

Dr. KIRAN R. GORE

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ACADEMIC RECORD

Post-Doctoral studies

(Oct 2013-Jan 2015)

In **Bio-Organic Chemistry**, Max-Planck
Institute for Biophysical Chemistry, Göttingen,
Germany

Supervisor: **Prof. Dr. Claudia Hoebartner**

Ph.D.

(Jan 2008-Sep 2013)

In **Bio-Organic Chemistry**, Department of
Chemistry, Indian Institute of Technology
Bombay (IIT Bombay), Mumbai

*Title: "Design, Synthesis, Biophysical, and
Biological Studies of Chemically Modified Small
Interfering RNAs and Damaged DNAs."*

Supervisor: **Prof. Dr. Pradeepkumar, P. I.**

M. Sc.

(July 2005 -June 2007)

In **Organic Chemistry**, Ahmednagar College,
University of Pune, Pune

(73 %, 2nd rank in college)

B.Sc.

(July 2002 -June 2005)

In **Chemistry**, Ahmednagar College, University
of Pune, Pune

(82 %, 1st rank in college)

AWARDS / HONORS

1. Award for Outstanding Contribution and Dedication, Golden Jubilee Ceremony, Department of Chemistry, University of Mumbai, (March 2018).
2. Awarded Ph.D. Guideship Recognition, University of Mumbai (July 2016).
3. DST-INSPIRE Faculty Award from Government of India to pursue the research in RNA Interference field (Aug-2015).
4. Max-Planck Postdoctoral Fellowship, Max Planck Institute for Biophysical Chemistry (MPIBPC), Gottingen, Germany (Oct 2013-Jan 2015).
5. Junior Research Fellowship (JRF) and Senior Research Fellowship (SRF), CSIR-UGC, New Delhi, India (Jan 2008-Sep 2013).
6. Qualified State Eligibility Test (SET) for Lectureship and National Eligibility Test (NET) for Junior Research Fellowship (2007).
7. Dr. M. V. Vaidya Award for securing 1st rank in B.Sc. (Jun-2005).
8. Avatar Meherbaba P.P.C. Trust Merit scholarship (1998 to 2007).

PROFESSIONAL EXPERIENCE

1. DST Inspire Faculty, Department of Chemistry, University of Mumbai (Oct-2015 to Sept-2019).
2. Tutor at SRSI Program, Kings Abdulla University Science and Technology, Saudi Arabia (June-2019 to Aug-2019)
3. Tutor at SRSI Program, Kings Abdulla University Science and Technology, Saudi Arabia (June-2018 to Aug-2018).
4. Group Principal Scientist, Innovassynth Technologies, Khopoli, Mumbai, Maharashtra (Mar-2015 to Oct 2015).
5. Postdoctoral Research Associate, Max Planck Institute of Biophysical Chemistry, Gottingen, Germany (Oct-2013 to Jan-2015).
6. Work Experience as Group Principal Scientist with Innovassynth Technologies, Khopoli, Maharashtra (Mar-2015 to Oct-2015).
7. Teaching Assistantship at Indian Institute of Technology Bombay, Tutor for undergraduate courses CH-103 (Organic Chemistry), CH-117L (General Chemistry)

Laboratory) (Jan 2009-Jun 2010).

8. Work experience at Ranbaxy Research Lab (New Drug Discovery and Research Department) as Trainee Chemist. (Jun 2007-Dec 2007).

AREA OF RESEARCH INTEREST

Broad area of research: **Bioorganic Chemistry**

1. *Chemically modified siRNAs for therapeutic applications*

RNA interference is a naturally occurring gene silencing mechanism that is mediated by RNA. Small interfering RNA (siRNA) is 21-22 nucleotides double-stranded RNA with two nucleotide 3'-overhangs. siRNAs have great potential in therapeutic applications. There are also some challenges associated with siRNA applications like nuclease susceptibility, unwanted binding to off-target due to partial complementarity, activation of unwanted immune responses, and *in vivo* delivery. The rational use of chemical modifications in sugar, nucleobase, and backbone of siRNAs can address most of these challenges.

