CURRICULUM VITAE

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Summary

I have research experience in the field of Porphyrin Chemistry, particularly in the synthesis of *Meso*-and *β*-functionalized porphyrins and their utilization in **anion sensing**, **DSSC**, **catalysis** and **nonlinear optics (NLO)**.

Research Experience

- Developed novel synthetic routes for ***β*-functionalized porphyrins** (added 45 new porphyrin derivatives to porphyrin chemistry) **with mixed substituent pattern** *via* modified bromination, nitration, formylation procedures; modified Suzuki, Stille and Sonogashira coupling reactions. Characterized all by the combined use of various spectroscopic techniques as well as single crystal XRD analysis. The synthesized *β*-functionalized push-pull derivatives can be used for **Non-Linear Optical (NLO) Applications.**
- Synthesized five highly electron deficient ***β*-substituted Ni(II) porphyrins and utilized as reversible chemosensors** for rapid **'naked-eye' detection of cyanide ions** with extremely high binding constants (10^{16} - 10^{8} M^{-2}) and detection limit < 0.11 ppm. Explored their applicability as practical visible colorimetric test kits for CN^- ions in an aqueous and non-aqueous media. (***One of the most accessed article in the RSC website during April 2015)***
- Ten efficient, scalable, stable and cost effective '**Push-Pull' Zn(II)-porphyrin based sensitizers** with various donor groups have been synthesized through shortest possible synthetic route without the use of expensive Pd-catalysed coupling reactions for the practical commercialization as **Dye-Sensitized Solar Cells (DSSCs).** The maximum power conversion efficiencies (η) of DSSCs based on these dyes are in the range of 5.3% to 7.11% under 1 sun illumination and highly dependent on donor strength of appended moiety.
- Highly electron deficient and severely nonplanar saddle shaped ***β*-Octachloro-*meso*-tetraphenylporphyrinato oxovanadium(IV)** ($VOTPPCl_8$) was synthesized and utilized as reversible **selective epoxidation catalyst for olefins** with very high TOF numbers (6566-9650 h^{-1}) in presence of H_2O_2 as an oxidant and $NaHCO_3$ as promoter in CH_3CN/H_2O mixture.
- **Electron deficient *β*-phenylethynyl substituted porphyrins** were synthesized through modified Stille coupling reactions. We unveiled the profound solvatochromism with enhanced nonradiative rate constants (*k*nr) upon *β*-phenylethynyl substitution which indicate intramolecular charge transfer (ICT) from porphyrin core to phenyethynyl moieties
- Developed facile synthetic route and studied electrochemical properties of **Diethoxyphosphorylphenyl Substituted Porphyrins.**

Academic Qualifications

PhD	Indian Institute of Technology Roorkee, India Thesis Title**:** "**Synthesis and Applications of *β*- and *Meso*-Substituted Porphyrins"** (CGPA **8.8** out of 10 in course work)			**2015**
M.Sc	**University of Jammu**	**72%**	**I Division**	**2011**
B.Sc	**University of Jammu**	**77%**	**Distinction**	**2009**

Postdoctoral research Experience

July, 2015 to Dec, 2015 – **Postdoctoral Fellow IITR, India**
Research area: Synthesis of Novel Pull-Pull Porphyrins for DSSCs Applications

2016 - Postdoctoral Fellow at **Institute of Chemistry, Academia Sinica, Taiwan**
Research area: Synthesis of Fluorinated Porphyrins for diverse Applications

2017- Postdoctoral researcher at **Kangwon National University**, **South Korea**
Research area: Synthesis of Novel *Meso*-Alkylidine Porphyrins for supramolecular Applications

Teaching Experience

Assistant Professor, Government Degree College Udhampur, University of Jammu **April 2017 – October 2018**

Current Position: Assistant Professor, Department of Chemistry, National Institute of Technology Srinagar, Jammu and Kashmir, 190006, India

https://www.nitsri.ac.in/Department/Department_FacultyProfile.aspx?nEmpID=ega&nDeptID=s

