

## Phosphorescence and triplet lasing in organic and organometallic systems

Lopa Paul<sup>1</sup>, Swapan Chakrabarti<sup>1</sup> and Kenneth Ruud<sup>2</sup>

<sup>1</sup> *Department of Chemistry, University of Calcutta A.P.C. Road, Kolkata 700 009, India*

<sup>2</sup>*Hylleraas Centre for Quantum Molecular Science, Department of Chemistry, University of Tromsø – The Arctic University of Norway, 9037 Tromsø, Norway*

*E-mail: kenneth.ruud@uit.no*

In the talk, I will describe some of our recent work on unraveling the microscopic origin of triplet-state emission properties, with particular focus on the applications to anomalous white-light phosphorescence [1], ultralong phosphorescence lifetimes in organic molecules [2] and triplet lasing from organic solids [3]. We use electronic structure calculations and consider both radiative and non-radiative relaxation mechanisms in order to compare with experimental observations and to unravel the origins of the experimental observations. We demonstrate that the observed white-light phosphorescence observed in an organometallic complex is a consequence of non-Kasha behavior, whereas the ultralong phosphorescence lifetime observed in an organic compound is a consequence of aggregation effects.

[1] L. Paul, S. Chakrabarti and K. Ruud, *J. Phys. Chem. Lett.* **8**, 4893 (2017)

[2] L. Paul, S. Chakrabarti and K. Ruud, *J. Phys. Chem. Lett.* **8**, 1253 (2017)

[3] L. Paul, A. Banerjee, A. Paul, K. Ruud and S. Chakrabarti, *J. Phys. Chem. Lett.* **9**, 4314 (2018).