Our objective is to synthesize chemically modified siRNAs and test their biochemical properties. Our primary goal is to carry out duplex stability study, serum stability study, and gene silencing studies using chemically modified siRNAs (References: *J. Org. chem* 2012, 77, 3233–3245; *Chem. Comm.* 2012, 48, 9619–9621; *J. Org. chem* 2013, 78, 9956–9962). Our research area will also cover broad nucleic acid fields such as synthesis and applications of fluorescent nucleosides in RNA imaging, targeted delivery of chemically modified ASOs and siRNA (Gore, K.R. *et al.*, *Nucleic Acid Therapeutics* 2018, 209–224), synthesis, and biochemical applications of various sugar and base modified novel ASOs and siRNAs.

2. *Design and development of chromogenic sensors for the detection of biologically important molecules.*

We aim to develop fluorescent probes for the rapid and selective detection of environmentally and biologically important molecules.

Fluorescent probe for detection of hydrogen sulfide: H₂S was considered as toxic gas for many years. After a period, along with nitric oxide (NO) and carbon monoxide (CO), H₂S was recognized as endogenously produced gaseous neurotransmitters. Interestingly, H₂S plays an important role in many physiological processes, such as cell growth, vasodilation, anti-

inflammation, and regulation of blood pressure. Intracellular regulation of H₂S is also considered as one of the potential targets for anticancer therapy as it is known to promote tumor angiogenesis and metastasis in certain cancer types. Owing to its complex biological role and its gaseous nature, accurate detection of H₂S is necessary to find out its production and consumption. We are interested in developing fluorescent probes for the detection and discrimination of biothiols (H₂S, Cys, Hcy, GSH, etc.). For this purpose, we designed a probe with an Acryloyl protected GFP chromophore analog (AHBI), which is a completely novel strategy for the detection of H₂S. This strategy will be more advantageous in terms of its high selectivity and sensitivity towards H₂S, rapid response time, low detection limit (1000 fold lower than WHO limit), detects H₂S in complete water and in live cells, high fluorescence stability, etc. (*Gore, K.R. et al. Sens. Actuators B 2019, 298, 126875*).

Fluorescent probe for detection of cyanide: Cyanide is one of the most toxic anions among all the anions and exhibits a strong affinity for the heme unit of cytochrome oxidase. Cyanide is widely used in many industrial applications such as metallurgy, electroplating, fishing, gold mining, production of organic chemicals and polymers, etc. We have developed turn-on fluorescent probe based upon silyl protected modified HBI analog for the detection of cyanide in water, on a solid support, and in living cells (*Gore, K.R. et al. Sens. Actuators B 2018, 265, 257*).

Synthetic Methodology: We are also working on developing new methodologies in the synthesis of chemically modified nucleosides, developing optical probes, etc.

RESEARCH PROJECTS

1. **DST-INSPIRE Faculty Award**, Government of India (Since Aug-2015)

Project Title: **Synthesis and *in vivo* Applications of Modified Small Interfering RNAs**

Funding Agency DST-INSPIRE, Government of India

Amount 35.00 Lakhs

Period Oct 2015-Sep 2020

RESEARCH PUBLICATIONS

1. Synthesis, Gene Silencing, and Molecular Modelling Studies of 4'-C-Aminomethyl-2'-O-Methyl-Modified Small Interfering RNAs. **Gore, K. R.**; Nawale, G. N.; Harikrishna, S.;

