Chemical & Physical Sciences
UNIVERSITY OF TORONTO
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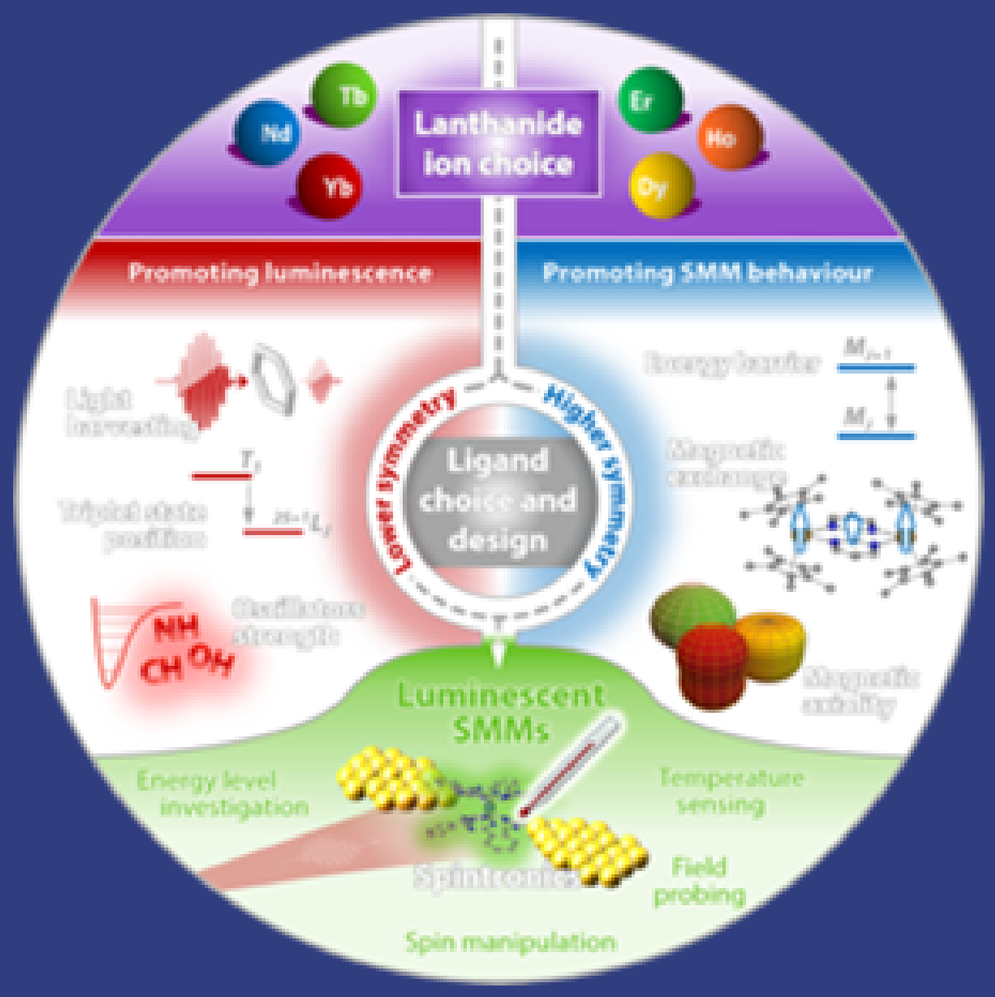
COLLOQUIUM SEMINAR SERIES

LANTHANIDE BASED OPTO-MAGNETIC MOLECULAR MATERIALS

Single-Molecule Magnets (SMMs) are highly sought-after systems for next generation high-density memory storage owing to their nanoscale dimensions. These systems exhibit magnet-like behaviour of magnetic remanence and hysteresis at the molecular level below their blocking temperature (TB; below which, the material acts like a magnet), thus each individual molecule acts as a single-domain magnetic particle with bistability (binary coding needed for data storage and communication technologies).[1] These systems enable a bottom-up approach to overcome the problems faced in miniaturization and provide a real solution to handle the ever-growing volume of data. The use of lanthanide ions in the development of high-performing SMMs led to the current state-of-the-art Dysprosocenium molecule that acts as a magnet above 80 K,[2] which is a remarkable achievement that brings us closer their implementation in molecular electronics. In addition to our continuous effort in producing high-performing SMMs we also continually seek to provide answers to continuously arising questions about addressability of these nanoscale magnets in potential molecular electronics. With this in mind, we investigate how novel materials interact with light and how light can be used to understand, manipulate and optimize material's performances. Herein we provide a unique avenue through-light matter interaction to investigate and address issues that will likely rise when implementing SMMs at molecular electronics. [3,4]



[1] (a)Leuenberger, M. N.; Loss, D. Quantum computing in molecular magnets. Nature 2001, 410, 789-793. (b) Thiele, S.; Balestro, F.; Ballou, R.; Klyatskaya, S.; Ruben, M.; Wernsdorfer, W.* "Electrically driven nuclear spin resonance in single-molecule magnets." Science 2014, 344 (6188), 1135-1138.

[2] Guo, F.-S.; Day, B. M.; Chen, Y.-C.; Ton g, M.-L.; Mansikkamäki, A.; Layfield, R. A.* "Magnetic hysteresis up to 80 Kelvin in a dysprosium metallocene single-molecule magnet." Science 2018, 362 (6421), 1400-1403.

[3] Errulat, D.; Marin, R.; Gálico, D. A.; Harriman, K. L.; Pialat, A.; Gabidullin, B.; Iikawa, F.; Couto Junior, O. D. D.; Moilanen, J.; Hemmer, E.;* Sigoli, F. A.;* Murugesu, M.* "A luminescent thermometer exhibiting slow relaxation of the magnetization: towards self-monitored building blocks for next-generation opto-magnetic devices" ACS Cent. Sci., 2019, 5, 1187-1198.

[4] Brunet, G.; Marin, R.; Monk, M.; Resch-Genger, U.; Suturina, E. A.; Hemmer, E.; Murugesu, M.* "Exploring the dual functionality of an ytterbium complex for optical nanothermometry and slow magnetic relaxation" Chem. Sci. 2019, 10, 6799-6808

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Professor Muralee Murugesu

Department of Chemistry and Biomolecular Sciences, University of Ottawa

Wednesday, October 4, 2023 | 3:30pm | CCT2150