Awards and Fellowships

1) Recipient of Senior Research Fellowship (SRF) from Ministry of Human Resource Development (MHRD), Govt. of India since January **2014** to June **2015**.
2) Received Junior Research Fellowship (JRF) from MHRD, Govt. of India during January **2012** to January **2014**.
3) Qualified **CSIR-UGC National Eligibility Test** in Chemistry, December **2012** and December **2010**.
4) Recipient of **SPP Student Assistance Grant** to aid with the cost of registration to attend the Eighth International Conference of Porphyrins and Phthalocyanines **(ICPP-8), June 22-27, 2014, in Istanbul, Turkey.**
5) **CAS Registry Innovator Award by American Chemical Society** for Innovation of **20 Porphyrin Molecules, Year 2020.**

Publications: 20 International Journals

Publications

1. **R. Kumar** and M. Sankar, "Synthesis, spectral and electrochemical studies of electronically tunable *β*-substituted porphyrins with mixed substituent pattern", *Inorg. Chem.*, **2014**, *53*, 12706-12719.

2. **R. Kumar**, N. Chaudhri, and M. Sankar, "Ratiometric and colorimetric "naked eye" selective detection of CN^- ions by electron deficient Ni(II) porphyrins and their reversibility studies", *Dalton Trans*., **2015**, *44*, 9149-9156 (***One of the most accessed article in the RSC website during April 2015)***.

3. **R. Kumar**, P. Yadav, A. Kumar and M. Sankar, "Facile synthesis and electrochemical studies of diethoxyphosphorylphenyl substituted porphyrin and metal complexes", *Chem. Lett.*, **2015**, *44*, 914-916.

4. **R. Kumar**, N. Choudhary, M. Sankar and M. R. Maurya, "Electron Deficient Nonplanar *β*-Octachlorovanadylporphyrin as Highly Efficient and Selective Epoxidation Catalyst for Olefins" *Dalton Trans*., **2015**, *44*, 17720-17729.

5. **R. Kumar**, P. Yadav, P. Rathi and M. Sankar, "Photophysical, electrochemical redox, solvatochromism and anion sensing properties of *β*-tetra- and -octaphenylethynyl substituted *meso*-tetraphenylporphyrins" *RSC Adv*. **2015**, *5*, 82237-82246**.**

6. K. Praksh**, R. Kumar** and M. Sankar, "Mono- and Tri-*β*-Substituted Unsymmetrical Metalloporphyrins: Synthesis, Spectral and Electrochemical Properties**"** *RSC Adv*. **2015**, *5*, 66824-66832**.**

7. **R. Kumar**, M. Sankar, V. Sudhakar and K. Krishnamoorthy, "Simple Cost-effective *Trans*-A_2BC-porphyrins with Various Donor Groups for Dye-Sensitized Solar Cells" *New J. Chem.* **2016**, *40*, 5704-5713.

8. **R. Kumar**, A. Saxena and M. Sankar, "Mixed *β*-Bromo/Cyano Tetrasubstituted-*meso*-tetraphenylporphyrin Cu(II) Complexes: Synthesis and Electrochemical studies" '*J. Porphyrins Phthalocynines* **2016**, *20*, 1-6.

9. X. Ke, P. Yadav, L. Cong, **R Kumar**, M. Sankar and K. M. Kadish, "Facile and Reversible Electrogeneration of Porphyrin Trianions and Tetraanions in Nonaqueous Media" *Inorg. Chem.*, **2017**, *56*, 8527-8537.

10. P. Yadav, **R. Kumar**, A. Saxena, R. J. Butcher and M. Sankar, "*β*-Trisubstituted 'Push-Pull′ Porphyrins: Synthesis, Structural, Photophysical and Electrochemical Redox Properties" '*Eur. J. Inorg. Chem*, **2017**, 3269–3274.

11. R. Dutta, D. Firmansyah, J. Yoo, **R. Kumar**, E. Mulugeta, H. Jo, K. M. Ok and C.-H. Lee, "BF_2-Complexes of Carbazole–Benzimidazole Conjugates: Synthesis, Structures, and Spectroscopic Properties", *Bull. Korean Chem. Soc*. **2017**, 38, 1163-1168.

