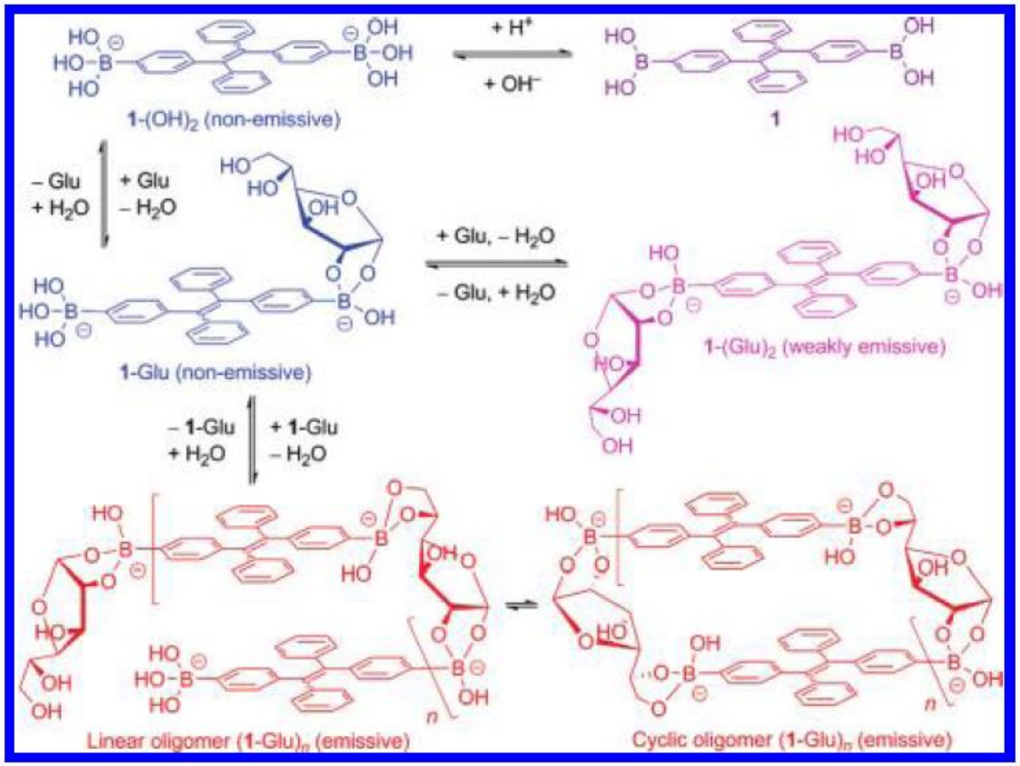
Biosensing of Luminogens with Aggregation-Induced Emission Characteristics

Ryan T. K. Kwok, Chris W. T. Leung,
Jacky W. Y. Lam and Ben Zhong Tang*

Carbohydrates

Glucose Sensor

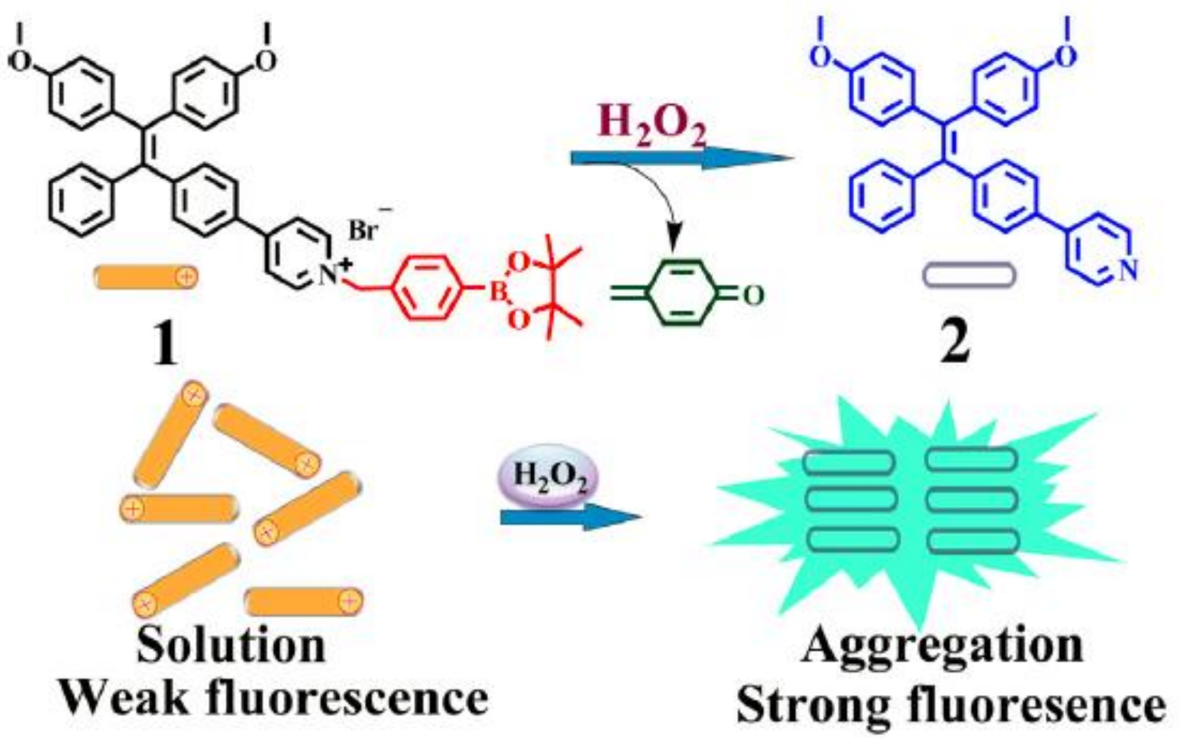


Scheme 1. Proposed Mechanism for the Process of Glucose-Specific Sensing by AIE-Active Bioprobe 1

Yi Liu, Ben Zhong Tang* J. Am. Chem. Soc. 2011, **133**, 660

Carbohydrates

Glucose Sensor (H_2O_2 Sensor)

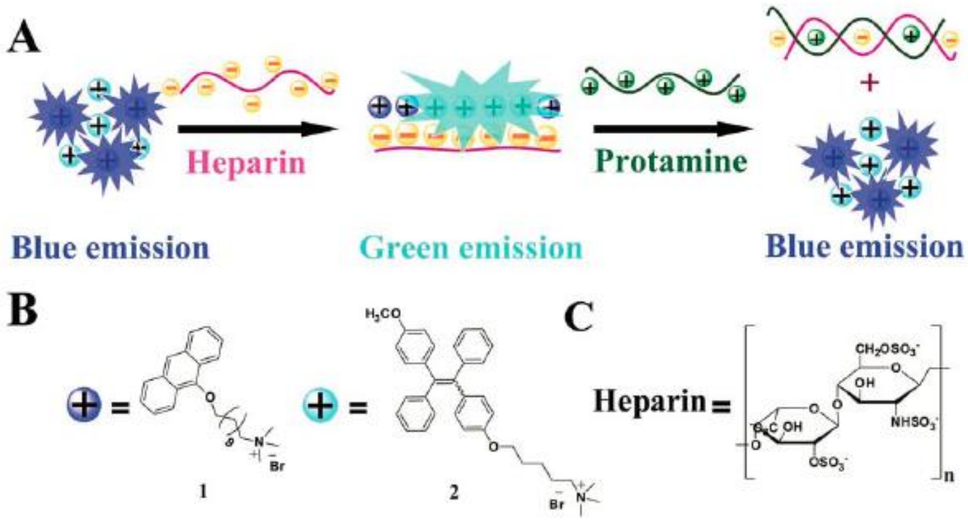


Scheme 1. The chemical structure of **1** and **2**, and the design rationale for the fluorescence turn-on detection of H_2O_2.

