

Rajeswara Rao. M

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Research Interests

- ❖ π -Conjugated organic and inorganic compounds for optoelectronics
- ❖ NIR-absorbing and emissive materials
- ❖ Organic fluorescent materials for ion and explosives sensing
- ❖ Polycyclic aromatic hydrocarbons with ground state open shell biradicals
- ❖ π -Conjugated two-dimensional organic polymers

Work experience

- ❖ **Assistant Professor** at IIT Dharwad, Dharwad, India July 2017 - till date
- ❖ **Research associate** at IIT Bombay, Mumbai, India. Jan. 2017 - July 2017
- ❖ **Post-doctoral fellow** at McGill University, Montreal, Canada. Sept. 2013 - Dec. 2016
Advisor: Prof. Dmitrii F. Perepichka
- ❖ **Post-doctoral fellow** at Academia Sinica, Taipei, Taiwan. Sept. 2011 - July 2013
Advisor: Dr. Shih-Sheng Sun
- ❖ **Doctoral student** at IIT Bombay, Mumbai. Jan. 2006 - June 2011
Advisor: Prof. M. Ravikanth
Thesis title: Synthesis and studies of porphyrin and boron-dipyrrromethene (BODIPY) based fluorescent systems.

Scholastic Achievements

- ❖ ***Early Career Research Award (ECRA-SERB)*** for the period 2019-2022.
- ❖ ***IIT Bombay research paper award 2013*** for the highest citations during the period 2005-2013 (Tetrahedron **2010**, *66*, 1728).
- ❖ ***Quebec Merit Post-Doctoral Scholarship*** (PBEEE) for Foreign Nationals; Canada (Sept. 2013- August 2014).
- ❖ ***Eli Lilly Asia Outstanding Thesis Award*** given by the Discovery Chemistry Research and Technologies division at Eli Lilly & Company, Indianapolis, USA, **2011**.
- ❖ ***“Best Oral Presentation Award”*** in National Symposium on “Chemistry of Functional Materials (CFM-09)” Goa, India, **2008**.
- ❖ ***Senior Research Fellowship*** sponsored by Council of Scientific and Industrial Research, India, **2007**.
- ❖ ***Junior Research Fellowship*** sponsored by Council of Scientific and Industrial Research, India, **2005**.
- ❖ ***Citation impact:*** >1600 citations (h-index: 18).
<https://scholar.google.com/citations?hl=en&user=bSmbLv8AAAAJ>

Sponsored research

Sl. No.	PI/ Co-PI	Project Title	Funding Agency	Total Grant (in lakhs)	Status
1	PI	Novel nitrogen incorporated indenofluorenes: An effective structural topology to modulate electronic properties and to develop low band gap polymers and stable ground state open shell biradicals	CSIR	8 Lakhs	On-going
2	Co-PI	Development of resistive sensors for early detection of crop infestation	BITS - BioCyTiH foundation	21 lakhs (42 lakhs for the entire project)	On-going
3	PI	C-H activation derived novel π -conjugated organic electronic compounds for sensing and optoelectronic applications	SERB	~37 Lakhs	Completed
4	PI	Electrochemical sensor for soil health monitoring	Institute	13.5 lakhs	Completed
5	PI	Development of fluorescent and resistive sensors for monitoring the chili crop health via detection of plant emitted volatile organic compounds (VOCs)	NASF-ICAR	~30 lakhs (~75 lakhs for overall project)	Approved

