Biological Applications of Efficient Luminogenic Aggregates

by

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Abstract

Fluorescence have found wide scope of application in biological science and biomedical fields due to it offers real time, in situ and non-invasive characteristics. Traditional organic fluorophores emit strong fluorescence in dilute solution, but their fluorescence is generally decreased or even quenched when their molecules are aggregated. This phenomenon has been well known as aggregation-caused quenching (ACQ). Therefore, ACQ fluorophores are often used in dilute solution but it raises many problems such as poor sensitivity and low photostability.

In 2001, our group discovered an opposite phenomenon to the ACQ. A group of fluorophores that are not emissive in dilute solution but become highly emissive after forming aggregates. We named this interesting phenomenon as “Aggregation-induced emission” or AIE. AIE luminogens emit intensively when the intramolecular motion of AIE molecules is restricted. Guided by the restriction of intramolecular motion (RIM) principle, many AIE luminogens (AIEgens) have been designed and their biological application have been explored.

In this thesis, some new AIE systems have been developed and their utilities in biomedical application have been explored. Benefited from their high fluorescence intensity and photostability, organelle specific AIEgens are applied in multiplexed imaging to real-time monitor the intracellular changes under apoptosis. Besides, some AIEgens can serve as organic photosensitizer (PS) and the result showed their ROS efficiency in the aggregate form was much enhanced as compared to in solution. Therefore, fluorescence-guided cancer therapy has been achieved by a mitochondrion-specific AIE PS. Lastly, we demonstrated to use AIE aggregates to convert the unutilized light energy to useful light for cyanobacteria photosynthesis.

Date: 13 Jul 2020 (Monday)
Time: 3:00 pm
Venue: Online via Zoom

Examination Committee:
Prof. Eva Chen (Chair)
Prof. Ben Zhong Tang (Supervisor)
Prof. Ying Chau
Prof. Fei Sun
Prof. Zhihong Guo
Prof. Michael Lam (CUHK)

All are welcome!

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