Fang Hu, Deqing Zhang* Tetrahedron Letters, 2014, **55**, 1471

Carbohydrates

Heparin Sensor

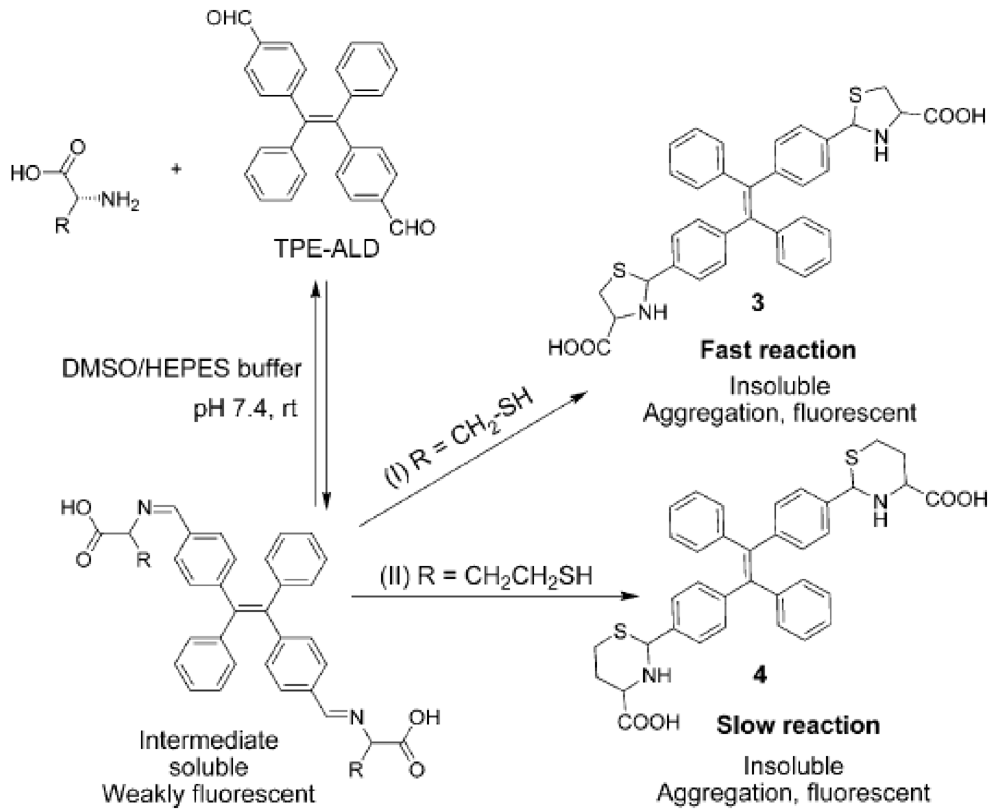


Scheme 1 (A) Illustration of the design rationale for the fluorescence ratiometric detection of heparin based on the combination of the ACQ feature of compound **1** and the AIE feature of compound **2**, and the potential application to study the interaction between heparin and protamine. (B) Chemical structures of **1** and **2**. (C) Chemical structure of the major unit of heparin.

Xinggui Gu, Deqing Zhang* Analyst, 2012, **137**, 365

Amino Acids

Cysteine Sensor

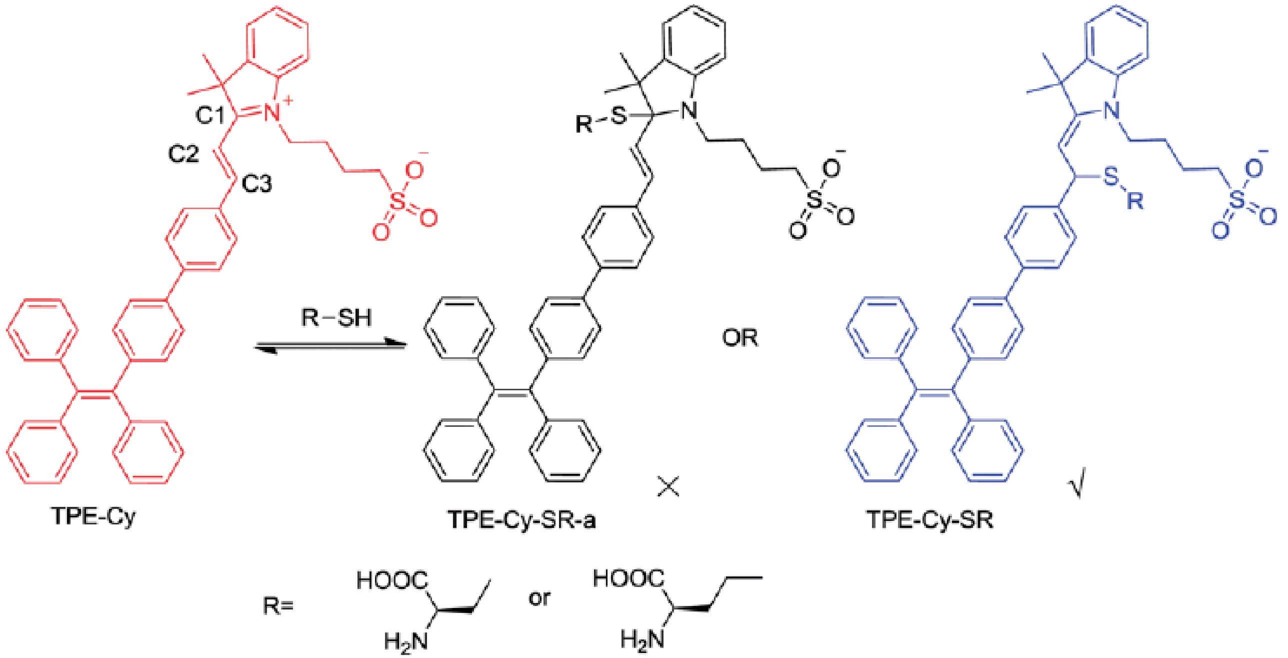


Scheme 2. Mechanistic representation of the discriminative detection of Cys and Hcy.

Ju Mei, Ben Zhong Tang* Chem. Eur. J., 2013, **19**, 613

Amino Acids

Cysteine and Homo-cysteine Sensor



Scheme 1 Proposed mechanism of the reaction between TPE-Cy and biothiols.

Sijie Chen, Ben Zhong Tang* J. Mater. Chem. B, 2014, **2**, 3919

Proteins

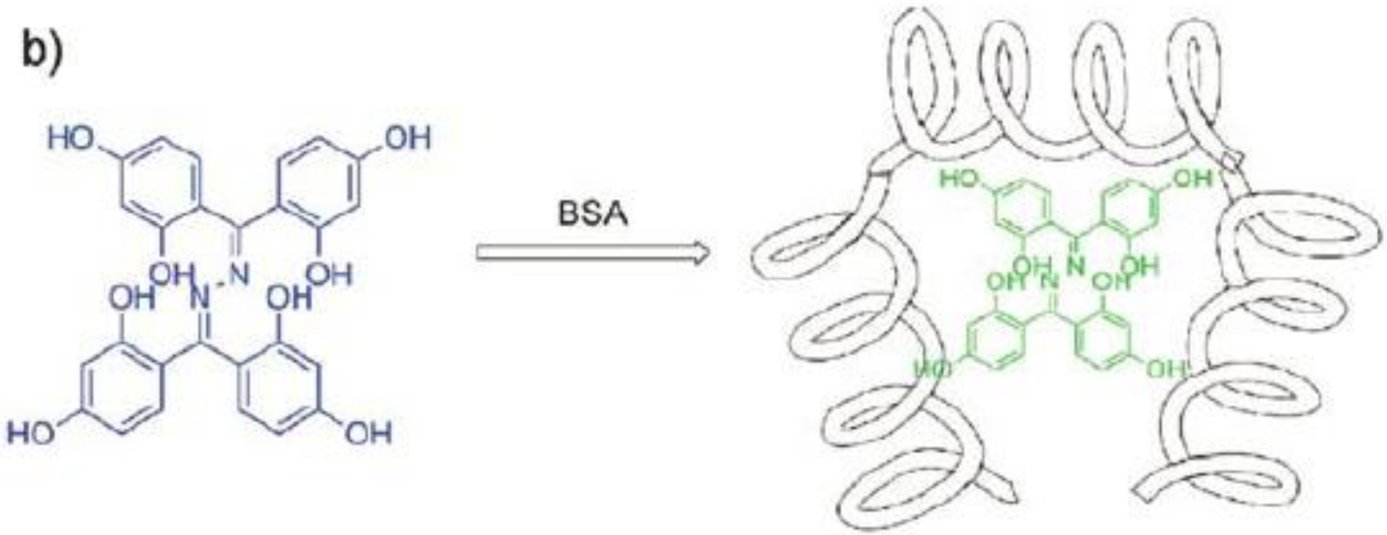
Albumin Sensor

Fig. 2 Schematic representations of the detection for BSA.

