



Dr. Pratheek M

Laboratory for Molecular
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(LAMP)

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PROFILE

Highly organized and meticulous research scholar in the field of material science and photovoltaics. Adept at setting up and maintaining laboratories, writing articles, coordinate with professors and colleagues, prepare and give presentations and operating scientific instruments. Good science communicator and planner with strong judgement and innovative thinking abilities.

WORK EXPERIENCE

Laboratory for Molecular Photonics
and Electronics, Dept. of Physics,
NIT Calicut

July 2019 — March 2023

Senior Research Fellow

Laboratory for Molecular Photonics
and Electronics, Dept. of Physics,
NIT Calicut

July 2017 — June 2019

Junior Research Fellow

EDUCATION

PhD in Physics

July 2017 — March 2023

National Institute of Technology Calicut

Title of the Thesis: Perovskite Single Crystals: From Bulk to Ultrathin Wafers

Supervisor: Prof. P. Predeep

Master of Science in Physics

August 2014 — May 2016

Central University of Kerala, Periyar

Bachelor of Science in Physics

June 2011 — May 2014

Nehru Arts and Science College, Kanhangad, Kannur University

INTERNATIONAL PUBLICATIONS

1. Pratheek, M, P. Predeep. "Hybrid perovskite single crystal with extended absorption edge and environmental stability: Towards a simple and easy synthesis procedure" in Materials Chemistry and Physics, Volume 239 (2020), 122084
2. M. Pratheek, T. Abhinav, Susmita Bhattacharya, Goutam Kumar Chandra, P. Predeep. "Recent progress on defect passivation in perovskites for solar cell application" in Materials Science for Energy Technologies, Volume 4 (2021), 282-289
3. M. Pratheek, P. Sujith, T.A. Shahul Hameed, P. Predeep. "Effect of bromide doping on the phase stability and shelf life of the triple cation mixed halide perovskite single-crystals" in Materials Letters, Volume 326 (2022), 132903.
4. M. Pratheek, Goutam Kumar Chandra, P. Predeep. "Ultrathin single-crystalline perovskites: Toward large area wafers" in Journal of Crystal Growth, Volume 597 (2022), 126848.
5. P. Sujith, M. Pratheek, S.R. Parne, P. Predeep. "Growth and Characterization of

High-Quality Orthorhombic Phase CsPbBr₃ Perovskite Single Crystals for Optoelectronic Applications” in Journal of Electronic Materials (2022).

6. K. L. Usha Kumary, M. Pratheek, T. A. Shahul Hameed, P. Predeep. “Thickness dependence of poly(triaryl amine) hole transport layer on bulk heterojunction organic solar cells” in Optoelectronics and Advanced Materials - Rapid Communications, Volume 15, 2021, 278-285.
7. K. L. Usha Kumary, M. Pratheek, A. Ashfak, T. A. Shahul Hameed and P. Predeep. "Effect of Transport Layer on Polymer - Fullerene Derivative Bulk Heterojunction Organic Photovoltaic Cell Performance using Transmission Circuit Model Analysis" in International Journal of Nanoelectronics and Materials Volume 14, No. 3, July 2021 [219-228]

BOOK CHAPTERS

1. Pratheek Mekkat,, TA. Shahul Hameed, P. Predeep “The Challenge of Realizing Nano-Thin Perovskite Single-Crystalline Wafers: Computational and Experimental Aspects” in Materials Modelling for Macro to Micro/Nano Scale Systems, Edited By Satya Bir Singh, Prabhat Ranjan, A. K. Haghi ISBN: 9781774630198, Apple Academic Press, Publication date: 16-06-2022,
2. Saranya Babu, Pratheek. M, P. Predeep. “Nanocrystalline Perovskites: From Materials to Modelling” in Materials Modelling for Macro to Micro/Nano Scale Systems, Edited By Satya Bir Singh, Prabhat Ranjan, A. K. Haghi, ISBN: 9781774630198, Apple Academic Press, Publication date: 16-06-2022,
3. P. Sidharth, M. Pratheek, P. Predeep. “When Perovskites Memorize” in Mathematics Applied to Engineering in Action Advanced Theories, Methods, and models, Edited By Nazmul Islam, Satya Bir Singh, Prabhat Ranjan, A. K. Haghi, ISBN: 9781771889223, Apple Academic Press, Publication date: 22-03-2021,

