



Academic Details

2014–2021

Ph.D. (Chemistry, Thesis Submitted), Indian Institute of Science Education and Research Thiruvananthapuram (IISER-TVM), Kerala, India.

2010–2012

Master of Science (Chemistry), Madurai Kamaraj University, Madurai, Tamil Nadu, India, CGPA-7.72

Ph. D. Thesis

Title

Design and Synthesis of DNA-Based Amphiphiles for Cancer Diagnosis and Therapy

Supervisor

Dr. Reji Varghese

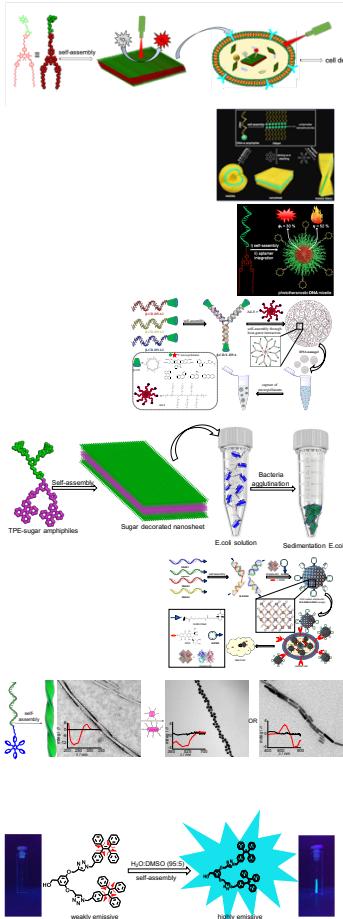
Description

The DNA-based nanostructures derived from the self-assembly of DNA amphiphiles received tremendous attention because of their unique structural features such as surface addressability, biocompatibility, hydrophobic core or membrane that can encapsulate hydrophobic guest molecules and high stability against enzymatic degradation. The present thesis describes the design and synthesis of a few DNA-based amphiphiles and their applications toward cancer diagnosis and therapy. In particular, we explored the molecular recognition properties of DNA for the specific detection of cancer biomarkers such as miRNA and telomerase using ¹⁹F NMR turn “OFF/ON” response. We have also exploited the stimuli responsive nature of the DNA amphiphiles for the targeted drug delivery applications.

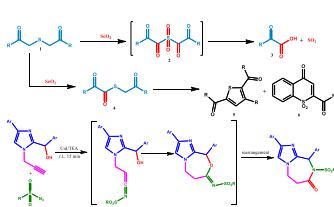
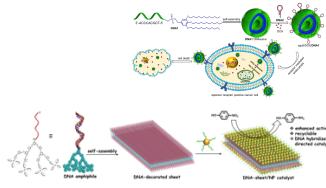
Research Interests

Self-assembly of amphiphilic systems, DNA-based responsive nanostructures, cancer diagnosis and therapy, synthetic organic chemistry.

List of Publications

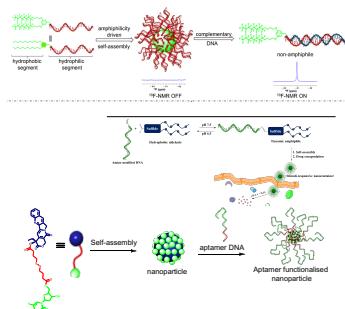


- 1) Near-IR Absorbing Biotin Tethered Iodo-BODIPY Conjugate for Targeted Photodynamic Therapy. D. Perumal, M. Golla, K. S. Pillai, Gowdham Raj, A. Krishna, R. Varghese* *Org. Biomol. Chem.*, **2021**, *19*, 2804–2810.
- 2) DNA-π Amphiphiles: A Unique Building Block for the Crafting of DNA-Decorated Unilamellar Nanostructures: S. K. Albert, M. Golla, N. Krishnan, D. Perumal, R. Varghese* *Acc. Chem. Res.*, **2020**, *53*, 2668–2679.
- 3) Phototheranostic DNA Micelles from the Self-assembly of DNA-BODIPY Amphiphiles for the Thermal Ablation of Cancer Cell. S. Atchimnaidu, D. Perumal, K. S. Harikrishnan, H. V. P. Thelu, R. Varghese* *Nanoscale* **2020**, *12*, 11858–11862.
- 4) Efficient Capturing of Polycyclic Aromatic Micropollutants from Water Using Physically Cross-linked DNA Nanoparticles: S. Atchimnaidu, H. V. P. Thelu, D. Perumal, K. S. Harikrishnan, R. Varghese* *Front. Chem.*, **2020**, *8*, 2.
- 5) Galactose-Grafted 2D Nanosheets from the Self-Assembly of Amphiphilic Janus Dendrimers for the Capture and Agglutination of Escherichia coli: N. Krishnan, D. Perumal, S. Atchimnaidu, k. S. Harikrishnan, M. Golla, M. Nilima, K. Jemshiyi, J. Krishna, D. K. Vijayan and R. Varghese* *Chem. Eur. J.*, **2020**, *26*, 1037–1041.
- 6) Self-Assembly of an Aptamer-Decorated, DNA-Protein Hybrid Nanogel: A Biocompatible Nanocarrier for Targeted Cancer Therapy: H. V. P. Thelu, S. Atchimnaidu, D. Perumal, K. S. Harikrishnan, S. Vijayan and R. Varghese* *ACS Appl. Bio Mater.*, **2019**, *2*, 5227–5234.
- 7) DNA-Decorated Helically Twisted Nanoribbon: A Scaffold for the Fabrication of One Dimensional Chiral Plasmonic Nanostructures: M. Golla, S. K. Albert, S. Atchimnaidu, D. Perumal, N. Krishnan and R. Varghese* *Angew. Chem. Int. Ed.*, **2019**, *58*, 3865–3869.
- 8) Self-assembly of Tetraphenylethylene-Based Dendron into Blue Fluorescent Nanoparticles with Aggregation Induced Enhanced Emission: N. Krishnan, H. Ameena, S. Atchimnaidu, D. Perumal, M. Golla, J. Krishna and R. Varghese* *J. Chem. Sci.*, **2018**, *130*, 1–8.