Xiujuan Xu, Zhen Li*, Chem. Commun., 2011, **47**, 12385

Proteins

Albumin Sensor

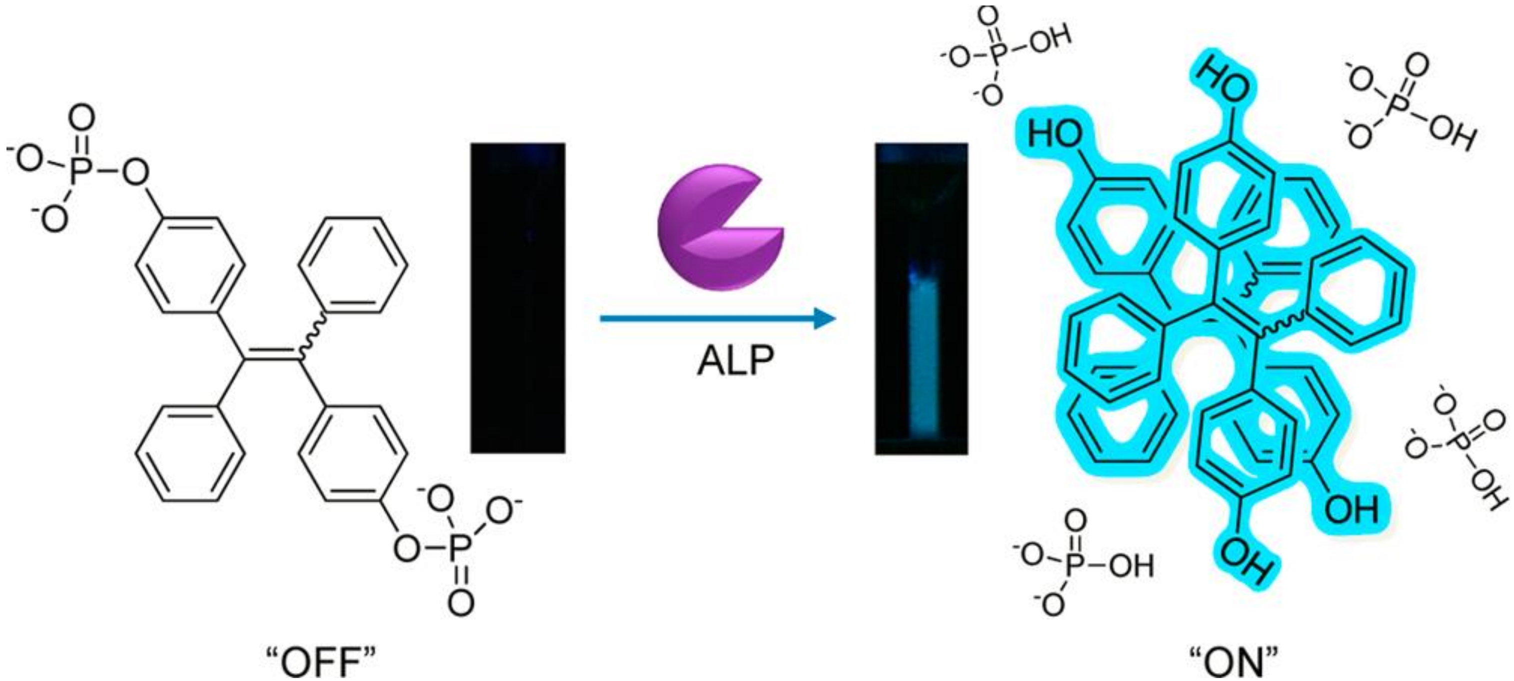


Schematic presentation of the ratiometric fluorescence change of **1** upon binding to the hydrophobic pocket of BSA. The emission wavelength of **1** changes from 436 nm to 518 nm.

Lu Peng, Aijun Tong*, Analyst., 2013, **138**, 2068

Enzymatic Activities

Alkaline phosphatase (ALP)

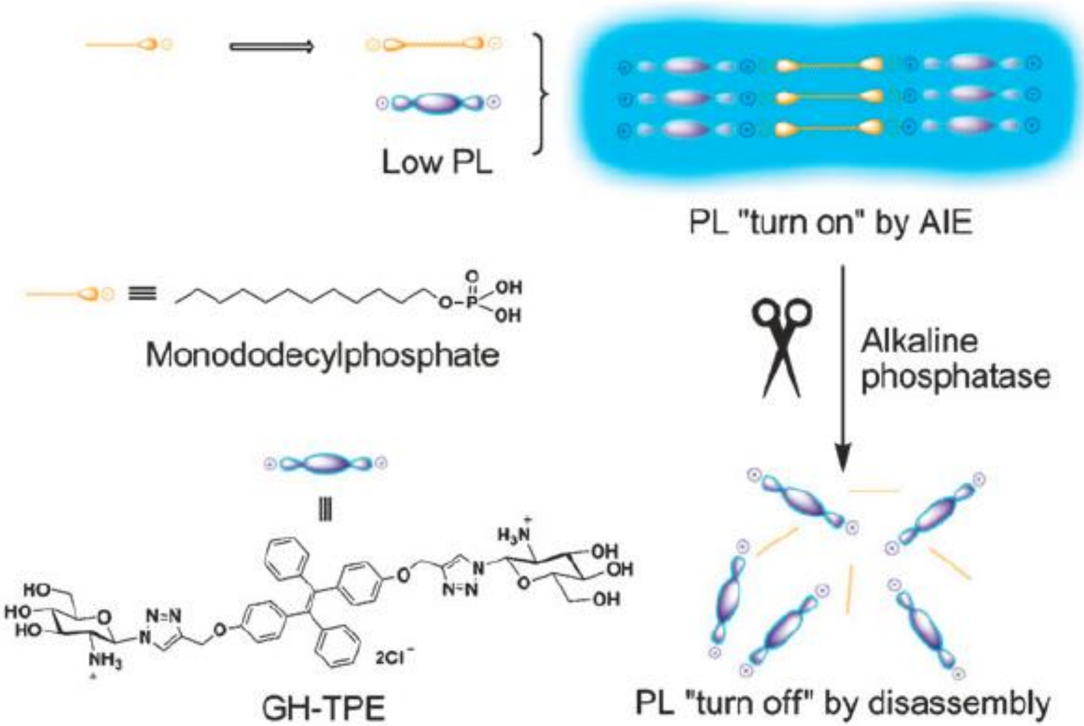


Scheme 1. Illustration of Design Principle of ALP Assay

Jing Liang, Bin Liu* ACS Appl. Mater. Interfaces 2013, **5**, 8784

Enzymatic Activities

Alkaline phosphatase (ALP)



Scheme 1 Illustration of fluorometric assay for alkaline phosphatase using GH-TPE as a fluorescent probe based on AIE feature.

Qi Chen, Bao Hang Han*, Chem. Commun., 2010, **46**, 4067

Enzymatic Activities

Alkaline phosphatase (ALP)

Scheme 1 Illustration of the design rationale for the fluorometric assay with compound **1** for ALP based on the hydrolysis of **1** into **3** catalyzed by ALP.

