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Multimodal Fluorogenic molecules for Biomedical Engineering

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Small fluorescent molecules are now well-established organic materials to track biochemical or biological phenomena [**1**]. To date, only a modest collection of dyes are available for fluorescence probes including most popular and commercially available families such as BODIPY, flurorescein, coumarins, rhodamines and cyanines (figure 1) fraught with some limitations, poor modularity in optical properties in UV/vis absorption and emission (ranging from 250 to 650nm), poor diversity in tagging-group such as mainly high cost amine and acid moieties. In the current need to enhance the small fluorogenic 'core' for bio-imaging and photovoltaic cells, the project aims at developing a first generation of highly modular small fluorescent GFP-like **[2]** 4-arylidene imidazolone platform that offers a great flexibility in optical properties, in group-tagging for biological probes (fluorescence and TEP imaging) and in synthesis to achieve cost-effective production.

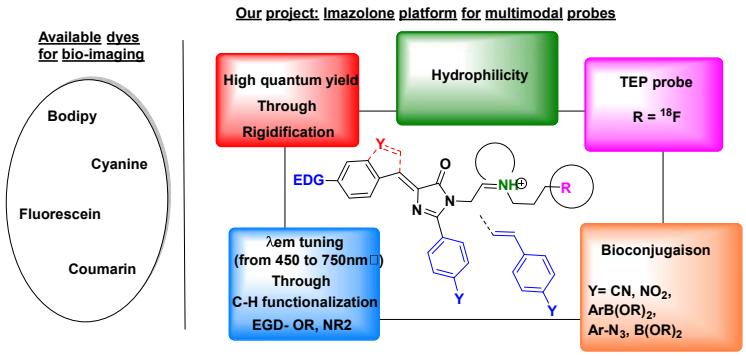

Figure 1. *Standard current fluorophores for bioimaging and novel family*

The current background of the laboratory at Rouen concerns with the recent development an innovative access to 4-arylidene imidazolone-based fluorophores that offer a broad spectrum of modularity **[3]** as depicted in figure 1 over several characteristics: (i) *Optical properties*: A full control is effective envisaged by modulation of the substitution at C-2 of imidazolone ring; (ii) *Bio-conjugation*: By introduction of tagging-group cat the south aryl unit; (iii) *Hydrophilicity*: By quaternarization of the *N*-containing appendice; (iv) *Bimodality*: TEP probes by introduction of a sultone group for displacement with radioactive fluoride ^{18}F.

The last bottleneck of this family concerns with the optimization of quantum yield and the 'hula-twist' limitation. The MFBE PhD project is directed towards this objective and aims at creating an additional covalent-link onto arylidene system through a late-stage step- and atom-economical direct C-H functionalization synthetic approach (red link in figure 1). This new family of GFP-type highly valuable dyes will be next evaluated in biomedical engineering .

[1] Ha, Y.; Choi, H.-K.; *Chemico-Biological Interactions* **2016**, 248, 36–51. (b) Xu, W.; Zeng, Z.; Jiang, J.-H.; Chang, Y.-T.; Yuan, L. *Angew. Chem. Int. Ed*. **2016**, 55, 2-44.
[2] Zimmer, M. *Chem. Rev*. **2002**, *102*, 759–781.
[3] Muselli, M.; Baudequin, C;. Perrio, C.; Hoarau, C.; Bischoff, L. *Chem. Eur. J*. **2016**, 22, 5520 – 5524.