CONFERENCE PROCEEDINGS

1. M Pratheek, TA Hameed, P Predeep. “Effect of copper phthalocyanine (CuPc) as hole transport layer in perovskite solar cells” in AIP Conference Series, Volume 2287, Issue:1 (2020), 020030
2. P. Sujith, M. Pratheek, M. Aiswarya, S. Babu, S.R. Parne, P. Predeep. “Effect of Solution and Dry Processing Techniques on the Optical and Transport Properties of Inorganic CsPbBr₃ Perovskite Films” in Journal of Physics Conference Series, Volume 2357 (2022) 12019.
3. KLU Kumary, M Pratheek, TAS Hameed, P Predeep. “Admittance spectroscopy in the measurement of hole mobility in organic photovoltaic cell” in AIP Conference Proceedings Volume 2222 Issue:1 (2020) 020016
4. KLU Kumary, M Pratheek, TAS Hameed, P Predeep “Measurement of hole mobility in P3HT based photovoltaic cell using space charge limited current method” in AIP Conference Proceedings, Volume 2162 Issue:1 (2020) 020142

CONFERENCES

- 33-Kerala science congress, Kerala, 25-30 January 2021.Oral presentation
- National conference on "Soft Matter and Functional Materials (SMFM 2020)" organized by Physics Department, NIT Calicut, March 02-04, 2020. Poster presentation
- International Conference on Energy and Environment, Kerala, India - Dec 12-14, 2019. Poster presentation
- International Conference on Materials for Energy Applications, Jaipur, India - Dec 6-8, 2018. Oral presentation

EXPERTISE

- Growth and characterization of hybrid perovskite single crystals
- Growth of single crystals of halide Perovskite for solar cell application
- Fabrication and characterization of Perovskite and Organic solar cells

- Study of crystallinity in organic films; XRD and GI-XRD
- Scanning Electron Microscopy (SEM)
- Atomic Force Microscopy (AFM)
- Hall effect
- UV-Vis Absorption spectroscopy and FT-IR spectroscopy
- Spin coating
- Vacuum thermal deposition (PVD)
- Pulsed laser deposition (PLD)
- Impedance spectroscopy
- Cyclic Voltammetry
- Photoluminescence
- Glove box, furnaces and fume hood
- Nano-structures on small molecular thin-films
- Device design of organic solar cells
- Charge transport study in organic and perovskite solar cells
- Fabrication and characterization of OFETs
- Proficient in Origin, Latex, Chem-sketch, ImageJ, Word, Excel, and PowerPoint

PROJECTS

- ANERT, Kerala government sponsored research project entitled “ FABRICATION STARATEGIES FOR ORGANIC HYBRID PEROVSKITE SOLAR CELLS”.
Principal investigator: Prof. P. Predeep

TRAINING AND CERTIFICATION

- SERB sponsored workshop (Karyashala) on ORGANIC AND HYBRID SOLAR CELLS: FROM PRINCIPLES TO PRACTICE-2022 23 - 29 July 2022. Co-ordinated by NIT Calicut.
- "Workshop on Innovative Experiments in Physics for classroom Teaching" sponsored by Vigyan-Prasar and coordinated by NIT Calicut, Department of Physics. March 5-8, 2020
- GIAN sponsored course on "Polymer and Hybrid Electronics: Physics and Device Applications", Aug 21-27, 2017 (Faculty: Prof. Andrey N. Aleshin, Ioffe Physical Technical Institute, Russia, Coordinated by NIT, Calicut) - Flexible electronics, OLEDs, OSCs, OFETs, LE-OFETs, Organic and hybrid memory, Bio-organic electronics and Perovskites in flexible electronics.

AWARDS

- Junior Research Fellowship (2017) and Senior Research Fellowship (2019) awarded by Ministry of Human Resource Development (MHRD), India
- Qualified Graduate Aptitude Test in Engineering (GATE), Conducted by MHRD, India - 2017 (Rank : 481)

INTERESTS

- Photovoltaics
- Hybrid perovskites for flexible electronics
- Single crystalline hybrid perovskites for solar cells
- Organic solar cells
- 2D materials and nano-structures

REFERENCES

- Dr. P. Predeep , Professor (HAG), Dept. of Physics, National Institute of Technology, Calicut, 673601, Email: ppredeep@gmail.com
- Dr. Aneesh. P. M, Assistant Professor, Dept. of Physics, Central University of Kerala, Tejaswini Hills, Periyar, Kerala 671316 Email: aneeshpm@cukerala.ac.in
- Dr. C. S. Suchand Sangeeth, Assistant Professor, Dept. of Physics, National Institute of Technology, Calicut, 673601, Email: goutam@nitc.ac.in