Xinggui Gu, Deqing Zhang* Analyst, 2013, **138**, 2427

Enzymatic Activities

Histone deacetylase

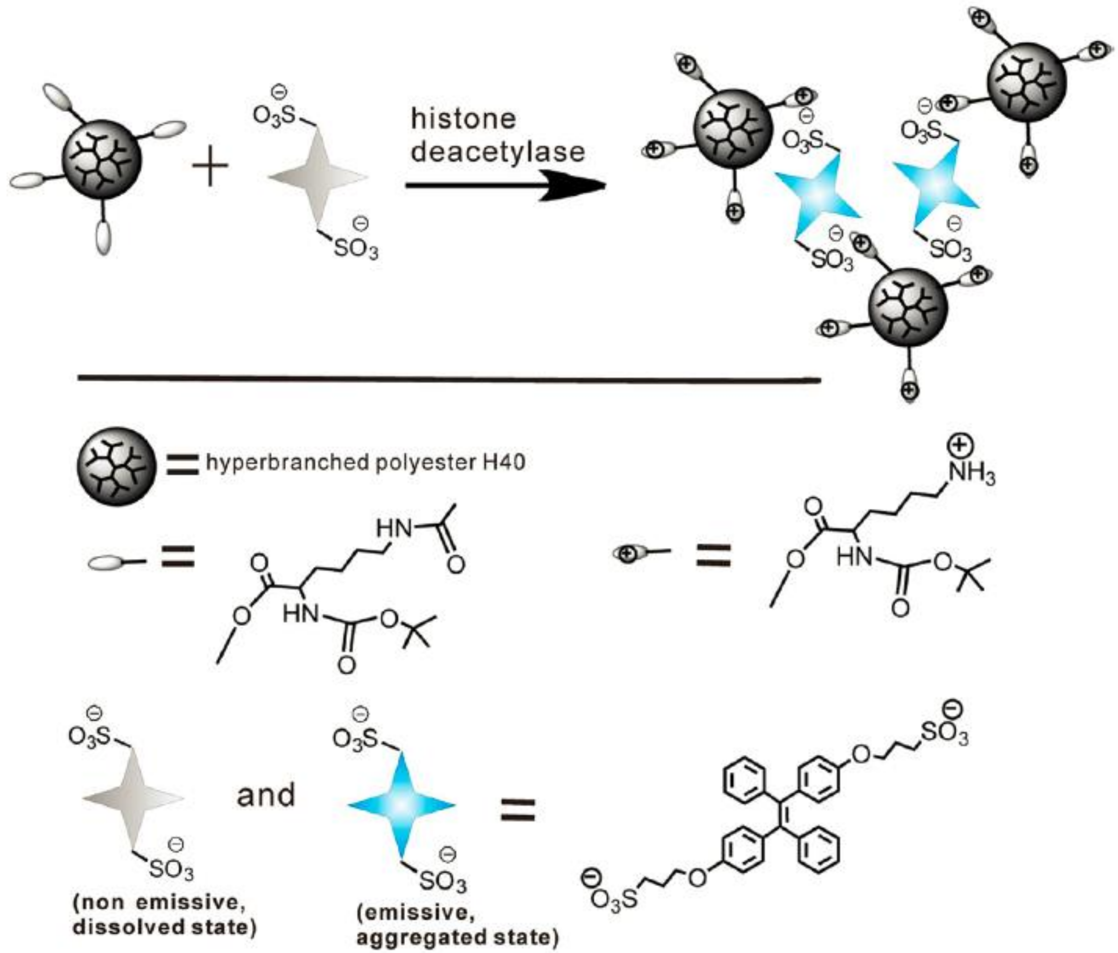
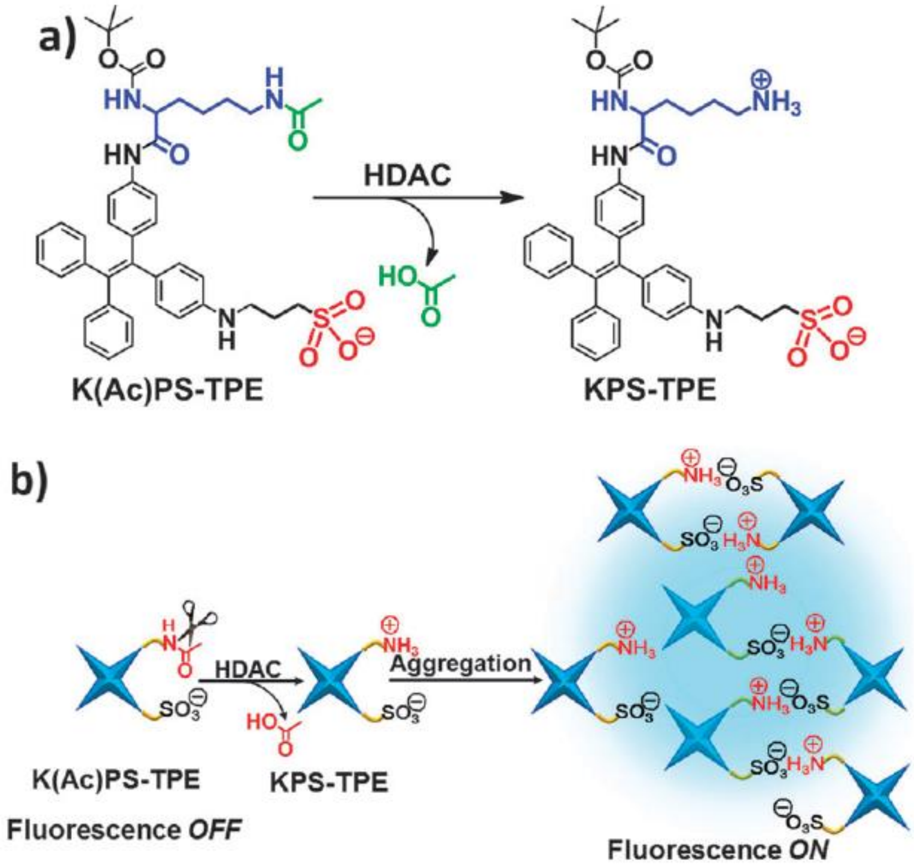


Figure 1. Schematic illustration for the assay system, and its fluorescent response to histone deacetylase.

Changmin Yu, Shuizhu Wu* J. Mater. Chem. B, 2013, **1**, 5550

Enzymatic Activities

Histone deacetylase

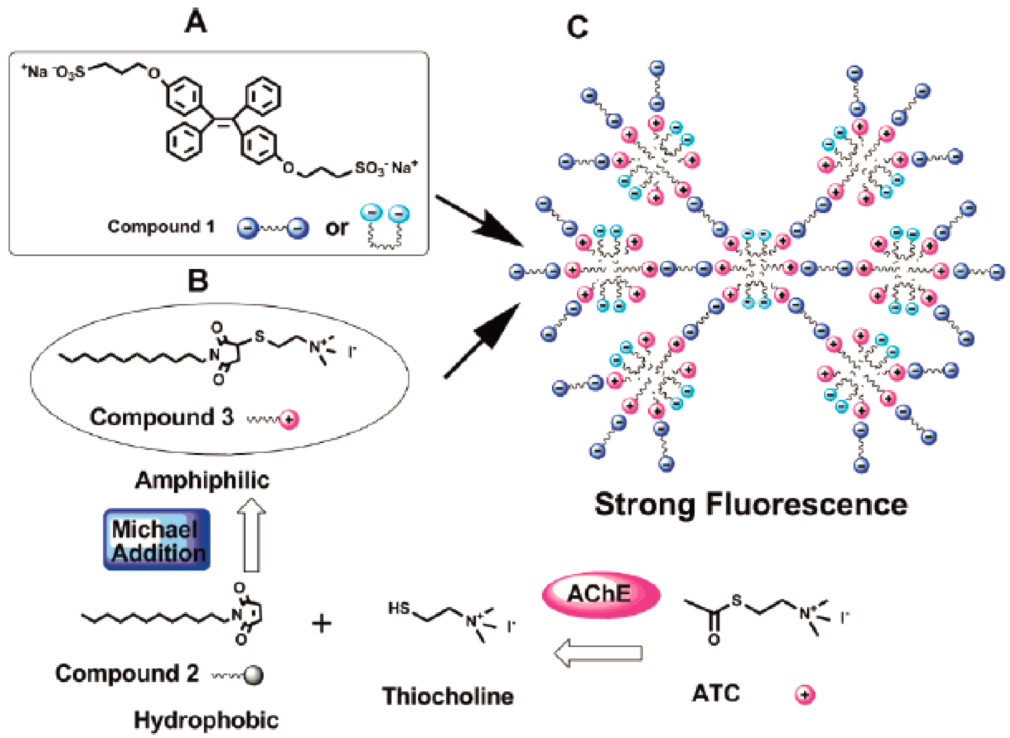


Scheme 1 (a) Proposed enzymatic reaction of K(Ac)PS-TPE with HDAC. (b) Schematic representation of the aggregation-induced fluorescence enhancement of K(Ac)PS-TPE by HDAC reaction.

Koushik Dhara, Kazuya Kikuchi* Chem. Commun., 2012, **48**, 11534

Enzymatic Activities

Acetylcholinesterase (AChE)

