Abstract
Light is indispensable to the survival of human beings. Driven by curiosity and the key role of light in human life, people have never stopped seeking ideal luminogens and exploring the essence of luminescence. In fact, many luminogens have been developed for diseases diagnosis in biological settings. However, traditional planar luminogens usually suffer from the phenomenon of aggregation-caused quenching (ACQ) effect, which hampers their value as a bioprobe. In 2001, our group discovered a phenomenon of aggregation-induced emission (AIE) effect, which is opposite to the ACQ effect. Guided by the principles of restrictions of intramolecular motions (RIM), various novel luminogens with AIE property have been designed and synthesized for bio-applications. Despite there have already been quite a lot AIEgens developed by us and other labs, most of the synthesized AIEgens are commonly associated with complicated organic synthesis and being environmentally unfriendly. Thus, it is desired to point out a new source to acquire more AIEgens. One of the common applications for AIEgens is analytes quantification. Most turn-on type AIEgens’ signals can be affected by the experimental parameters, making them unsuitable for quantitative measurements. In contrast, ratiometric AIE probes detecting the fluorescent signals of the probes at two distinct wavelengths can facilitate analytes quantification. What’s more, two-photon-excited fluorescent imaging holds advantages of less interference from background autofluorescence, deeper penetration to tissues, and low phototoxicity to living bio-samples. In this thesis, we put forward natural resources as a new reservoir to obtain more functional AIEgens for applications in biological fields. Berberine and Dihydro Berberine were chosen as examples for demonstration. Both of them exhibit AIE effects. In particular, Berberine shows mitochondria specificity and Dihydro Berberine is a promising bioprobe to visualize Ion Trapping. In addition, a ratiometric two-photon-active AIEgen called TPE-PBP was designed and synthesized for mitochondrial thiol detection.

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