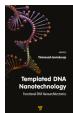
- 9) Aptamer Decorated DNAsome for Targeted Cancer Therapy: M. Golla, S. P. Thaddi, D. Perumal, S. Atchimnaidu and R. Varghese* *ChemNanoMat.*, **2018**, *4*, 1153-1159.
- 10) Self-assembly of DNA-Tetraphenylethylene Amphiphile into DNA-Grafted Nanosheet as a Support for the Immobilization of Gold Nanoparticles: A Recyclable Catalyst with Enhanced Activity: N. Krishnan, M. Golla, H. V. P. Thelu, S. K. Albert, S. Atchimnaidu, D. Perumal and R. Varghese* *Nanoscale* **2018**, *10*, 17174-17181.
- 11) Selenium Dioxide Reaction of Substituted Diphenacyl Sulfides: Generation of α -Ketoacids: M. Nagaraj, D. Perumal, M. Boominathan, S. Muthusubramanian* and N. Bhuvanesh *J. Sulfur Chem.*, **2014**, *35*, 24-30.
- 12) Copper(I)-Catalyzed Cascade Sulfonimidate to Sulfonamide Rearrangement: Synthesis of Imidazo[1,2-*a*] [1,4] diazepin-7(6*H*)-one: M. Nagaraj, M. Boominathan, D. Perumal, S. Muthusubramanian* and N. Bhuvanesh *J. Org. Chem.*, **2012**, *77*, 6319-6326.

Manuscripts Under Preparation



- 13) High Fluorine Content DNA Micelle: A Universal "OFF/ON" ^{19}F NMR Probe for the Detection of miRNA and Telomerase for Cancer Diagnosis: D. Perumal, J. Krishna, M. Golla, N. Krishnan and R. Varghese*
- 14) Dual-Stimuli Responsive Supramolecular Nanocontainers for Targeted Drug Delivery Towards Cancer Therapy: D. Perumal, J. Krishna, M. Golla and R. Varghese*
- 15) Design and Synthesis of Amphiphilic Dual-Drug Conjugate for Targeted Cancer Therapy: D. Perumal, K. Jemshiya, J. Krishna, N. Krishnan and R. Varghese*

List of Book Chapters



- 1) M. Golla, H. V. P. Thelu, S. K. Albert, N. Krishnan, S. Atchimnaidu, D. Perumal, T. S. Praveen and R. Varghese, *Templated DNA Nanotechnology: Functional DNA Nanoarchitectonics* *Pan Stanford Publishing*, **2019**, Chapter 4.

Awards and Recognitions

Jun-2012	Qualified Council of Scientific & Industrial Research – Junior Research Fellow (CSIR-JRF) in Chemical Sciences, Government of India (June 2012) - All India Rank 37
Apr-2012	Madurai Kamaraj University First Rank with Gold Medal in M. Sc. (Chemistry)
Apr-2010	Thiruvalluvar University First Rank with Gold Medal in B. Sc. (Industrial Chemistry)

Poster and Oral Presentations

Dec-2020	Invited short talk at RSC symposium held at IISER-Trivandrum, India
Oct -2019	Poster presentation in JNC research conference (JNC-2019) held at Trivandrum, Kerala, India
Dec-2018	Poster presentation in Nano-biotech conference (Nanobiotech-2018) held at AIIMS, New Delhi, India

Technical and Experimental Skills

Experienced in handling moisture sensitive reactions, purification and characterization of organic compounds using NMR, IR, HRMS & MALDI. Hands on experience in operating DNA Synthesizer, HPLC, UV-vis Spectrometer, Fluorimeter, CD-Spectrometer, Zetasizer, Atomic Force Microscope, Fluorescence Microscope, Confocal Laser Scanning Microscope, Gel Electrophoresis and Documentation. Experienced in the synthesis, purification and characterization of natural and modified DNAs.

References

Dr. Reji Varghese (Supervisor) Associate professor School of Chemistry IISER Thiruvananthapuram Email: reji@iisertvm.ac.in Phone: 9400795658	Prof. Mahesh Hariharan Professor School of Chemistry IISER Thiruvananthapuram Email: mahesh@iisertvm.ac.in Phone: 9037705564	Dr. Vinesh Vijayan Associate professor School of Chemistry IISER Thiruvananthapuram Email: vinesh@iisertvm.ac.in Phone: 9946194572
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