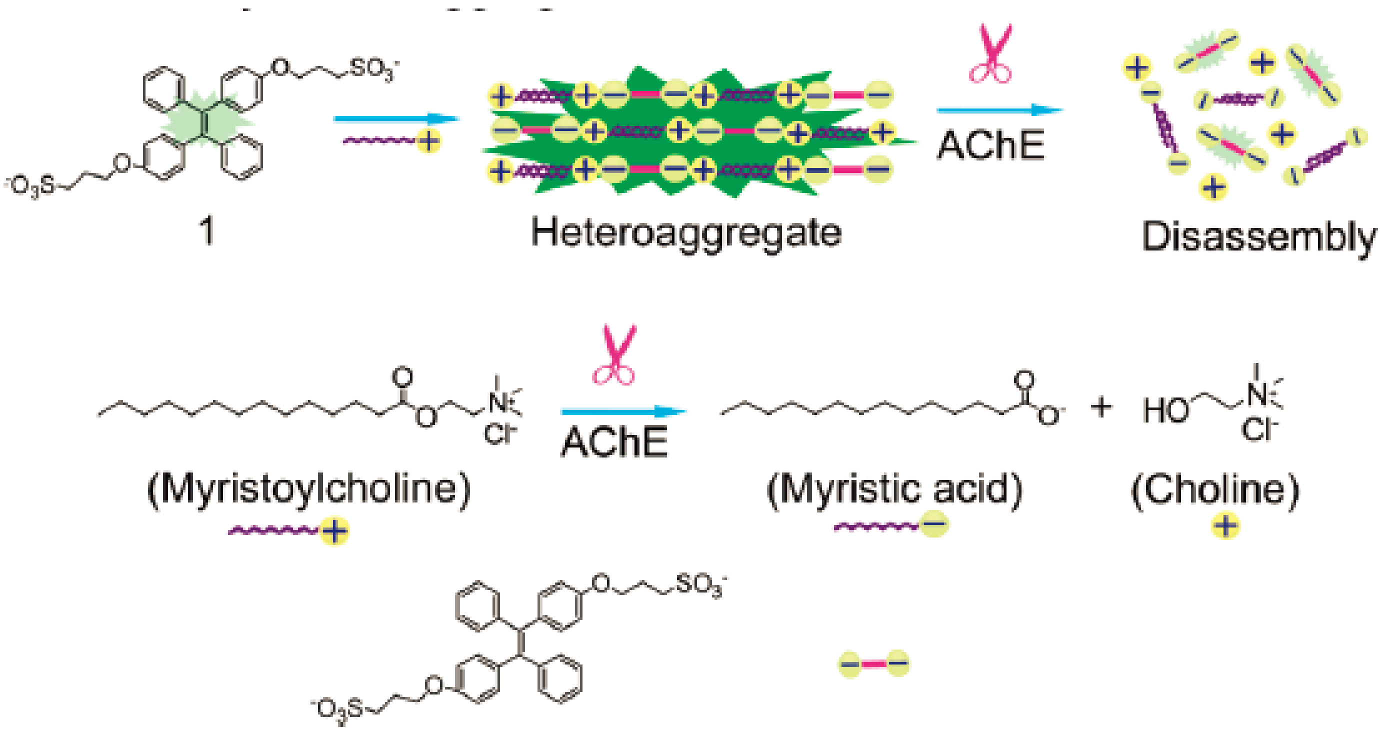


Scheme 1. (A) Chemical Structures of Compounds **1**-**3**.
(B) Cascade Reactions among ATC, AChE, and Compound **2**.
(C) Illustration of the Aggregation of Compound **1** in the Presence of Compound **3**

Lihua Peng, Deqing Zhang* Org. Lett., 2009, **11**, 4014

Enzymatic Activities

Acetylcholinesterase (AChE)

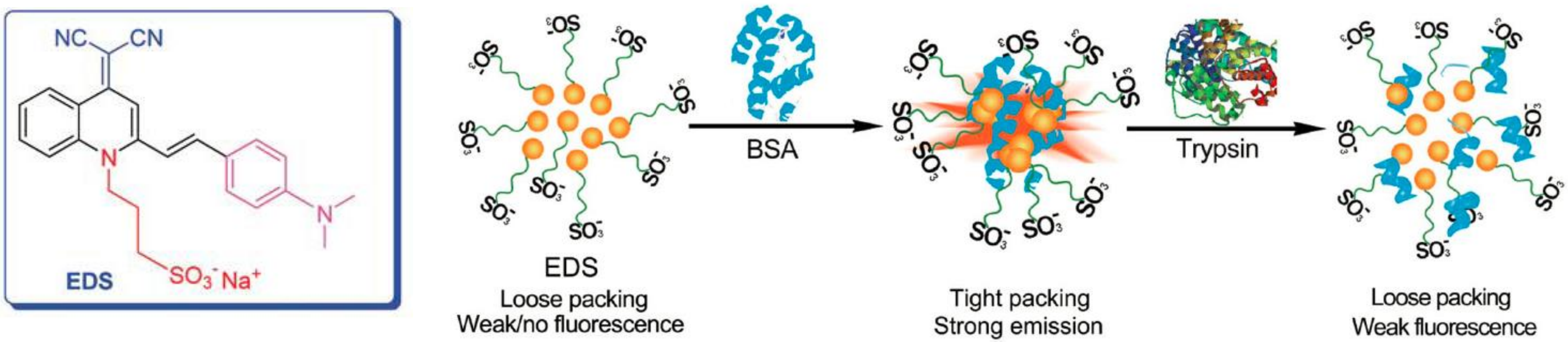


Scheme 1. Illustration of the Formation of Heteroaggregate between Myristoylcholine and Tetraphenylethylene 1 and the Disassembly of the Aggregate in the Presence of AChE

Mike Wang, Deqing Zhang* Anal. Chem., 2009, **81**, 4444

Enzymatic Activities

Trypsin

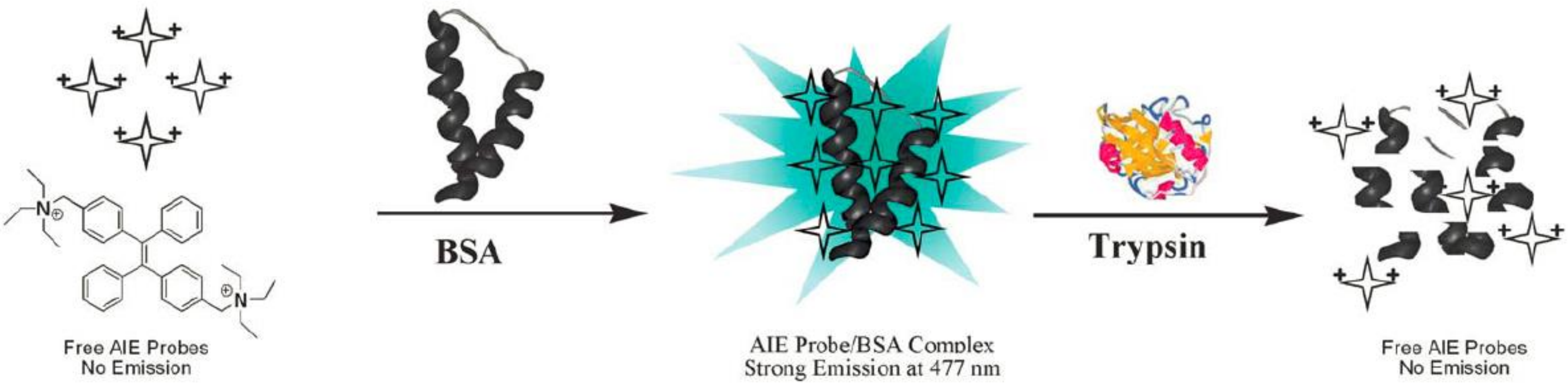


Scheme 3. Proposed mechanism for the interaction of EDS and BSA, and its disassembly in the presence of trypsin.

Andong Shao, Weihong Zhu* Chem. Sci., 2014, **5**, 1383

Enzymatic Activities

Trypsin

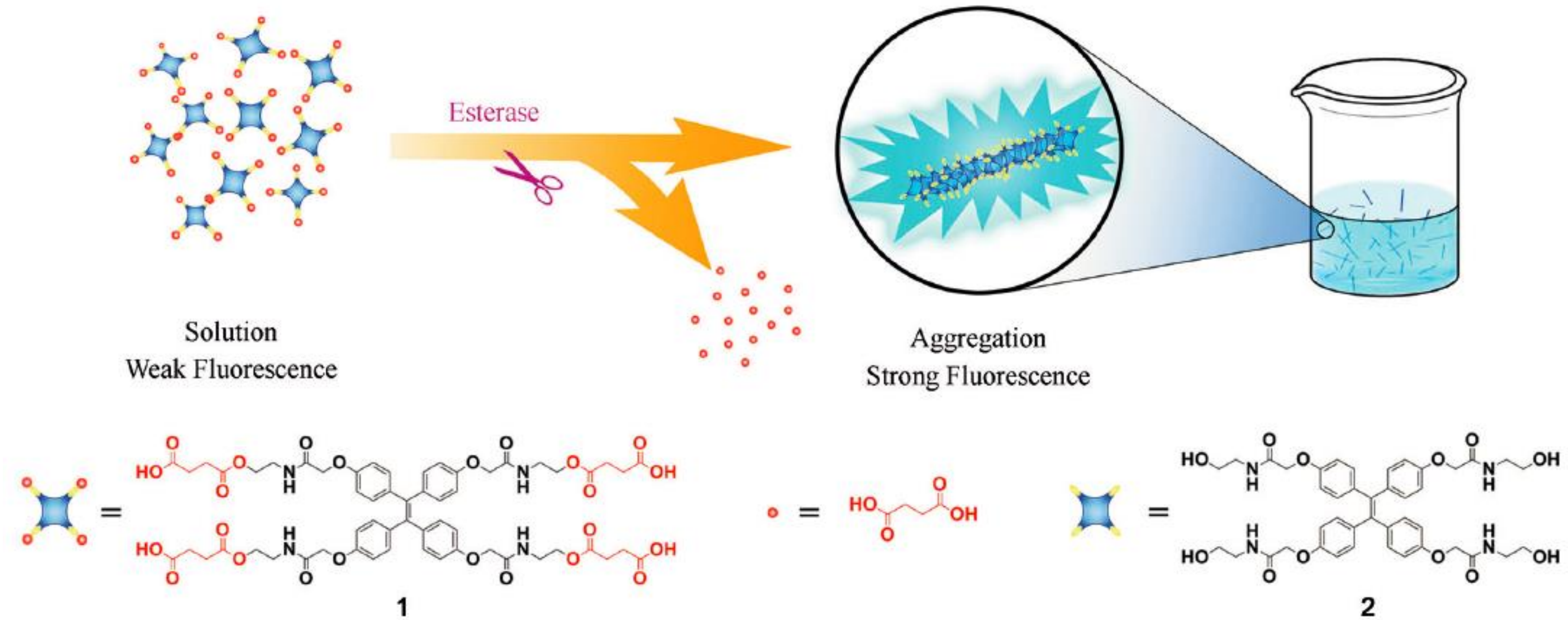


Scheme 1. Schematic illustration of the sensing mechanism of the probing complex for the detection of trypsin.

