

# WRITE-UP FOR PMR FELLOWSHIP FROM NOV 2023- NOV 2024

## External Teaching Assistantship: Sri Venkateswara College of Engineering, Tirupati

- Modern Engineering Materials
- Structure and Bonding Models
- Instrumental Methods and Applications

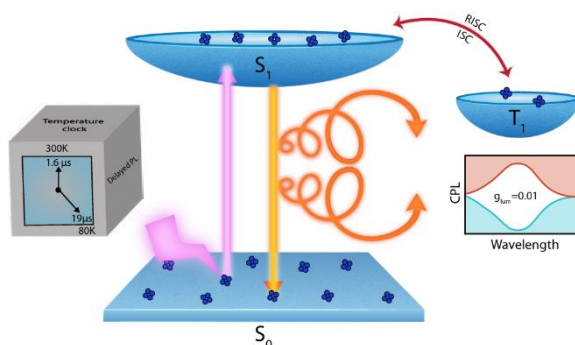
## Achievements

- *Best Poster Award* by ACS Publications in the International Conference on “*Emerging Trends in Supramolecular Science & Technology*” (March 7-8<sup>th</sup>, 2024; SRM University, Andhra Pradesh)

## Research Progress

### Chapter 1: Biomolecule-Assisted Circularly Polarized Thermally Activated Delayed Luminescence in Copper Iodide Hybrid Clusters

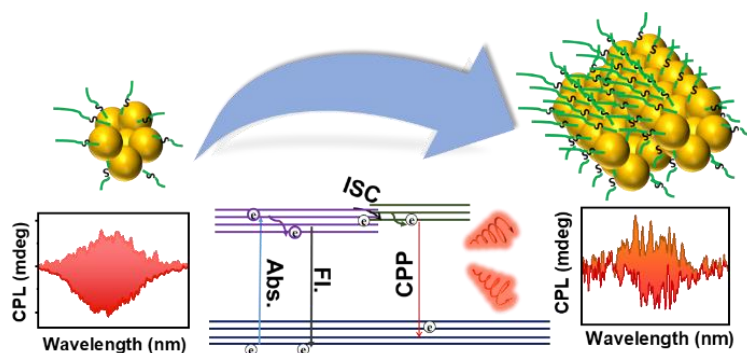
We report the synthesis and chiral analysis of enantiomerically pure copper-iodide clusters exhibiting strong optical activity in both ground and excited states. Using L- and D-isomers of a chiral ligand yielded metal clusters with mirror-image circular dichroism and circularly polarized luminescence signals. Structural validation through single-crystal XRD, powder XRD, and XPS, supported by chiroptical and computational studies, established a distinct structure–property relationship. Photoluminescence studies revealed long excited-state lifetimes, with the rare occurrence of circularly polarized thermally activated delayed luminescence. These chiral emissive properties were demonstrated in free-standing polymeric films, highlighting potential applications in data encryption, security tags, and polarized light-emitting devices. This work also offers key insights into excited-state chirality in copper clusters, encouraging further exploration of similar effects in other metal systems.



*Scheme illustrating circularly polarized thermally activated delayed luminescence in copper iodide clusters.*

## Chapter 2: Optically Active Dual-emissive Gold Nanoclusters Featuring Circularly Polarized Phosphorescence

Enantiomerically pure gold nanoclusters with dual-emission properties, encompassing both fluorescence and phosphorescence, were synthesized using a straightforward and efficient method. Detailed investigations revealed that the triplet-state emission exhibited chiral luminescence, leading to circularly polarized phosphorescence observable in both solution and solid states. The nanoclusters also demonstrated aggregation-induced emission (AIE), where the emission intensity was significantly enhanced upon aggregation. Notably, the aggregated nanoclusters retained and amplified their chiral characteristics, resulting in pronounced circularly polarized phosphorescence. These findings highlight the potential of such nanoclusters for applications in chiral optoelectronics, sensing, and display technologies.



*Scheme illustrating circularly polarised phosphorescence in monomeric and aggregated states of gold clusters.*

## Chapter 3: Intrinsically Chiral Nanocluster Assemblies with Enhanced Emission and Optical Activity

A straightforward approach has been performed for the synthesis of inherently chiral nanocluster assemblies by the incorporation of a chiral dopant during the synthesis of negatively charged achiral clusters, exhibiting improved luminescence and optical activity.

### Publications (Nov 2023- Nov 2024)

1. Dual Emissive Optically Active Gold Nanoclusters Endowed with Circularly Polarized Phosphorescence  
**Camelia Dutta**, Sonia Maniappan, Jatish Kumar\*  
*Chem. Commun.* 59, 13735–13738 (2023)
2. Chiroptically Active Copper Clusters as Platform for Enantioselective Detection of Lysine  
**Camelia Dutta**, Ragul Vivaz Nataraajan, Jatish Kumar\*

*Chirality* 36, e23670 (2024)

3. Engineering Copper Plasmonic Chirality via Ligand-Induced Dissolution for Enantioselective Recognition of Amino Acids  
Sonia Maniappan, **Camelia Dutta**, Arunima Cheran, Diego M. Solís, Jatish Kumar\*  
*Chem. Sci.* 15, 7121–7129 (2024)
4. Binaphthalene Assisted Axial Chirality in Porphyrins: Towards Solid State Circularly Polarized Luminescence from Self-Assembled Nanostructures  
Ashok Jadhav,<sup>‡</sup> Arunima Cheran,<sup>‡</sup> **Camelia Dutta**, Betsy Marydasan, Jatish Kumar\*  
*J. Phys. Chem. Lett.* 15, 8125–8132 (2024)
5. Aggregation induced generation of circularly polarized luminescence in naphthaleneimide-based nanostructures with high dissymmetry factor  
Aakash Ravikant Likhari,<sup>‡</sup> Arunima Cheran,<sup>‡</sup> Alisha Sengupta, **Camelia Dutta**, Jatish Kumar, Deepak Asthana\*  
*Chem. Commun.* 60, 9022-9025 (2024)
6. Engineering Host-Guest Interactions to Drive Enhanced and Tunable Chiral Emission in Achiral Porphyrin Nanostructures  
Ashok Jadhav, Arunima Cheran, **Camelia Dutta**, Praveen Kumar, Ravi Kumar Pujala, Jatish Kumar\*  
*ACS Mater. Lett.* (2024, *In Press*)
7. Intrinsically Chiral Thermoresponsive Assemblies from Achiral Clusters: Enhanced Luminescence and Optical Activity through Tailor-made Chiral Additives  
**Camelia Dutta**, Ragul Vivaz Nataraajan, Jatish Kumar\*  
*Chem. Sci.* (*Manuscript under Revision*)