- Chittoor, V.; Pandey, S.; Höbartner, C.; Patankar, S.; Pradeepkumar, P.I. *Journal of Organic Chemistry* **2012**, *77*, 3233–3245.
- Incorporation of 4'-C-Aminomethyl-2'-O-Methylthymidine into DNA by Thermophilic DNA Polymerases. Nawale, G. N.; **Gore, K. R.**; Höbartner, C.; Pradeepkumar, P.I. *Chemical Communications* **2012**, *48*, 9619–9621.
 - Influence of 2'-Fluoro versus 2'-O-Methyl Substituent on the Sugar Puckering of 4'-C-Aminomethyl-uridine. **Gore, K. R.**; Harikrishna, S.; Pradeepkumar, P. I. *Journal of Organic Chemistry* **2013**, *78*, 9956–9962.
 - Design, Synthesis, Biophysical and Primer Extension Studies of Novel Acyclic Butyl Nucleic Acid (BuNA). Kumar, V.; **Gore, K. R.**; Pradeepkumar, P. I.; Kesavan, V. *Organic and Biomolecular Chemistry* **2013**, *11*, 5853–5865.
 - Unique Structural Features in DNA polymerase IV Enable Efficient Bypass of the N2 Adduct Induced by the Nitrofurazone Antibiotic. Kottur, J.; Sharma, A.; **Gore, K. R.**; Narayan. N.; Samanta, B.; Pradeepkumar, P. I.; Nair, D. T. *Structure* **2015**, *23*, 56–67.
 - The N2-Furfural Deoxyguanosine (fdG) Adduct Does Not Alters The Structure of B-DNA, Ghodke, P. P.; **Gore, K. R.**; Harikrishna, S.; Samanta, B.; Kottur, J.; Nair, D. T.; Pradeepkumar, P. I. *Journal of Organic Chemistry* **2016**, *81*, 502–511 (Joint First Author).
 - Novel Silylated HBI Analog for Rapid, Selective, and Sensitive Detection of Cyanide in Water and Living Cells. Abhishek L. Mirajkar, Lavanya L. Mittapelli, Ganesh N. Nawale, **Gore, K. R.*** *Sensors and actuators: Chemical B*, **2018**, *265*, 257–263.
 - Journey of siRNA: Clinical Developments and Targeted Delivery. Nikam, R. R., and **Gore, K. R.*** *Nucleic Acid Therapeutics* **2018**, 209–224.
 - A large Stokes shift fluorogen-activating RNA aptamer. Steinmetzger, C. Palaniswamy, N.; **Gore, K. R.**, Höbartner, C. *Chemistry-European Journal* **2019**, *25*, 1931–1935.
 - Towards elucidation of catalytic DNA: an EPR spectroscopic approach on copper (Cu²⁺) binding site (s). Sicoli, G., **Gore, K. R.**, Hoebartner, C., Mouesca, J. M., Gambarelli, S. *Eur. Biophys. J.* *44*, S157–S1576.
 - Microwave Assisted Selective Acetonide Cleavage Involved in Multi-Step Sugar Synthesis: A Greener Approach Over Conventional Synthetic Route. Nikam, R. R. Chavan, A. R., **Gore, K. R.*** *Recent Trends in Chemical and Physical Sciences* **2019**, ISBN: 978-93-5346-273-4.
 - A Novel Green Florescent Protein Analog for Selective and Rapid Detection of H₂S in Water as well as in Living Cells. Lavanya L. Mittapelli, Ganesh N. Nawale, **Gore, K. R.*** *Sensors and actuators: Chemical B* **2019**, *298*, 126875.

MANUSCRIPT UNDER REVIEW/REVISION

13. A Turn-On Fluorescent Dual Chemodosimeter for Ultrasensitive Differential Detection of Fluoride and Cyanide Based Upon Synthetic GFP Chromophore Analog. Lavanya Mittapelli, Ganesh N. Nawale, and **Gore, K. R.***.
14. A mild & convenient approach for selective acetonide cleavage involved in carbohydrate synthesis using PPA-SiO₂: an alternative to conventional synthetic route. Nikam, R. R., and **Gore, K. R.***.

PATENT FILED TO INDIAN PATENT OFFICE

15. Synthesis of *N*²-furfuryl deoxyguanosine phosphoramidite and modified oligonucleotides. **Gore, K. R.**; Nair, D. T.; Pradeepkumar, P. I. (**Granted**, Patent Number 295309).
16. Novel Silylated HBI Analog for Rapid, Selective, and Sensitive Detection of Cyanide in Water and Living Cells. **Gore, K. R.** Lavanya L. Mittapelli, Abhishek L. Mirajkar, Ganesh N. Nawale (**Application number 201821004548**).
17. Highly Selective Detection and Discrimination of H₂S over Cysteine Based Upon Novel Acryloyl GFP Chromophore Analog. **Gore, K. R.** Lavanya L. Mittapelli, Ganesh N. Nawale (**Application number 201821031531**).
18. Distinguishing Fluoride and Cyanide Using Turn-On Fluorescent Chemodosimeter Based Upon Synthetic GFP Chromophore Analog in Polar Protic Solvent. **Gore, K. R.** Lavanya L. Mittapelli, Ganesh N. Nawale (**Application number 201821031530**).

PRESENTATIONS IN CONFERENCES

1. Poster presentation at 6th Junior National Organic Symposium Trust (JNOST) conference, held at the University of Hyderabad, Hyderabad India (Jan 28- 31st, 2011).
2. Poster presentation at *In-House Symposium-2010*, Department of Chemistry, IIT-Bombay, India (Feb. 27, 2010).

