019) 207.
14. "Cooperative Catalysis at Metal-MOF Interface: Hydrodeoxygenation of Vanillin over Pd Nanoparticles Covered with UiO-66 (Hf) MOF". Bakuru, V.R.; Davis, D.; Kalidindi, S.B. *Dalton Trans.*, 48 (2019) 8573.
15. "Metal-Organic Frameworks for Hydrogen Energy Applications: Advances and Challenges". Bakuru, V.R.; DMello, M. E.; Kalidindi, S.B. *ChemPhysChem*. 20 (2019) 1177.
16. "Structural Basis of CD160 HVEM Recognition". Liu W, Garrett SC, Fedorov EV, Ramagopal UA, Garforth SJ, Bonanno JB, Almo SC, *Structure*, 6;27(2019) 1286.
17. "Characterization of Majorana-Ising phase transition in a helical liquid system". Sudip Kumar Saha, Dayasindhu Dey, Monalisa Singh Roy, Sujit Sarkar, Manoranjan Kumar *Journal of Magnetism and Magnetic Materials* 475 (2019) 257.
18. "Average Structure, Local Structure, Photoluminescence and NLO properties of Scheelite type NaCe(WO<sub>4</sub>)<sub>2</sub>. Archana K. Munirathnappa, Joerg C. Neufeind, Premakumar Yanda, A. Sundaresan, I.V Kityk, K.Ozga, J.Jedryka, Poornesh P Ashok Rao and Nalini G. Sundaram *ACS Crystal Growth & Design* (DOI: 10.1021/acs.cgd.9b00041) 2019.
19. "Scheelite like NaTb(WO<sub>4</sub>)<sub>2</sub> Nanoparticles: Green Fluorescence and In vitro Cell Imaging Applications". Archana K Munirathnappa, Sachin Kumar Maurya, Kaushal Kumar, Kavitha Keshava Navada, Ananda Kulal, and Nalini G Sundaram, *Journal of Materials Science and Engineering: C* 106 (2020) 110182.
20. "High-Energy Electron-Beam-Induced Evolution of Secondary Phase and Enhanced Photocatalytic Activity in Monoclinic BiEuWO<sub>6</sub> Nanoparticles". Pradeep P Shanbogh, VC Petwal, J Dwivedi, A Rao, NG Sundaram. *J. Phys. Chem. C.* 123 (2019) 10881.



