

Master's Thesis project

Synthesis and characterization of molecular thermometers showing (sub)microsecond TADF-emission

Scientific background

Thermally activated delayed fluorescence (TADF) is a type of luminescence with intermediate properties between fluorescence and phosphorescence.^[1] In the last decade, many purely organic dyes and metal complexes that emit TADF have been synthesised and investigated in context of application in OLED technology. Recently, it was shown that TADF materials display *temperature-dependent emission behaviour* and are very promising *molecular thermometers* relying on self-referenced read-out via *luminescence decay time*.^[2,3]



What we offer

The main goal will be the synthesis and characterisation of *bright TADF-emitting dyes* with short emission lifetimes (several μs and ideally $< 1 \mu\text{s}$) that will enable *lifetime-based temperature imaging* with negligible oxygen cross-talk and using widespread imaging equipment. In this thesis, you will become familiar with experimental techniques used for the synthesis and characterization of TADF-emitting organic dyes. You will also gain knowledge of luminescent materials and their characterization.

Requirements

Study programme: Chemistry or Technical Chemistry, good synthesis skills (Schlenk line), self-organized and independent way of work, experience in fluorescence spectroscopy is a plus.

Terms

Duration of practical work: 6 months **Starting date:** now **Payment:** 440 €/month

Contact

Assoc.Prof. Sergey Borisov
Institute of Analytical Chemistry and Food Chemistry
Stremayrgasse 9, 8010 Graz
E-Mail: sergey.borisov@tugraz.at

References

- [1] Z. Yang, Z. Mao, Z. Xie, Y. Zhang, S. Liu, J. Zhao, J. Xu, Z. Chi, M. P. Aldred, *Chemical Society reviews* **2017**, *46*, 915.
- [2] A. Steinegger, S. M. Borisov, *ACS Omega* **2020**, *5*, 7729.
- [3] A. Steinegger, I. Klimant, S. M. Borisov, *Advanced Optical Materials* **2017**, *5*, 1700372.