Publications

- ❖ 40. Raj, K. A., Joshi, S., Ghosh, R.* and **Rajeswara Rao, M.*** Structural tailoring of semiconducting tetrazine polymers based immobilizing matrix for superior electronic biosensing of carcinoembryonic antigen *Polym. Adv. Technol.* **2023**, *Just accepted*.
- ❖ 39. Laxman, K., Che, Y.; Raj, K. A.; Perepichka, D. F.* and **Rajeswara Rao, M.*** Trifluoroacetic acid promoted unexpected visible to NIR switching of ketoenamine-substituted triphenylamines. *J. Mater. Chem. C.* **2023**, *11*, 2680-2687.
- ❖ 38. Bai, M. G. M.; Atul, B. N.; and **Rajeswara Rao, M.*** Selectively sensing amines through aldehyde-functional conjugated microporous organic polymers via Pd-catalysed direct arylation. *Polymer. J.* **2023**, *55*, 133-140.
- ❖ 37. Bai, M. G. M.; Babu, H. V.; V. Lakshmi* and **Rajeswara Rao, M.*** Acid-modulated synthesis of novel p-conjugated microporous polymers for efficient metal-free photocatalytic hydrogen production. *Chem. Eur. J.* **2022**, *28*, e202202023.
- ❖ 36. Raj, K. A., Guru parsad, G.; Ghosh, R.* and **Rajeswara Rao, M.*** Tetrazine based 1D-Polymers for Selective Chemiresistive Sensing of Nitrogen Dioxide via Interplay of Hydrogen bonding and N-heteroatom interactions, *Polymer. J.* **2022**, *54*, 1191-1201
- ❖ 35. Joshi, S., Raj, K. A., **Rajeswara Rao, M.*** and Ghosh, R.* An electronic biosensor based on semiconducting tetrazine polymer immobilizing matrix coated on rGO for carcinoembryonic antigen. *Sci. Rep.* **2022**, *12*, 3006:1–14.
- ❖ 34. Bai, M. G. M.; Babu, H. V.; V. Lakshmi* and **Rajeswara Rao, M.*** Structure–property–function relationship of fluorescent conjugated microporous polymers. *Mater. Chem. Front.* **2021**, *5*, 2506.
- ❖ 33. G. Galeotti, F. De Marchi, E. Hamzehpoor, O. MacLean, **M. Rajeswara Rao**, Y. Chen, L. V. Besteiro, D. Dettmann, L. Ferrari, F. Frezza, P. M. Sheverdyeva, R. Liu, A. K. Kundu, P. Moras, M. Ebrahimi, M.C. Gallagher, F. Rosei, D.F. Perepichka, G. Contini. Synthesis of mesoscale ordered 2D p-conjugated polymer with semiconducting properties *Nature. Mater.* **2020**, *19*, 874.
- ❖ 32. Lakshmi, V.; Liu, C.-H.; **Rajeswara Rao, M.**; Chen, Y.; Yuan, F.; Hamzehpoor, E.; Sakai-Otsuka, Y.; Stein, R. S.; Perepichka, D. F. A two-dimensional poly (azatriangulene) covalent organic framework with semiconducting and paramagnetic state *J. Am. Chem. Soc.* **2020**, *142*, 2155.
- ❖ 31. De Marchi, F.; Galeotti, G.; Simenas, M.; Gallagher, M.; Hamzehpoor, E.; MacLean, O.; **Rajeswara Rao, M.**; Chen, Y.; Dettmann, D.; Contini, G.; Tornau, E.; Ebrahimi, M.; Perepichka, D. F.; Rosei, F. Temperature induced Molecular reorganization on Au(111) driven by oligomeric Defects *Nanoscale* **2019**, *11*, 19468