## Highlights of Research Activities

- ◆ **Dr. A.B. Halgeri** gave a talk on “Nanocatalytic materials for Chemical industry application from Concept to commercialization” at Webinar on Nanotechnology organized by KSTePS in association with Austrian Trade Commission & IISc.
- ◆ **Dr. Nalini G. Sundaram** received “Awards for Research Publications” (ARP) from Vision Group on Science and Technology Department of IT, BT and S & T, Government of Karnataka, during the year 2018-19
- ◆ **Dr. Ganapati Shanbhag** gave an invited talk on his research work titled “Novel mesoporous tin phosphate/oxide as catalyst for valorization of biomass derivatives” at prestigious 5<sup>th</sup> **Indo-French** symposium on "Functionalized Materials for Sustainable Catalytic and Related Applications" MATSUCAT-2019 at National Chemical Laboratory (NCL), Pune on Feb 26-March 1, 2019.
- ◆ **Dr. Ganapati Shanbhag** gave an invited talk on "Catalysis and its role in green synthesis of fuels and chemicals; Present challenges" during One Day Symposium on Advances in Chemical Sciences conducted by PPISR in collaboration with Reva University on 9th April 2019.
- ◆ **Dr. Ganapati Shanbhag** was invited by Christ University to be External Examiner for two of the research scholars from Department of Chemistry for their PhD synopsis defence on June 6, 2019.
- ◆ **Dr. Ganapati Shanbhag** worked as a member of the technical committee for the “International Conference on Advances in Materials Research”, organized by Ramaiah University of Applied Sciences, Bengaluru on 25 to 27th July 2019.
- ◆ **Dr. Nalini Sundaram** was invited to deliver a lecture for a workshop on “X-ray Crystallography” on March 16 2019 at the Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, sponsored by DST and RSC, India Chapter.
- ◆ **Dr. Sanjeev Maradur** gave an invited talk in FDP Program on “ Emerging Trends in Chemical Science” at BMSIT, Yelahanka, Bengaluru on 19<sup>th</sup> Feb 2019
- ◆ **Dr. Sanjeev Maradur** gave an invited talk on "Beyond Silica: Mesoporous Polymers, A New Class of Advanced Structured Materials for Catalytic Applications" during One Day Symposium on Advances in Chemical Sciences conducted by PPISR in collaboration with Reva University on 9<sup>th</sup> April 2019
- ◆ **Ms. Archana's** abstract titled “Average and local structure of NaCe(WO<sub>4</sub>)<sub>2</sub> : A Structure-Property Correlation” was selected for oral presentation at the ADD2019 (School And Conference on Diffraction Data in Real Space) at ILL (Institut Laue-Langevin) Grenoble, France. Her travel was supported by DST-SERB.
- ◆ **Ms. Swetha Lankipalli and Udupi Ramagopal** submitted a proposal to X-ray data collection at synchrotron station, XRD2, Trieste, Italy, sponsored by DST and managed by IISc has been approved and they have allotted the data collection slot in the first week of October 2019. Mr. Shankar Kundapura visited the facility conduct the experiment at Trieste, Italy.
- ◆ **Mr. Kempanna** presented a poster at Manipal Research Colloquium 2019 from 31<sup>st</sup> March to 4<sup>th</sup> April 2019 in MAHE Campus “Organized by Manipal Academy of Higher Education.
- ◆ **Mr. Nagendra Kulal** presented a poster titled “Chemical fixation of CO<sub>2</sub> by converting into value-added chemicals using heterogeneous catalysts” in “**Manipal Research colloquium-2019**” 1-3<sup>rd</sup> April 2019 in Manipal.
- ◆ **Mr. Kirana M.P.** participated in two weeks on hand workshop on “Multi-omics applications in medicinal plant research” organized at Trans Disciplinary University (TDU), Bengaluru during February 11-22, 2019.
- ◆ **Ms. Shrilakshmi S.** presented a poster titled “Chemical modification and bioconjugation of insulin for therapeutic applications” at Manipal research colloquium held from April 1<sup>st</sup>-3<sup>rd</sup> organized by MAHE, Manipal.
- ◆ **Mr. Kirana M. P.** presented a poster titled “ Studies on alpha glucosidase inhibitors isolated from medicinal plants and their endophytic fungi ” at Manipal research colloquium held from April 1<sup>st</sup>-3<sup>rd</sup> organized by MAHE, Manipal.
- ◆ The UGC-DAE Project titled “Phase Transitions in BiMWO<sub>6</sub> (M=Ce,Fe,Cr) Smart Functional Nanomaterials” has been renewed for one more year. **Dr. Nalini G. S.** is the PI- of the project.
- ◆ Bristol Myers sqibb (BMS) scholarship Grant to **Dr. Udupi A. Ramagopal**, titled “Structure based rational design of Pd I mutants to create lead molecule for cancer immunotherapy is approved and BMS has released the money
- ◆ **Dr. Sanjeev Maradur** gave an invited talk in one day work shop on “Heterogeneous catalysis in organic synthesis: Concepts and Industrial applications” organized by Vijaya college, Bangalore on 18<sup>th</sup> October 2019.

## 6<sup>th</sup> Outreach Programme for PPEC Schools



It has been 5 years now we started this initiative of outreach programme with a theme "Today's Science for Tomorrow's Scientists" for 9<sup>th</sup> Standard Poomnaprajna School students of Bengaluru. The five days programme of 6<sup>th</sup> Outreach Programme for PP School students started on 5<sup>th</sup> of March, 2019 and continued till 9<sup>th</sup> of March, 2019. Experiments were demonstrated in the areas of chemistry, physics and biology in order to create interest for research in the young boys and girls. All the faculty and students actively participated in the event interacting with students and inspiring the young minds through beautifully designed experiments and themes related to basic science.

## Visitors to the Institute



**Dr. V K Gupta**, Senior Vice President and Head-Polymer, Reliance Research and Development Centre, Reliance Industries Limited, Navi Mumbai visited the Bidalur Campus on 25<sup>th</sup> July 2019. Faculty of materials science division interacted with him. He was impressed with the research environment and the facilities created at PPISR.



Project Review Meeting of Deepak Novochem Technologies Ltd Pune sponsored Project: **ShreeKrishna Sawant**, CEO and **Dr. Anand Hunoor**, Executive Director of DNTL visited PPISR for the 2<sup>nd</sup> Review meeting of the sponsored project. Dr. Shanbhag made a comprehensive presentation of the work carried out in the said project. Dr A B Halgeri and Dr Sanjeev Maradur were present during the meeting. The Visiting Team appreciated the efforts and the progress made in the sponsored project.

