Chromophores in layered oxides and hydroxides: towards Circularly Polarized Luminescent hybrids

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Chemical and structural versatility of layered metal hydroxides and oxides allows for insertion and grafting of various kinds of functional molecules in between magnetic, ferroelectric or electro-catalytic sheets for generating multiple functional systems. Numerous properties can be combined as conductivity, luminescence, chirality, magnetism electro-activity, catalysis, etc. In addition, the functionalities of such structures can be rather easily modulated by changing the host structure as well as the inserted species. We thus obtained many magnetic (2D-3D), magneto-luminescent and magneto-electric systems.[1,2]

In the present PhD project, we propose to go a step further in the field of luminescent materials based on the insertion/grafting of luminecent molecules into layered inorganic strutures. Actually, circularly polarized light emission is currently under focus due to promising applications, in photonic technologies, for instance.[3] In this respect, the objective of the PhD program is to stabilize new hybrid systems exhibiting circularly polarised luminescence. To this end, luminescent molecular species will be assembled into layered oxides or hydroxides. The molecules will possibly be adapted to facilitate their insertion. We will explore insertion into colorless host structures to investigate the intrinsic properties of the molecular network (Fig. 1). Then, optically active hosts structures encompassing various transition metals will be considered to favour host guest interactions. The work will take advantage of the strong expertise of the team in the field of layered hybrid functional materials.[2,4–6] The structural and optical properties will be studied with approriate set-ups at disposal in the laboratory, allowing for establishing structure-properties relationships, and improving of the design of layered functional materials.

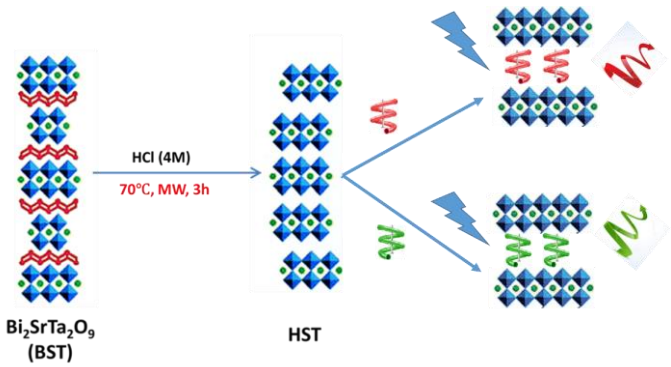

Figure 1 : Schematic chemical approach to hybrid Circularly Polarized Light emitter using the functionalization of metal oxides with chiral luminescent molecules.

(1) Rabu, P.; Delahaye, E.; Rogez, G. Hybrid *Nanotechnol. Rev.* **2015**, *4* (6), 557–580.
(2) Evrard, Q.; Chaker, Z.; Roger, M.; Sevrain, C. M.; Delahaye, E.; Gallart, M.; Gilliot, P.; Leuvrey, C.; Rueff, J.-M.; Rabu, P.; Massobrio, C.; Boero, M.; Pautrat, A.; Jaffrès, P.-A.; Ori, G.; Rogez, G. *Adv. Funct. Mater.* **2017**, *27* (41), 1703576.
(3) Deng, Y.; Wang, M.; Zhuang, Y.; Liu, S.; Huang, W.; Zhao, Q. *Light Sci. Appl.* **2021**, *10* (1), 76.
(4) Evrard, Q.; Leuvrey, C.; Farger, P.; Delahaye, E.; Rabu, P.; Taupier, G.; Dorkenoo, K. D.; Rueff, J.-M.; Barrier, N.; Pérez, O.; Rogez, G. *Cryst. Growth Des.* **2018**, *18* (3), 1809–1817.
(5) Wang, Y.; Leuvrey, C.; Delahaye, E.; Leroux, F.; Rabu, P.; Taviot-Guého, C.; Rogez, G. *J. Solid State Chem.* **2019**, *269*, 532–539.
(6) Payet, F.; Bouillet, C.; Leroux, F.; Leuvrey, C.; Rabu, P.; Schosseler, F.; Taviot-Guého, C.; Rogez, G. *J. Colloid Interface Sci.* **2022**, *607*, 621–632.