

## Coupled Polymethines: Towards a new family of NIR absorbing dyes

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Polymethine dyes, often referred to as cyanines, are organic chromophores with an even number of  $\pi$  electrons delocalized between two terminal heteroatoms over an odd number of unsaturated carbon atoms. Upon molecular engineering (extremities, conjugation length...), polymethines are capable of absorbing up to the near-infrared (NIR) region and are therefore used in multiple applications ranging from molecular electronics<sup>[1a]</sup> to bio-imaging<sup>[1b]</sup> and nonlinear optics.<sup>[1c]</sup>

According to a theoretical study by Dähne and Leupold published in 1966, the coupling of two polymethines subunits linked by two sigma bonds would induce an enhancement of optical properties.<sup>[2]</sup> So far, dyes introducing multiple polymethine subunits have been scarcely reported, the most recent examples being red-absorbing zwitterions based on benzoquinone monoimine (BQMI)<sup>[3a]</sup> and diaminobenzoquinone diimine (DABQDI).<sup>[3b]</sup>

With the aim to use the coupling strategy to develop new families of dyes, we recently synthesized coupled polymethines incorporating anionic oxonol and cationic heptamethine subunits that gave rise to unprecedented derivatives holding potential as pH- and photo-switches, providing a wide span of absorption up to the NIR domain.

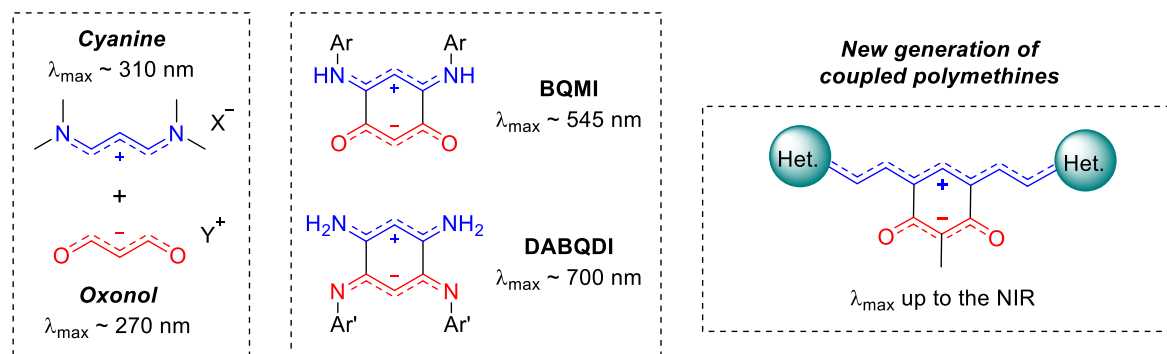


Figure 1. Examples of respectively : trimethines, coupled trimethines and new generation of coupled trimethine and heptamethine.

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