Jian Ping Xu, Ben Zhong Tang* Analyst, 2011, **136**, 2315

Enzymatic Activities

Carboxylesterase

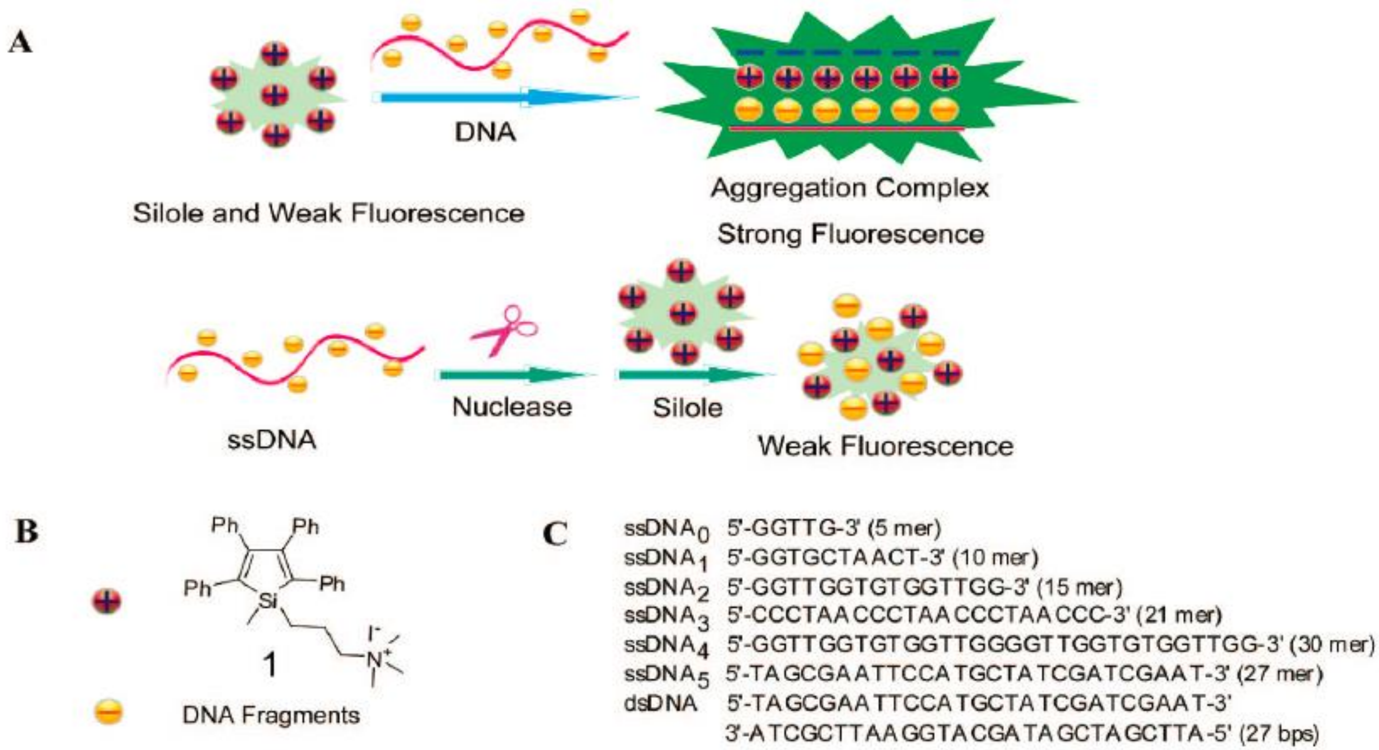


Scheme 1. Illustration of the fluorometric detection of carboxylesterase through the formation of supramolecular microfibers by carboxylic ester hydrolysis of the AIE probe.

Xiaojing Wang, Hong Chen*, Xinming Li* Chem. Asian J. 2014, **9**, 784

Enzymatic Activities

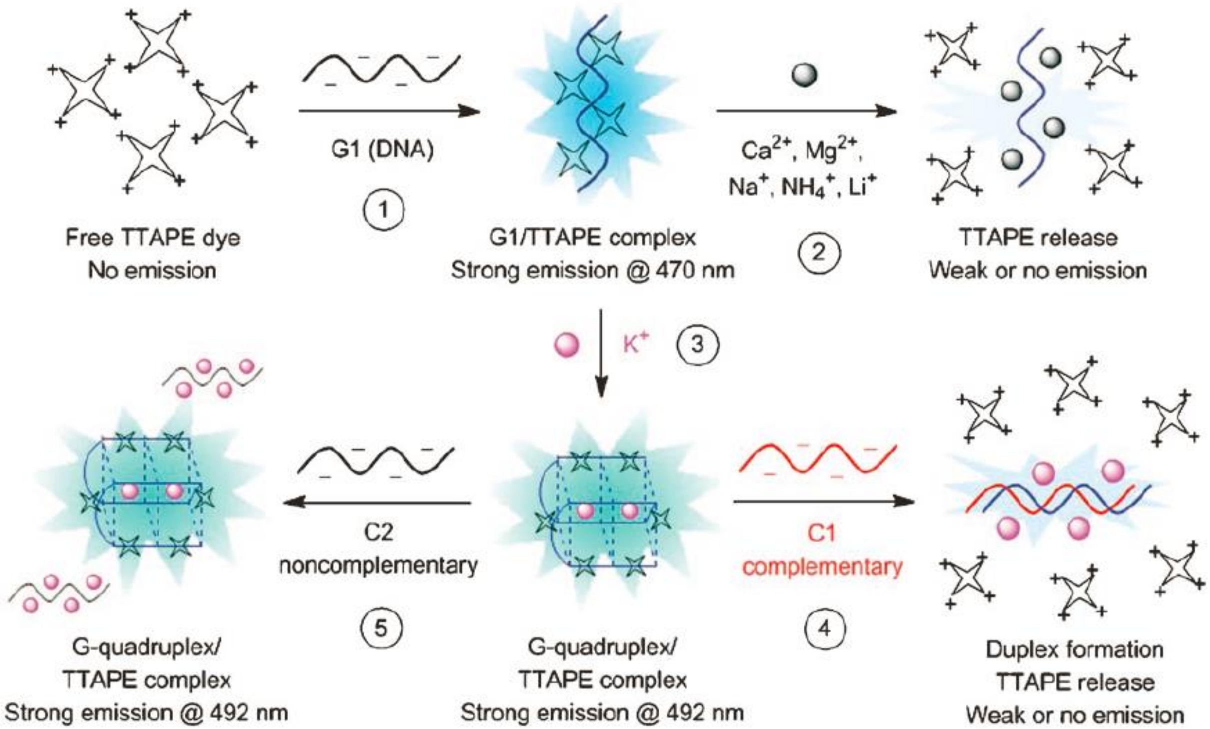
Nuclease



Scheme 1. (A) Illustration of Fluorescence Turn-On Detection of DNA and Label-Free Nuclease Assay Based on the AIE Feature of Silole.
(B) Chemical Structure of Silole with Quaternary Ammonium Moiety (1).
(C) DNA Sequence Used in This Study