- ❖ 30. Babu, H. V.; Bai, M. G. M. and **Rajeswara Rao, M.*** Functional π -Conjugated Covalent Organic Frameworks *ACS Appl. Mater. Interfaces* **2019**, *11*, 11029.
- ❖ 29. Isar, P.; **Rajeswara Rao, M.**; Ravikanth, M. “Synthesis, Characterization, Sensing and Coordination Properties of Trans-Homoporphyridimethenes” *Eur. J. Org. Chem.* **2018**, (Just Accepted).
- ❖ 28. Kumar. S.; **Rajeswara Rao, M.**; Ravikanth, M. “Stable Core-modified Doubly N-confused Expanded Dibenzo porphyrinoids” *J. Org. Chem.* **2018**, *83*, 1584.
- ❖ 27. Alka, A.; Pareek, Y.; Shetti, V. S.; **Rajeswara Rao, M.**; Theophall, G. G.; Lee, W. Z.; Lakshmi, K. V.; Ravikanth, M. “Construction of Novel Cyclic Tetrads by Axial Coordination of Thiaporphyrins to Tin(IV)Porphyrins” *Inorg. Chem.* **2017**, *56*, 13913.
- ❖ 26. Kumar, A.; **Rajeswara Rao, M.**; Lee, W. Z.; Ravikanth, M. “Hybrid Macrocycles of Subporphyrins and Triphyrins” *Org. Lett.* **2017**, *19*, 5924.
- ❖ 25. Sharma, R.; **Rajeswara Rao, M.**; and Ravikanth, M. “a-Pyrrolyl Dipyrins as Suitable Ligands for Coordination chemistry” *Coord. Chem. Rev.* **2017**, *348*, 92.
- ❖ 24. Lijia. L; Filip. P; **Rajeswara Rao, M**; and Perepichka, D. F.* “A Wide Bandgap Naphthalene Semiconductor for Thin-film Transistors” *Adv. Electron. Mater.* **2017**, *3*, 1600556.
- ❖ 23. **Rajeswara Rao, M**; Fang, Y.; DeFeyter, S. and Perepichka, D. F.* “Conjugated Covalent Organic frameworks via Michael Addition-Elimination” *J. Am. Chem. Soc.* **2017**, *139*, 2421.
- ❖ 22. **Rajeswara Rao, M**; Johnson, S.; and Perepichka, D. F.* “Aromatization of Benzannulated Perylene-8,16-diones: Photophysical Properties and Reactivity” *Org. Lett.* **2016**, *18*, 3574-3577.
- ❖ 21. **Rajeswara Rao, M**; Black, H. T.; and Perepichka, D. F.* “Synthesis and divergent electronic properties of two ring-fused derivatives of 9,10-diphenylanthracene” *Org. Lett.* **2015**, *17*, 4224-4227.
- ❖ 20. **Rajeswara Rao, M**; Desmecht, A and Perepichka, D. F.* “ π -Extended indenofluorenes” *Chem. Eur. J.* **2015**, *21*, 6193-6201.
- ❖ 19. Chia-Wei Liao; **Rajeswara Rao, M** and Shih-Sheng Sun,* “Structural diversity of new solid-state luminophores based on quinoxaline- β -ketoiminate boron difluoride complexes with remarkable switching properties” *Chem. Commun.* **2015**, *51*, 2656-2659.

- ❖ 18. Lakshmi, V; **Rajeswara Rao, M** and Ravikanth, M,* “Halogenated Boron-dipyrromethenes: Synthesis, Properties and Applications” *Org. Biomol. Chem.* **2015**, 13, 2501-2517.
- ❖ 17. Kaur, T; **Rajeswara Rao, M** and Ravikanth, M,* “Multi-porphyrin arrays on cyclotriphosphazene scaffolds” *Inorg. Chem.* **2014**, 53, 11051-11059.
- ❖ 16. **Rajeswara Rao, M** and Shih-Sheng Sun,* “Supramolecular assemblies amide-derived organogels featuring rigid π -conjugated phenylethynyl frameworks” *Langmuir* **2013**, 29, 15146-15158 (Invited Feature article).
- ❖ 15. **Rajeswara Rao, M.**; Chia-Wei Liao and Shih-Sheng Sun,* “Structurally simple thienodipyrandione-containing reversible fluorescent switching piezo- and acido-chromic materials” *J. Mater. Chem. C* **2013**, 1, 6386-6394.
- ❖ 14. **Rajeswara Rao, M.**; Chia-Wei Liao.; Wei-Lin Su and Shih-Sheng Sun,* “Quinoxaline based D-A-D molecules: high contrast reversible solid-state mechano- and thermo- responsive fluorescent materials” *J. Mater. Chem. C* **2013**, 1, 5491-5501.
- ❖ 13. **Rajeswara Rao, M** and Ravikanth, M,* “Synthesis of functionalized core-modified sapphyrins and covalently linked porphyrin-sapphyrin dyads” *Tetrahedron* **2012**, 68, 1306-1314.
- ❖ 12. Khan, T. K.; Jana, S. K.; **Rajeswara Rao, M.**; Shaikh, M. S. and Ravikanth, M.* “Synthesis and electronic properties of meso-furyl boron-dipyrromethenes” *Inorg. Chim. Acta* **2012**, 383, 257-266
- ❖ 11. **Rajeswara Rao, M.**; Manu T. T, Suresh, B. and Ravikanth, M.* “Synthesis of BF₂ complexes of prodigiosin type oligopyrroles” *J. Org. Chem.* **2011**, 76, 7263-7268.
- ❖ 10. **Rajeswara Rao, M.** and Ravikanth, M.* “Boron complexes of oxasmaragdyrin, a core-modified expanded porphyrin” *J. Org. Chem.* **2011**, 76, 3582-3587.
- ❖ 9. Madhu, S.; **Rajeswara Rao, M.**; Shaikh, M. S. and Ravikanth, M.* “3, 5-Diformyl Boron-dipyrromethenes as Fluorescent pH sensors” *Inorg. Chem.* **2011**, 50, 4392-4400.
- ❖ 8. **Rajeswara Rao, M.**; Ghosh, A. and Ravikanth, M.* “Synthesis, spectral and electrochemical properties of cyclotriphosphazene appended with six metalloporphyrins” *Inorg. Chim. Acta* **2011**, 372, 436-441.
- ❖ 7. **Rajeswara Rao, M.** and Ravikanth, M.* “Synthesis and anion binding studies of covalently linked porphyrin-expanded heteroporphyrin dyads” *Eur. J. Org. Chem.* **2011**, 1335-1345.

