



St Thomas College, Kozhencherry

Established in 1953 | Reaccredited by NAAC with Grade A | ISO 9001:2015 Certified | ISO 21001:2018 Certified

Affiliated to Mahatma Gandhi University, Kottayam

www.stthomascollege.info

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Faculty Profile

Dr. Dickson D Babu

Assistant Professor

Department of Chemistry

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Higher Education

- 2012 – 2016 ■ **Ph.D Chemistry**, Department of Chemistry, National Institute of Technology Karnataka.
- 2010 – 2012 ■ **M.Sc Chemistry**, Christ University, Bangalore.
- 2007 – 2010 ■ **B.Sc Chemistry**, Kuriakose Elias College, Mannanam.

Professional Position

- 12 March 2020 to present ■ **Assistant Professor**, Department of Chemistry, St Thomas College, Kozhencherry

Teaching Experience

- 2020 – 2023 ■ **Undergraduate students**
- **Postgraduate students**

Courses Taught

- M.Sc ■ **Classical Thermodynamics**
- **Molecular Spectroscopy**
- **Structural Inorganic Chemistry**
- **Instrumental Methods of Analysis**
- **Modern Analytical Techniques**
- **Inorganic Chemistry Practical**

- B.Sc ■ **Organic Chemistry**
- **Environmental Studies**
- **Chemistry in Everyday Life (Open Course)**

Courses Taught (continued)

- Physical Chemistry
- Organic Preparations and Basic Laboratory Techniques

Professional Service Rendered

- AY 2021-22 Co-ordinator, Industry-Institution Interface Cell
- AY 2021-22 Committee Member, Multidisciplinary Research Centre
- AY 2021-'22 Co-ordinator, Young Innovators Programme (YIP)
- 2021-22 Additional Examiner, B.Sc. Degree Examinations held under Mahatma Gandhi University, Kottayam
- Additional Examiner, M.Sc and B.Sc. Degree Examinations held under Mahatma Gandhi University, Kottayam

Other Important Responsibilities/Positions Held

- Participated in the Question Bank Upgradation Initiative of Mahatma Gandhi University, Kottayam and Contributed to the Question Bank of IVth Semester PG CSS Chemistry Course. (During 2021-22)

Awards and Achievements

- 2010 Topper in BSc. Chemistry
- 2012 **University topper (1st rank)** in MSc.Chemistry (**Gold medalist**) from Christ University, Bangalore.
- June 2012-14 Junior Research Fellowship (JRF) from Ministry of Human Resource Development (MHRD), Government of India
- July 2014-16 Senior Research Fellowship (SRF), MHRD, Government of India
- Google scholar **h-index = 19, i10 index=21.**
- July 2018 Excellent Postdoc award from FJIRSM, CAS
- June 2015 Best Poster Presentation award from Bharathiar University.
- CGPA of 9.54/10 in PhD. Course work
- Reviewer for Peer-Reviewed Scientific Journals of American Chemical Society, The Royal Society of Chemistry, London, Wiley Publications, Elsevier.

Research Experience

- Doctor of Philosophy (2012-2016)**, Thesis Title: Design and Development of New Indole Based Sensitizers for Dye Sensitized Solar Cells
Adviser: Prof. A Vasudeva Adhikari, Former Head of the Department, Department of Chemistry, National Institute of Technology Karnataka, India.
Most of my Ph.D. work was carried out in collaboration with Prof. El-Shafei's group at North Carolina State University, USA.
- Visiting Researcher (2013)** IIT Kanpur (Samtel Centre for Display Technologies)
- Visiting Researcher (2015)** CSIR-NIIST, Photosciences and Photonics Section, Trivandrum, Kerala, India

Research Experience (continued)

- **Postdoctoral Research Fellow (2016 – 2019)**, Project Title: Development of Functional Materials for Electrochemical Energy Conversion, Zn-air Battery, Water splitting, Carbon dioxide reduction reaction (CDRR)
Adviser: Prof. Yaobing Wang, State Key Laboratory of Design and Assembly of Functional Nanostructures, CAS.
- **Postdoctoral Research Fellow (2019 – 2020)**, Project Title: Design and Development of organic thin film solar cells and Perovskite solar cells; Thin film technology.
Adviser: Prof. Aung Ko Ko Kyaw, Southern University of Science and Technology (SUSTech)