Mike Wang, Deqing Zhang*, Daoban Zhu*, Anal. Chem. 2008**, 80**, 6443

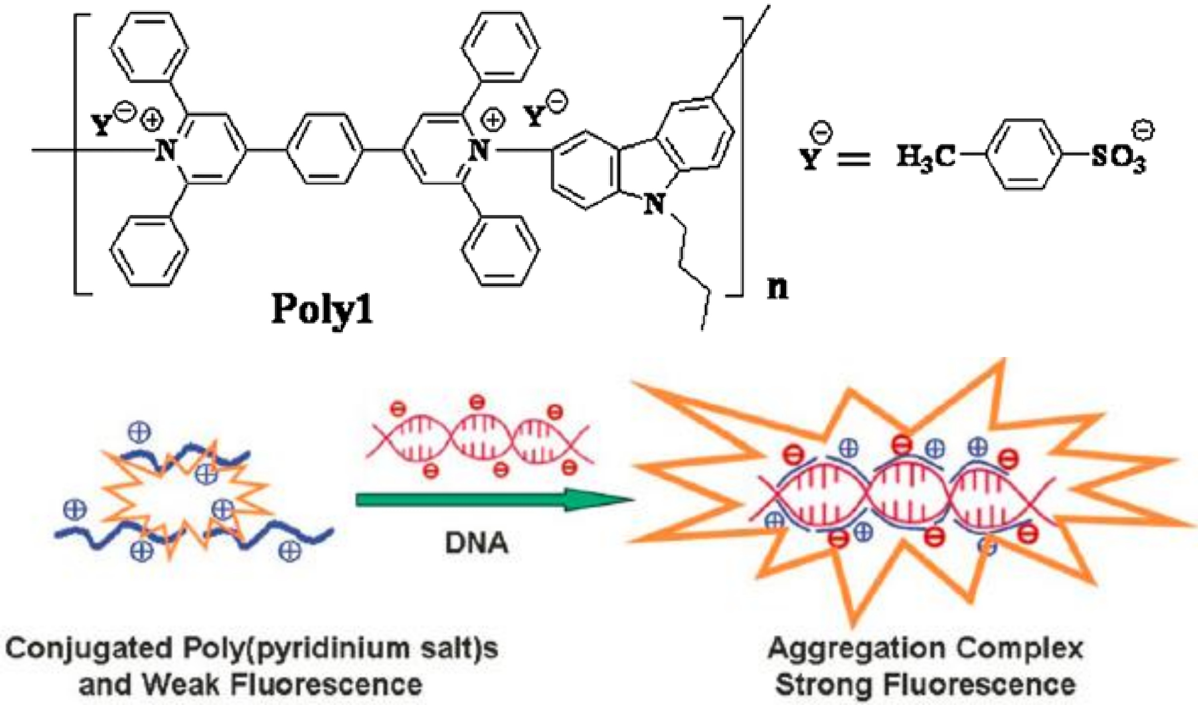
DNA / RNA / Nuclei acids



Scheme 2. Fluorescent bioprobing processes of TTAPE.

Yuning Hong, Ben Zhong Tang*, Chem. Eur. J. 2008**, 14**, 6428

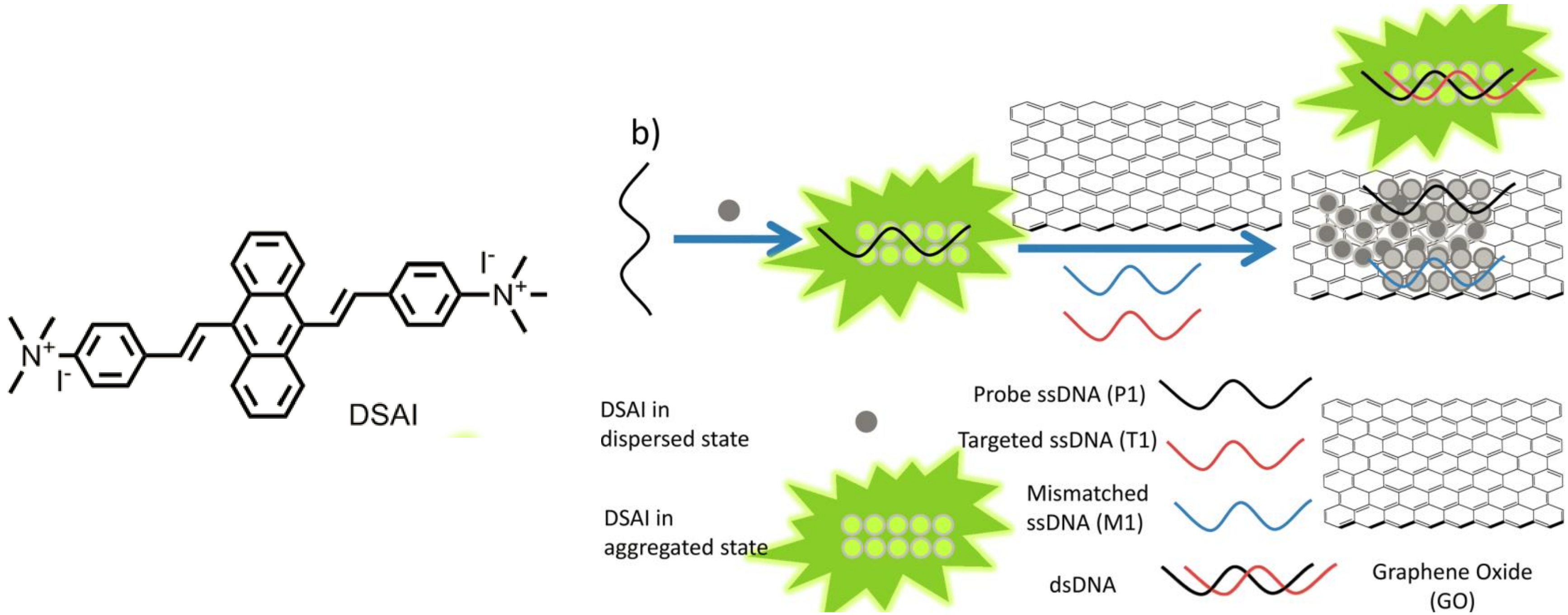
DNA / RNA / Nuclei acids



Scheme 1. Illustration of fluorescence turn-on detection of DNA.

Jingfen Sun, Yan Lu*, Polym. Chem. 2013**, 4**, 4045

DNA / RNA / Nuclei acids



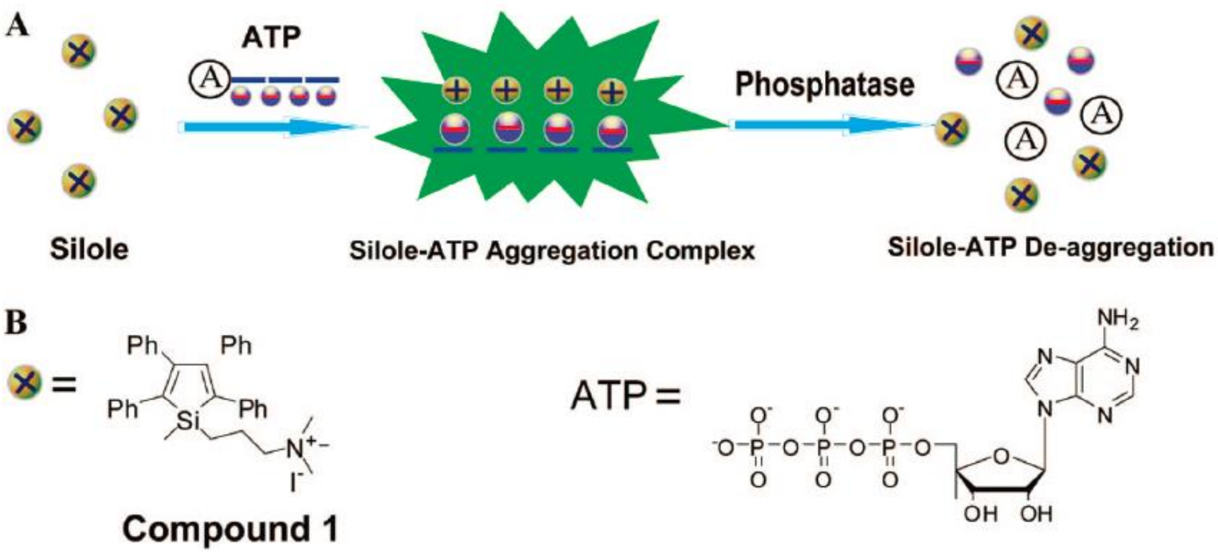
Scheme 1. (a) Structure of DSAI. (b) Schematic Description of Selective Fluorescent Aptasensor Based on DSAI/GO Probe

Xing Li, Bin Xu*, Wenjing Tian*, Anal. Chem. 2014**, 86***,* 298

Others

Adenosine Triphosphate (ATP)

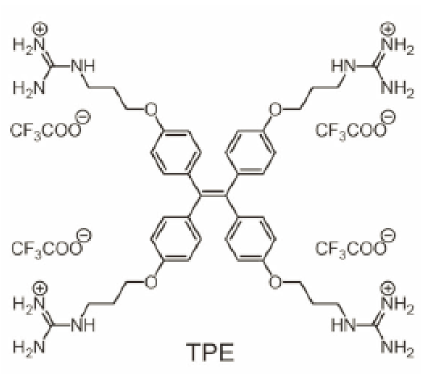
Scheme 1. Mechanism of the Fluorometric ATP Sensing Protocol

