

Design of multiresonance thermally activated delayed fluorescence materials for high-performance organic light-emitting diodes

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A grand challenge in emitter design for OLEDs is to develop bright materials that emit at the industry targeted deep blue color point and use translates into efficient and stable blue devices. This requires the emitter to be narrowband emissive in the deep blue, be very bright and be able to have short exciton lifetimes to mitigate undesired biexcitonic degradation pathways like singlet-triplet and triplet-triplet annihilation. In this presentation, I will discuss our recent efforts to towards the design of multiresonant TADF emitters that meet all of these design criteria simultaneously, and demonstrate their potential in OLEDs.

1. *Adv. Mater.* **2018**, 29, 1605444.
2. *Nature Commun.* **2019**, 10, 597.
3. *Adv. Funct. Mater.* **2020**, 30, 1908677.
4. *J. Am. Chem. Soc.* **2020**, 142, 6588.
5. *Angew. Chem. Int. Ed.* **2022**, 61, e202213697.
6. *J. Mater. Chem. C* **2022**, 10, 4861.
7. *Chem. Sci.* **2022**, 13, 1665.
8. *J. Mater. Chem. C* **2023**, 11, 8263.
9. *Angew. Chem. Int. Ed.* **2023**, 62, e202215522.
10. *Chem. Rev.* **2024**, 124, 13736 (REVIEW).
11. *Adv. Mater.* **2024**, 36, 2412761.
12. *Adv. Opt. Mater.* **2024**, 2402576.
13. *Adv. Funct. Mater.* **2024**, 34, 2470279.
14. *Adv. Funct. Mater.* **2024**, 34, 2402036.
15. *Chem. Sci.* **2024**, 15, 18022.



Eli Zysman-Colman obtained his PhD from McGill University in 2003 under the supervision of Prof. David N. Harpp as an FCAR scholar, conducting research in physical organic sulfur chemistry. He then completed two postdoctoral fellowships, one in supramolecular chemistry with Prof. Jay Siegel at the Organic Chemistry Institute, University of Zurich as an FQRNT fellow and the other in inorganic materials chemistry with Prof. Stefan Bernhard at Princeton University as a PCCM fellow. He joined the department of chemistry at the Université de Sherbrooke in Quebec, Canada as an assistant professor in 2007. In 2013, he moved to the University of St Andrews in St Andrews, UK, where he is presently Professor of Optoelectronic Materials, Fellow of the Royal Society of Chemistry, holder of an EPSRC open fellowship and the inaugural holder of the St Andrews innovation fellowship. He is a past holder of a Royal Society Leverhulme Trust Senior Research Fellowship. His research program focuses on the rational design of: (I) materials for organic light emitting diode (OLED) and light-emitting electrochemical cell (LEEC) device architectures; (II) sensing materials; (III) optical imaging agents; and (III) photocatalyst development for use in organic synthetic reactions. He published ca. 290 papers, with over 11,000 citations, h-index 51.