- ❖ 6. Khaderbad, M. A.; Roy, U.; Yedukondalu, M.; **Rajeswara Rao, M.**; Ravikanth, M.* and Rao, V. R. “Variable interface dipoles of metallated porphyrin self-assembled monolayers for metal-gate work function tuning in advanced CMOS technologies” *IEEE Transactions on Nanotechnology* **2010**, 9, 335-337.
- ❖ 5. Khan, T. K.; **Rajeswara Rao, M.** and Ravikanth, M.* “Synthesis and photophysical properties of 3,5-bis(oxopyridinyl)- and 3,5-bis(pyridinyloxy)-substituted boron-dipyrromethenes” *Eur. J. Org. Chem.* **2010**, 2314-2323.
- ❖ 4. **Rajeswara Rao, M.**; Pavan Kumar, K. V. and Ravikanth, M.* “Synthesis of boron-dipyrromethene ferrocene conjugates” *J. Organomet. Chem.* **2010**, 695, 863-869. (Featured in top 25 hottest articles list for JOMC during Jan to March 2010)
- ❖ 3. **Rajeswara Rao, M.**; Mobin, S. M. and Ravikanth, M.* “Boron-dipyrromethene based specific chemodosimeter for fluoride ion” *Tetrahedron* **2010**, 66, 1728-1734. (Received IIT Bombay highest citation research paper award 2013)
- ❖ 2. **Rajeswara Rao, M.**; Bolligarla, R.; Butcher, R. J. and Ravikanth, M.* “Hexa boron-dipyrromethene cyclotriphosphazenes: Synthesis, crystal structure, and photophysical properties” *Inorg. Chem.* **2010**, 49, 10606-10616.
- ❖ 1. **Rajeswara Rao, M.**; Gayatri, G.; Amit, K.; Sastry, G. N.* and Ravikanth, M.* “Cyclotriphosphazene ring as a platform for multiporphyrin assemblies” *Chem. Eur. J.* **2009**, 15, 3488-3496.

Book chapters

- ❖ 1. Aswani Raj and **Rajeswara Rao*** Crystalline Two-dimensional Organic Porous Polymers (Covalent Organic Frameworks) for Photocatalysis Book title: Material Science in photocatalysis” Elsevier publishing, **2021**
- ❖ 2. **Rajeswara Rao, M.** and Shih-Sheng Sun.* “Supramolecular assemblies of organogels featuring π -conjugated framework with long-chain dicarboxamides” Chapter, Pan Stanford Publishing, **2012**.

Patents

- ❖ 1. **Rajeswara Rao, M.** and Ravikanth, M.* “A simple method for the synthesis of biocompatible 3-pyrrolyl boron-dipyrromethenes” [Indian patent, 2011](#) (File no: 1443/mum/2011).
- ❖ 2. Joshi, S., Raj, K. A., **Rajeswara Rao, M.*** and Ghosh, R.* An electronic biosensor for detection of carcinoembryonic antigen [Indian patent, 2022](#) (File no: 202141055870).

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