Areas of Specialization and Interest

- **Design and Synthesis of Electrocatalyst for Energy Generation and Storage**
- **Design and Development Organic Sensitizers for Dye Sensitized Solar Cells**
- **Synthetic Organic Chemistry**
- **Metal-air Batteries**

Research Publications

- **New D-pi-A Type Indole Based Chromogens for DSSC: Design, Synthesis and Performance Studies .**
Dickson D. Babu, Gachumale, S.R., Anandan, S. and Adhikari, A.V. Dyes and Pigments, 112, 183–191, 2015. (I.F.= 5.122)
- **Molecular Engineering and Theoretical Investigation of Metal-Free Organic Chromophores for Dye-Sensitized Solar Cells.**
Dickson D. Babu, Adhikari, A.V. Advanced Science Letters, 22 (1), 36-39. 2015.
- **Molecular Engineering and Theoretical Investigation of Novel Metal-Free Organic Chromophores for Dye-Sensitized Solar Cells.**
Dickson D. Babu, Cheema, H., Elsherbiny, D., El-Shafei, A. and Adhikari, A.V. Electrochimica Acta, 176, 868–879, 2015. (I.F.= 7.336)
- **Highly Efficient Panchromatic Dye-Sensitized Solar Cells: Synergistic Interaction of Ruthenium Sensitizer with Novel Co-sensitizers Carrying Different Acceptor Units.**
Dickson D. Babu, Elsherbiny, D., Cheema, H., El-Shafei, A. and Adhikari, A.V. Dyes and Pigments, 132, 316-328, 2016. (I.F.= 5.122)
- **From Molecular Design to Co-Sensitization; High Performance Organic Photosensitizers for Dye-Sensitized Solar Cells.**
Dickson D. Babu, Su, R., El-Shafei, A. and Adhikari, A.V. Dyes and Pigments, 132, 316-328, 2016. (I.F.= 5.122)
- **New Indole Based Co-Sensitizers for Dye Sensitized Solar Cells Exceeding 10 percent Efficiency.**
Dickson D. Babu, Su, R., El-Shafei, A. and Adhikari, A.V. RSC Advances, 6, 30205–30216, 2016. (I.F.= 4.036)
- **Synthesis and Photovoltaic Performance of a Novel Asymmetric Dual-Channel Co-Sensitizer for Dye-Sensitized Solar Cell Exceeding 10 Percent Efficiency.**
Dickson D. Babu, Su, R., Naik, P., El-Shafei, A. and Adhikari, A.V. RSC Advances, 6, 30205–30216, 2017. (I.F.= 5.122)

Research Publications (continued)