Visit of Deepak Phenolics Team to PPISR: Mr. Anil Khatri, General Manager, Dr. Swapnil Yerande, Head R&D, visited PPISR on 10<sup>th</sup> September 2019 for discussions about new sponsored project. Dr Sanjeev Maradur made a presentation of the project proposal. The proposal got approved technically and is expected to start from 1<sup>st</sup> November 2019.

## Student Achievements



- ◆ **Mr. Vasudeva Rao B**, PhD Scholar, Materials Science & Catalysis Division received "Young Scientist Award of Citation 2018-2019" for outstanding achievement in chemistry- Runner Up-1(2nd) of Dr.K.V.Rao Research Awards for the year of 2019 in Chemistry.
- ◆ **Mr. Satyapal R. C** and **Ms. Archana**, PhD Scholars of Materials Science & Catalysis Division have been awarded the prestigious Senior Research Fellowship from CSIR, Govt of India for a period of two years starting from 2019.
- ◆ **Ms. Shrilakshmi S**, PhD Scholar, Biological Sciences Division received the best poster presentation award in the one-day conference "Recent



advances in Biochemistry” organized by St. Aloysius college, Mangalore on 23<sup>rd</sup> February 2019.

- ◆ **Ms. Marilyn**, PhD Scholar, Materials Science & Catalysis Division won best poster award at the Biennial Conference “Nano India 2019” held at Mahatma Gandhi University, Kottayam, Kerala, India during 26<sup>th</sup> April, 2019.
- ◆ **Ms. Archana**, PhD Scholar, Materials Science & Catalysis Division received International Travel Support from DST-SERB to participate in ADD2019 (School And Conference on Diffraction Data in Real Space) at ILL (Institut Laue-Langevin) Grenoble, France and gave oral presentation on “Average and local structure of  $\text{NaCe}(\text{WO}_4)_2$ : A Structure-Property Correlation”.
- ◆ **Ms. Vaishnavi**, **Ms. Shrilaxmi** and **Mr. Karthik** won the Best Seminar Award in PPISR weekly Seminar Series for 2018-2019.

## Thesis Defence and Colloquium

### Biological Sciences Division



**Mrs. Pavithra G C**, student of **Dr. Ramgopal** successfully defended her thesis titled “Structural Studies of Purine Phosphoribosyl transferases from Pathogenic Bacteria”, before the external examiner **Dr. Bichitra Kumar Biswal**, National Institute of Immunology, New Delhi on 25<sup>th</sup> July 2019 at the Bidalur campus and was awarded Ph.D by Manipal Academy of Higher Education, Manipal.

**Ms. Kavitha K.**, student of **Dr. Ananda K.** gave her Ph.D thesis colloquium titled “Studies on effect of radiation on laccase producing endophytic fungi and applications of fungal laccase” at PPISR campus on 4<sup>th</sup> September 2019. All the doctoral advisory committee members, including three subject-experts, **Dr. A.J. Rao**, Professor, INSA Senior Scientist, Department of Biochemistry, IISc, Bangalore, **Dr. Shanti K.N**, Professor, Department of Biotechnology, PES

University, Bengaluru and **Dr. Udupi Ramagopal**, Associate Professor, PPISR were present in the pre-thesis colloquium and recommended the submission of the Ph.D. thesis to MAHE, Manipal.

### Materials Science & Catalysis Division

**Mr. Pradeep Shanbhog**, student of **Dr. Nalini G. S.** successfully defended his thesis titled “Semiconducting Oxide Narticles: Band Gap Engineering, Photocatalysis and Photolumiscence Studies”, before the external examiner **Prof. Kaurna kar. Nanda**, MRC, IISc, Bengaluru on 27<sup>th</sup> September, 2019 at the Bidalur campus and was awarded Ph.D by Manipal Academy of Higher Education, Manipal.

**Mr. Vasudevarao B**, student of **Dr. Suresh K.** gave his Ph.D thesis colloquium titled “Metal-Organic Frameworks(MOFs) and their Nanohybrids for Synergetic Heterogeneous Catalysis” at PPISR campus on 29<sup>th</sup> May 2019. All the doctoral advisory committee members, **Prof. Balaji R. Jagirdar**, IPC, IISc, **Prof. Srinivasan Natarajan**, SSCU, IISc and **Prof. Y.S. Bhat**, faculties and students of PPISR were present in the meeting. The DAC members recommended the research work for submission of Thesis to MAHE, Manipal.