12. **R. Kumar**, V. Sudhakar, K. Krishnamoorthy and M. Sankar, "Tuning the photovoltaic performance of dye-sensitized solar cells by appending various donor groups on Tuning of photovoltaic performance of dye-sensitized solar cells by appending various donor groups on *trans*-dimesityl porphyrin backbone" *ACS Appl. Energy Mater*. **2018,** *1*, 2793-2801.

13. S.-J. Hong, R. Dutta, **R. Kumar**, Q. He, V. M. Lynch, J. L. Sessler and C.-H. Lee, *"meso*-Alkylidenyl dibenzihexaphyrins: synthesis and protonation studies", ***Chem. Commun***., **2019**, 55, 9693-9696.

14. M Verma, A Kumar, KP Singh, R Kumar, V Kumar, CM Srivastava, "Graphene oxide-manganese ferrite (GO-MnFe2O4) nanocomposite: One-pot hydrothermal synthesis and its use for adsorptive removal ofPb2+ions from aqueous medium", 2020, 315, 113769, JUL, 2020.

15. M. Singh, D. Vaya, R. Kumar, B. Dass," Role of EDTA capped cobalt oxide nanomaterial in photocatalytic degradation of dyes", *J. Serb. Chem. Soc*., 2021, 86, 327, MAR, 2021

16. M. Verma, I. Lee, S. Sharma, **R. Kumar**, V. Kumar, H. Kim," Simultaneous removal of heavy metals and ciprofloxacin micropollutants from wastewater using ethylenediaminetetraacetic acid-functionalized ß-cyclodextrin-chitosan adsorbent", ***ACS Omega***, 2021, 6, 34624., DEC, 2021.

17. I. A. Lone and **R. Kumar**," Exploring the Electronic Influence of ß-Br Substitutions in CuTPP on Electrochemical Overall Water Splitting in Alkaline Medium", ***Chemistry Select***, 2022, 12, e202202765., DEC, 2022

18. W. Arif and **R. Kumar**, Regioselective 2,3-Disubstituted Porphyrins: Synthesis, Spectral, Structural and Electrochemical Properties, ***New Journal of Chemistry***, 2023 (accepted).

19. I. A. Lone, S. Ur Rehman, **R. Kumar** and S. A. Shah, "Porphyrin-based Conjugated Microporous Adsorbent Material for the efficient Remediation of Hexavalent Chromium from the Aquatic Environment", **Environ. Sci. Pollut. Res., 2023** (accepted).

Presentations at International/National Conferences: 18

Visited Turkey, Taiwan, China, SouthKorea

Research Interests:

Synthetic Porphyrin Chemistry, Supramolecular Chemistry, Dye-Sensitized Solar Cells, Catalysis, Non-Linear Optics

Administrative Experience

Position	Period	Institution	Nature of work
Warden	29-11-2023 – Present	Department of Chemistry, National Institute of Technology (NIT), Srinagar, J&K, INDIA	PG Block Hostel affairs
Departmental Website Coordinator	04-03-2020 – Present	Department of Chemistry, National Institute of Technology (NIT), Srinagar, J&K, INDIA	Uploading Departmental notices on Webpage
Member Research Committee	04-03-2020 – Present	Department of Chemistry, National Institute of Technology (NIT), Srinagar, J&K, INDIA	Observing and Managing Research activities at the Departmental level
Member NIRF Ranking Committee	27-09-2021 – Present	National Institute of Technology (NIT), Srinagar, J&K, INDIA	Data collection related to Graduation Outcome

Research Guidance

NPDF - 01

PhD Ongoing – 04

MSc Ongoing – 02, Completed - 01

Sponsored Research Projects

Ongoing 01, Funding Agency – DST SERB, Project **Cost - 39.2 Lakh INR**

Reviewing Activity

Reviewer for 1) Journal of Physical Chemistry Letters **(American Chemical Society)**

2) New Journal of Chemistry **(Royal Society of Chemistry)**

Conference/Workshop/STC Organized:

Sr. No.	Role	Category of Programme	Title of Programme	Duration
1.	Coordinator	Short Term Course (STC)	Recent Advances in Chemical Sciences (RACS-2019)	05 Days (08-07-2019 – 12-07-2019)