- **Mixed-Metal-Organic Framework Self-Template Synthesis of Porous Hybrid Oxyphosphides for Efficient Oxygen Evolution Reaction.**
Dickson D. Babu, Yiyin Huang, Ganesan Anandhababu, Muhammad Arsalan Ghausi, Yaobing Wang. ACS Applied Materials and Interfaces, 9, 38621–38628, 2017. (I.F.= 10.383)
- **Atomic Iridium@Cobalt Nanosheets for Dinuclear Tandem Water Oxidation.**
Dickson D. Babu, Yiyin Huang, G. Anandha babu Zhen Peng, Xu Wang, Rui Si, Maoxiang Wu, Qiaohong Li, Yaobing Wang and Jiannian Yao. Journal of Materials Chemistry A. 7, 8376–8383, 2019. (Equal first author) (I.F.= 14.511).
- **Atomic Modulation, Structural Design and Systematic Optimization towards Efficient Electrochemical Nitrogen Reduction.**
Yiyin Huang, Dickson D. Babu, Zhen Peng, Yaobing Wang. Advanced Science, 7, 1902390, 2020. Equal First author. (I.F.= 17.521)
- **A simple D-A-pi-A configured carbazole based dye as an active photo-sensitizer: A comparative investigation on different parameters of cell.**
Dickson D. Babu,* Naik, P., Kavya S Keremane. Journal of Molecular Liquids, 310, 113189, 2020. (I.F.= 6.633)
- **Recent Progress in Organic Solar Cells Based on Non-Fullerene Acceptors: Materials to Devices.**
Dou Luo, Woongsik Jang, Dickson Babu, Min Soo Kim, Dong Hwan Wang, Aung Ko Ko Kyaw. Journal of Materials Chemistry A. 10, 3255–3295, 2022. Equal First author. (I.F.= 14.511)
- **Highly Exposed Fe-N₄ Active Sites in Porous Poly-Iron-Phthalocyanine based Oxygen Reduction Electrocatalyst with Ultrahigh Performance for Air Cathode.**
Ganesan Anandhababu, Syed Comail Abbas, Jiangquan Lv, Kui Ding, Qin Liu, Dickson D. Babu, Yiyin Huang, Jiafang Xie, Maoxiang Wu, and Yaobing Wang. Dalton Transactions, 46, 1803–1810, 2017. (I.F.= 4.569)
- **Co-intercalation of Multiple Active Units in Graphene by Pyrolysis of Hydrogen-bonded Precursors for Zinc-air Batteries and Water Splitting.**
Yiyin Huang, Qin Liu, Jiangquan Lv, Dickson D. Babu, Wenjing Wang, Maoxiang Wu, Daqiang Yuan, Yaobing Wang. Journal of Materials Chemistry A, 5, 20882–20891, 2017. (I.F.= 14.511)
- **Molecular Design and Theoretical Investigation of New Metal-Free Heteroaromatic Dyes With D-pi-A Architecture as Photosensitizers for DSSC Application.**
Naik, P., Su, R., Elmorsy R. M., Dickson D. Babu, El-Shafei, A, Adhikari, A.V. Journal of Photochemistry and photobiology A: Chemistry, 345, 63–73, 2017. (I.F.= 5.141)
- **New Carbazole Based Metal-Free Organic Dyes With D-pi-A-pi-A Architecture for DSSCs: Synthesis, Theoretical and Cell Performance Studies.**
Naik, P., Elmorsy R. M., Su, R., Dickson D. Babu, El-Shafei, A, Adhikari, A.V. Solar Energy, 153, 600–610, 2017. (I.F.= 7.188)
- **Structurally Simple D-pi-Type Organic Sensitizers for Dye-Sensitized Solar Cells: Effect of Anchoring Moieties on The Cell Performance.**
Naik, P., Su, R., Dickson D. Babu, El-Shafei, A, Adhikari, A.V. Journal of the Iranian Chemical Society, 14, 2457–2466, 2017. (I.F.= 2.019)
- **Oriented Growth of MOF-67 to Derive 2D Porous CoPO Nanosheets for Efficient Overall Water Splitting.**
Ganesan Anandhababu, Yiyin Huang, Dickson D. Babu, Maoxiang Wu, and Yaobing Wang. Advanced Functional Materials. 1706120, 2018. (I.F.= 19.924)

Research Publications (continued)