## Other Activities at PPISR



The 67<sup>th</sup> Republic day was celebrated at PPISR on 26<sup>th</sup> of January, 2019. **Sri Sreenivasa Rao**, Financial Advisor, AMEF was the chief guest of the occasion and hoisted the flag and addressed the students, faculties and staff present during the event. Tree saplings were planted in the campus to make the campus greener.

- ◆ Health Check up camp was organized by PPISR in collaboration with Ramaiah Leena Hospital, Devanahalli on 20<sup>th</sup> September 2019. All the faculty, students and staff of PPISR benefited from the event. On this occasion PPISR

went into memorandum of understanding with the hospital during the emergency situations.

- ◆ A new generator of 82.5KVA capacity was installed in the PPISR Campus and inaugurated by Dr. A. B. Halgeri, Director on Friday, August 02, 2019. This facility helps in running the research facilities un-interrupted as a power backup during main power crises.
- ◆ 73<sup>rd</sup> Independence Day was celebrated in the PPISR campus on 15th August 2019. Dr. A. B. Halgeri, Director of the institute hoisted the flag and addressed the gathering. Plantation of tree saplings were organized in order to mark the event. All the faculty, students and staff actively participated in the event.
- ◆ Swaccha Bharath Abhiyan was conducted on the eve of Gandhi Jayanthi on 2nd October 2019. All the faculty, students and staff participated in this event to make the campus plastic waste free.
- ◆ Sharada Pooja and Ayudha Pooja were performed at PPISR campus on 3rd October 2019. All the books, instruments and vehicles were decorated and worshiped on this special occasion. Priest from the nearby temple performed a pooja to goddess Saraswathi and all instruments.

## Visitors' views

- ◆ **Dr. SEUNG CHEOL LEE, Director, Korea Institute of Science and Technology:** As a theoretical materials scientist, this visit was very fruitful and productive. Strong collaboration between Indo Korea Science and Technology Centre (IKST) and PPISR should show another good example of materials science, especially catalyst relevant research topics. I appreciate the hospitality showed to us.
- ◆ **Prof. MUKUNDA N. Retd. Professor, Center for Theoretical Studies, IASc:** It is a pleasure to come here again after about a decade, Fine campus, Calm atmosphere and good place to work academically. All my best wishes.
- ◆ **Dr. SWAPNIL YERANDE AND Mr. ANIL KHATRI, Deepak Group of Companies, Baroda:** We had a great impression about the facilities built in institute. It is great to see the academic facility who understand industry requirement. We are happy to work with you and looking forward to fruitful and long term collaboration with you. Best of luck. PPISR has great potential to become Catalyst Excellent Centre in India. We are looking forward to work together.
- ◆ **Prof. NAVAKANTA BHAT, Professor and Chair, CeNSE, IISc, Bangalore:** I was very impressed with the quality of research work pursued. In particular, the collaboration with industry was so refreshing and unique. I am sure that the dedicated faculty and students will take this institute to greater heights.
- ◆ **Dr. HYACINTH MARY BASTIAN, Shell Technology Centre, Bengaluru:** The research scholars show a lot of energy and enthusiasm. The facilities are good, the labs are well maintained; potential to explore future collaborations. Enjoyed the interactions with students.
- ◆ **Dr. ANINDITA BANERJEE, Quantum Security Specialist, QuNu Labs, Bengaluru:** Very positive students. Faculty are very enthusiastic. Students can definitely explore this domain and anything we can do jointly will be great.
- ◆ **Dr. ANJALI A KARADE, Department of Bio Chemistry, IISc, Bengaluru:** It was very good to visit the institute and deliver a lecture at the symposium. The campus is lovely and the projects and publications from here are of high quality. Hope the institute expands and then will flourish even better.
- ◆ **Dr. B K BISWAL, N I I, New Delhi:** I am very impressed with the scientific ambience maintained in the institute. The greenery in the campus even great that motivated me. I wish you best of luck for the progress of the institute.

## Poornaprajna Analytical Center

Instruments available for external users :

- ★ X-Ray Diffractometer (Bruker)      ★ FTIR Spectrophotometer (Bruker)
- ★ Atomic Absorption Spectrophotometer (Perkin Elmer)      ★ UV-Vis Spectrophotometer (Perkin Elmer)
- ★ Fluorescence Spectrometer (Agilent)
- ★ Simultaneous Thermal Analyzer (TGA-DTA, DSC Perkin Elmer)

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