# Small organic molecule based nano-fluorophores for NIR biological imaging in deep tissues and small animals

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Biological imaging in the near-infrared (NIR) window is an extremely hot research topic in recent years due to it is known as a powerful technique to obtain three-dimensional images, provides key advantages over conventional fluorescence imaging techniques, namely, increased penetration depth, lower tissue autofluorescence and self-absorption, and reduced photodamage and photobleaching and therefore is particularly useful for imaging deep tissues and small animals. To achieve NIR imaging, various inorganic nanomaterials including transition-metal sulfide/oxide semiconductors, single-walled carbon nanotubes (SWNTs), quantum dots (QDs), and noble and semimetal nanoparticles (NPs) have been developed thanks to their highly tunable electronic structures. Moreover, few organic polymer nanomaterials with narrow band gap were also developed. However, the applications of both of inorganic/organic polymer nanomaterials for clinical use are limited due to their unknown long-term toxicity and excretion time. Hence, small and biocompatible NIR organic fluorophores are high desired for their great potential in clinical use. Nevertheless, the reality is that the design and synthesis of small organic NIR fluorophore is remains a great challenge, due to they generally have the drawbacks of poor water solubility and severe aggregation-caused fluorescence quenching (ACQ) or lifetime falloff in the biological system.

Herein, we would like to report classes of small organic molecule based nano-fluorophores for NIR biological imaging in deep tissues and small animals. These fluorophores were rational designed under the guide of theoretical calculations and facile synthesized *via* classical synthetic method, and exhibited NIR fluorescence emission with large Stokes' shift, high quantum yield and superior photo-stability and good fluorescent brightness or long lifetime in aqueous solution. The promising tissues and small animals NIR imaging results have demonstrated the high resolution and deep penetration imaging ability of these nano-fluorophores. In light of these results, we can predict that more new small organic molecule based nano-fluorophores would be achieved *via* rational tuning the structure of small organic molecule, and our future work will focus on the construction of the analogues/fluorogenic probes of them with good water solubility, higher quantum yield and tunable NIR emission wavelength, and investigate their potential application in clinic use.