- **Novel Strongly Coupled Tungsten-Carbon-Nitrogen complex for Efficient Hydrogen Evolution Reaction.**
Syed Comail Abbas, Jing Wu, Yiyin Huang, Dickson D. Babu, G. Anandha babu, Muhammad Arsalan Ghausi, Maoxiang Wu, Yaobing Wang. International Journal of Hydrogen Energy, 43, 16-23, 2017. (I.F.= 7.139)
- **Novel N-Mo₂C Active Sites for Efficient Solar to Hydrogen Generation Reaction.**
Syed Comail Abbas, Zeng Peng, Jing Wu, Yiyin Huang, **Dickson D. Babu**, G. Anandhababu, Muhammad Arsalan Ghausi, Maoxiang Wu, Yaobing Wang. ChemElectroChem, 5, 1-6, 2018. (I.F.= 4.782)
- **Synthesis, Characterization and Performance Studies of a New Metal-Free Organic Sensitizer for DSSC application.**
Naik, P., **Dickson D. Babu**, Su, R, El-Shafei, A, Adhikari, A.V. Materials today Proceedings, 345, 3150-3157, 2018.
- **Atomic dispersion of Fe/Co/N on graphene by ball-milling for efficient oxygen evolution reaction.**
Wenguo Wang, **Dickson D. Babu**, Yiyin Huang, Jiangquan Lv, Yaobing Wang, Maoxiang Wu. International Journal of Hydrogen Energy, 43, 10351-10358, 2018. (I.F.= 7.139)
- **Synergistic Supports Beyond Carbon Black for Polymer Electrolyte Fuel Cell Anodes.**
Yiyin Huang, **Dickson D. Babu**, Maoxiang Wu, Yaobing Wang. ChemCatChem. 20, 4497-4508, 2018. (I.F.= 5.501)
- **Profuse Surface activation of IrTiN: Bifunctional electrocatalyst for Universal PH range.**
G. Anandha babu Dickson D. Babu, V. Manimuthu, S. Baskaran. Advanced Energy and Sustainability Research, 2, 2000054, 2021.
- **Efficient Semi-Transparent Organic Solar Cells with High Color Rendering Index Enabled by Self-Assembled and Knitted AgNPs/MWCNTs Transparent Top Electrode via Solution Process.**
Y. Zhang, X. He, Dickson Babu, W. Li, X. Gu, C. Shan, Aung Ko Ko Kyaw, W. C. H. Choy. Advanced Optical Materials, 2170027, 2021. (I.F.= 10.505)
- **Recent progress in organic solar cells based on non-fullerene acceptors: materials to devices.**
Dou Luo, Woongsik Jang, **Dickson D Babu**, Min Soo Kim, Dong Hwan Wang, Aung Ko Ko Kyaw. Journal of Materials Chemistry A, 10, 3255-3295, 2022. (I.F.= 14.511)
- **Bis(azolyl)pyridine-2,6-dicarboxamide Derivatives: Synthesis, Bioassay Analysis and Molecular Docking Studies.**
Dickson D. Babu, Naik, P., Kavya S Keremane. ChemistrySelect, (Just Accepted) (I.F.= 2.307)
- **Book Chapter: Supercapacitors based on MXenes (Transition metal carbides and nitrides) and its hybrids.**
Dickson D. Babu,* M. Mathew, S. Thomas. Fundamentals and Supercapacitor applications of 2D materials, Elsevier, 2021, 217-233.

Paper Presentations

- **Design and Synthesis of Metal-Free Organic Chromophores for Dye-Sensitized Solar Cells.**
International Conference on Advanced Functional materials (ICAFM-2014). Department of Mathematics, CSIR-National Institute for Interdisciplinary Science and Technology (NIIST), Thiruvananthapuram, Kerala, India. February 19-21, 2014.
- **Molecular Engineering and Theoretical Investigation of Metal-Free Organic Chromophores for Dye-Sensitized Solar Cells.** Emerging Materials: Characterization and Application-2014 (EMCA-2014). CSIR-Central Glass and Ceramic Research Institute, Kolkata, December 4-6, 2014.

Paper Presentations (continued)

- **Novel D- π -A Organic Dyes for Highly Efficient Dye-Sensitized Solar Cells.** Advanced Materials for Energy and Environmental Applications (AMEEA-2015), Bharathiar University, Coimbatore, March 18-20, 2015. **(Honored with Best poster Presentation award).**
- **Synthesis and DFT Studies of New n-type Dyes for Dye-Sensitized Solar Cells.** Nascent Developments in Chemical Sciences: Opportunities for Academia-Industry Collaboration (NDCS-2015), Birla Institute of Technology and Science, Pilani, Rajasthan, October 16-18, 2015.
- **High performance organic photosensitizers for dye-sensitized solar cells.** International Conference on Advances in Chemical Engineering (ICACE-2015), NITK, Surathkal, December 20-22, 2015.
- **Tailor-Made Co-adsorbents for Highly Efficient Dye Sensitized Solar Cells.** National Conference on Recent Trends in Chemical Sciences (NCRTCS-2016) MIT, Manipal, January 11-12, 2016.
- **Design, Synthesis and Computational Modelling of a New Metal-Free Organic Chromophore for Dye-Sensitized Solar Cell Application.** National Conference on Recent Trends in Chemical Sciences (NCRTCS-2016) MIT, Manipal, January 11-12, 2016.
- **Design and Synthesis of new Metal-Free Organic Chromophores for Dye-Sensitized Solar Cell application.** International Conference on Advances in Chemical Engineering (ICACE-2015), NITK, Surathkal, December 20-22, 2015.
- **Design and Synthesis of new Metal-Free Organic Chromophores for Dye-Sensitized Solar Cell application.** 10th Mid-Year CSRI symposium in chemistry. National Institute of Technology, Trichy, India, July 23-25, 2015.
- **Design and Synthesis of a new carbazole based organic chromophore for Dye Sensitized Solar Cell Application.** International Conference Materials Science and Technology (ICMST-2016), St. Thomas College, Palai, Kerala, June 05-08, 2016.
- **Synthesis, Characterization and Performance Studies of a New Metal-Free organic Sensitizer for DSSC application.** International Conference on Advanced Materials and Applications (ICAMA-2016), BMS college of Engineering, Bangalore, Karnataka, June 15-17, 2016.