- Poster presentation at 3rd Indo-German Symposium on “Frontiers of Chemistry,” Department of Chemistry, IIT-Bombay, India (Sep. 27-28, 2011).
- Poster presentation at “New Horizons in Chemistry” held at the Department of Chemistry, IIT Bombay, India (Oct. 3-4, 2011).
- Oral presentation at *In-House Symposium-2013*, Department of Chemistry, IIT-Bombay, India (Mar. 2, 2013).
- Poster presentation at RDCS-2018, Department of Chemistry, University of Mumbai, India (7-8th march 2018).
- Poster presentation at DST/DBT/CSIR joint Conclave at Hotel Marriott, Jaipur, India (8-10th Jun-2018).
- Oral Presentation at “31st RSM 2019” held at Centre for excellence for basic sciences, University of Mumbai, (8th Feb. 2019).

RESEARCH ACTIVITIES

- No. of M.Sc. Projects (guided- 10, Ongoing- 4); Ph.D. students: 2 (In progress); Summer Internship: 1 (completed)

Sr. No.	Name of Student	Ongoing Ph.D. Students	Year
1.	Rahul Nikam	Synthesis, biochemical and biophysical studies of chemically modified RNA	2015
2.	Lavanya Mittapelli	Design, synthesis and biophysical studies of fluorogenic compounds and their application as a biological sensor	2015
Sr. No.	Name of Student	Title of MSc project guided	Year
1.	Abhishek Mirajkar	Distinguishing “Turn ON” Fluorescent Probe for Detection of Cyanide and Fluoride Anions Using Novel TBDMS Protected Aromatic Substituted HBI Analog	2016
2.	Tanaji Waykule	Preparation of Key Aldol Sugar Precursor for Synthesis of Biologically Important Modified nucleosides Phosphoramidite	2016
3.	Prakash Chaudhary	Preparation of 4'-C-Azidomethyl-2'-O-Acetyl-Uridine Nucleoside Intermediate for Synthesis of Biologically Important Chemically Modified siRNAs	2017

4.	Vidhi Gala	Selective Acetonide Deprotection Using Silica Supported Polyphosphoric Acid and Preparation of Key Aldol Sugar	2017
5.	Ashwini Bhanushali	Distinguishing “Turn ON” Fluorescent Probe For The Detection Of Cyanide And Fluoride Anions In Acetonitrile Using Novel TBDMS Protected Aromatic Substituted HBI Analog	2017
6.	Rupali Prajapati	Distinguishing “Turn ON” Fluorescent Probe For The Detection Of Cyanide And Fluoride Anions In Water Using Novel TBDMS Protected Aromatic Substituted HBI Analog	2017
7.	Chetna Tumade	LiHMDS: Facial, Highly Efficient and Environment-Friendly Catalyst for Transesterification of Benzoate Esters	2018
8.	Prajakta Pise	Synthesis and Conformational Studies of 4'-C-Azidomethyl-2'-O-Ethyl-Uridine nucleoside analogue	2018
9.	Hemant Kesari	A mild & convenient approach for selective acetonide cleavage involved in carbohydrate synthesis using PPA-SiO ₂ : an alternative to conventional synthetic route	2018
10.	Swapnali More	Highly efficient detection of mercury using TPA alkene probe	2018

SEMINARS/LECTURES DELIVERED

1. Delivered a lecture Entitled “Advancements in Nucleic Acids” in the **Refresher course, Department of Chemistry and UGC-HRDC University of Mumbai, Nov-2017**, to the teacher participants in Mumbai University.
2. Delivered a lecture Entitled “*Design, Synthesis, Biophysical, and Biological Studies of Chemically Modified Small Interfering RNAs and Damaged DNAs.*” **at the Department of Chemistry, Max Planck Institute of Biophysical Chemistry, Gottingen Germany, Nov-2013.**
3. Delivered a lecture on Ph.D. research work in **Research and Development division, Innovassynth Technologies, Khopoli, Mumbai.**
4. Delivered a lecture Entitled “Advancements in Nucleic Acids” in the **Refresher course, Department of Chemistry and UGC-HRDC University of Mumbai, Nov-2018**, to the teacher participants in Mumbai University.