Project Guidance

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| M.Sc | <ul style="list-style-type: none">■ Joeal Mery Jose, <i>Synthesis And Characterization of Silver Nanoparticles Using Brown Seaweed And Their Role As Catalyst In Organic Dye Degradation</i> (2019-2021 Batch)■ Jithu Anna Sunny, <i>Green Synthesis and Characterization of Silver Nano Particles Using Mangrove Humic Acid and The Role as Catalyst in the Degradation of Organic Dyes</i> (2019-2021 Batch)■ Neema Sarah Varghese, <i>Synthesis And Characterization of Zinc Oxide Nanoparticles Using Mangrove Leaves And Their Role As Catalyst For Methylene Blue and Congo Red Degradation</i> (2020-2022 Batch)■ Ashly Joy, <i>Synthesis And Characterization of Zinc Oxide Nanoparticles Using Mangrove Leaves And Their Role As Catalyst For Methylene Orange and Congo Red Degradation</i> (2020-2022 Batch) |
| B.Sc | <ul style="list-style-type: none">■ Akhil Pushpan, Akhila R Kurup, Amal Dev, <i>Evaluation Of Physico-Chemical Properties in Selected Branded Soaps</i> (2018-21 Batch) |

Project Guidance (continued)

- **Gopika Jayaprakash, Akhila K S, Athira Pradeep**, *Qualitative and Quantitative Analysis of Milk* (2019-2022 Batch)

Recent Seminar/Conferences/Workshops Organized

- Coordinator, “ International Webinar on Advanced Functional Materials (IWAFM -2022) on 6th April 2022.
- Coordinator, Webinar on “Understanding Research: A Way of Life in association with Internal Quality Assurance Cell (IQAC) on 17th March 2021.

Invited Talks

- Resource Person, International Webinar on Material Science and Nanotechnology, organized DBT,Star college scheme, Government of India, at St. Xavier’s College, Goa, India.(March 2022).
- “Invited Talk” on the topic "The Chemistry of Survival: Catalyzing a Sustainable Future", organized by Kuriakose Elias College, Kerala, India. (March 25th, 2022).
- Resource Person, International e-Conference on Advanced Functional Materials and Optoelectronic Devices, organized by centre for renewable energy, Veer Bahadur Singh Purvanchal University, U.P., India. (June 13-15, 2020)
- Resource Person, International Seminar on Advances in Organic and Materials Chemistry, Organized by St. Thomas College, Kozhencherry, Kerala, India. (February 10th, 2020)

Skills

- Experience in working with and maintaining various types of equipment including time correlated single photon counting system (TCSPC), fluorescence spectrophotometers, UV-Visible-NIR spectrophotometer, cyclic voltammeter (CV), electrochemical work station, PXRD, TEM, SEM, TG, DSC, solar simulators as well as OER/ORR/HER measurement
 - Handling and working with single crystal x-ray diffraction (SCXRD) instrument. Solving structures of Varsity of organic and inorganic compounds.
 - DFT calculations using TURBOMOLE (powerful Quantum Chemistry program package), X’.
- Languages known ■ English, Malayalam, Tamil, Hindi.