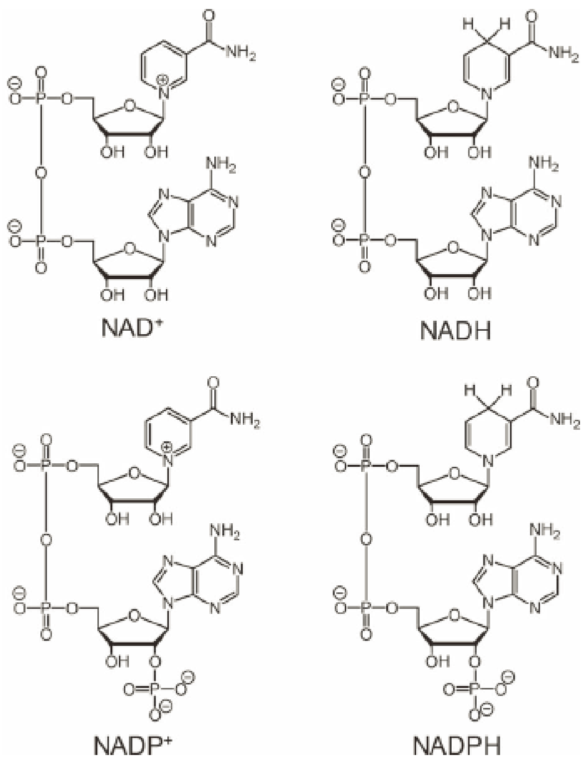


Manchun Zhao, Deqing Zhang* Langmuir 2009, **25**, 676

Others

Pyridine Nucleotide Cofactors





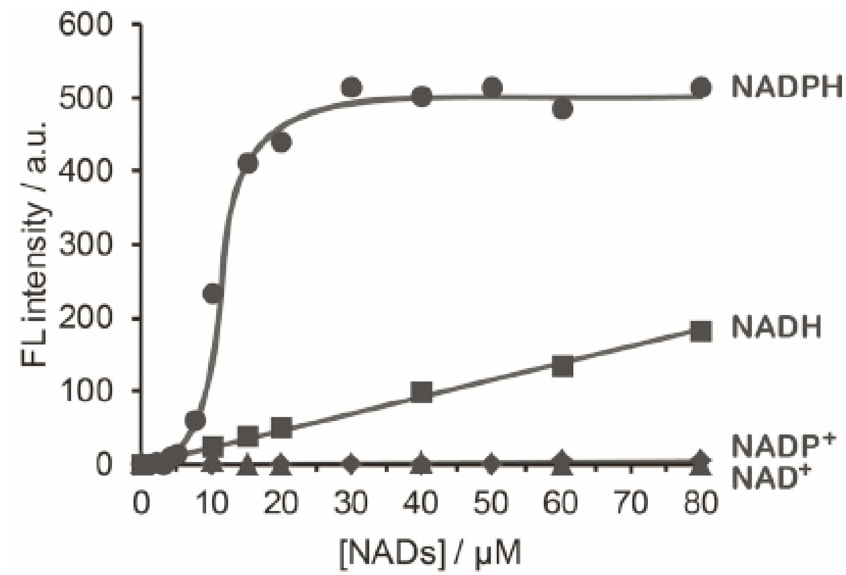
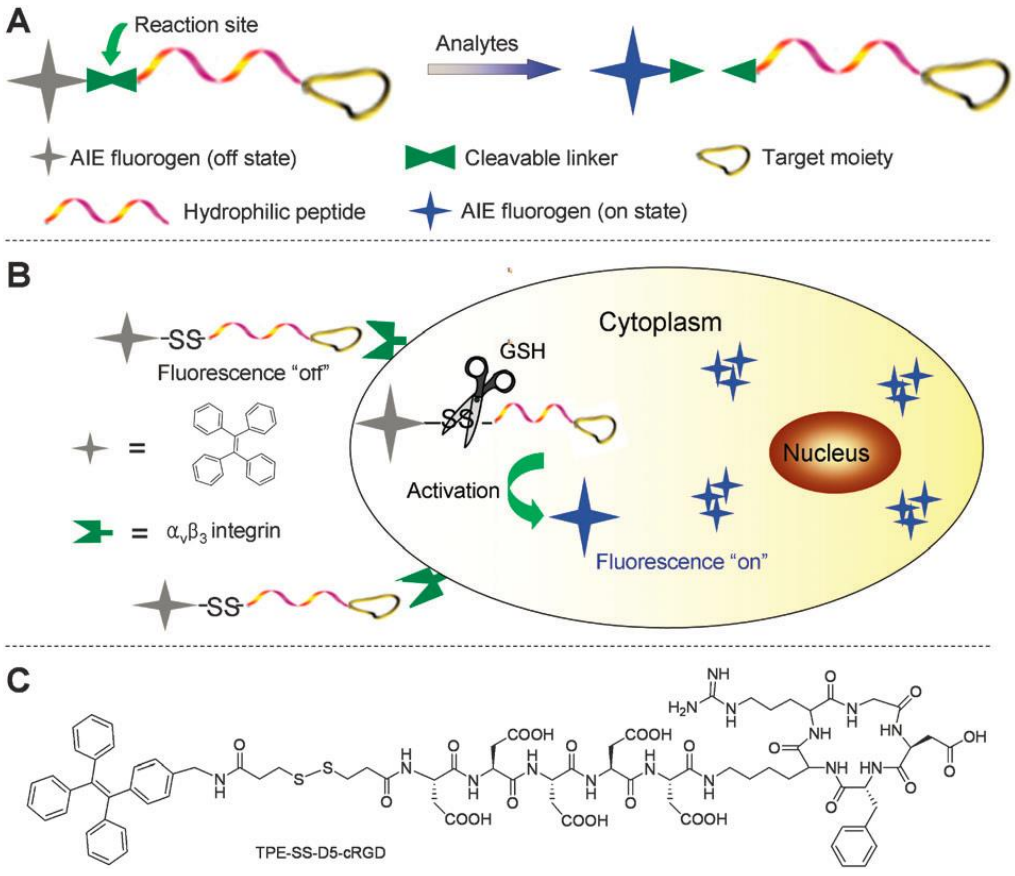


Figure 4 . Fluorescence titration curves (λ_{ex} = 335 nm) of TPE (6.0 × 10 − 6 M) upon the addition of NAD^+ , NADH, $NADP^+$ and NADPH in HEPES buffer (5.0 × 10 − 3 M , pH 7.4) at 25 ° C.

Takao Noguchi, Seiji Shinkai*
Marcromol. Rapid Commun. 2013, **34**, 779

Others

Thiol



Scheme 1. (A) General probe design strategy and (B) schematic illustration of cRGD targeted imaging of intracellular thiols through $\alpha_v\beta_3$ integrin mediated cellular uptake and cleavage of the disulfide bond to induce fluorescence ‘‘turn on’’. (C) Chemical structure of the probe.

Youyong Yuan, Bin Liu* Chem. Commu. 2014, **50**, 295

Others

Thiol

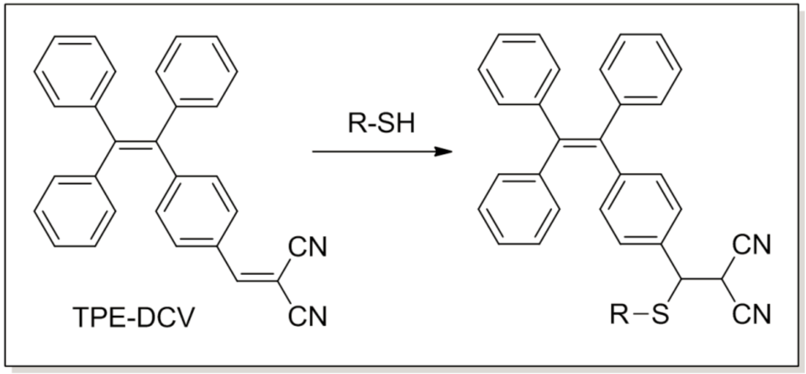


Figure 1. Reaction of TPE-DCV with thiol.

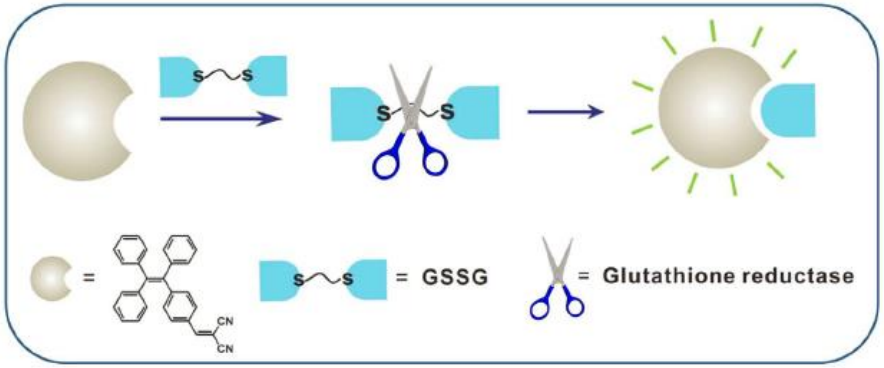
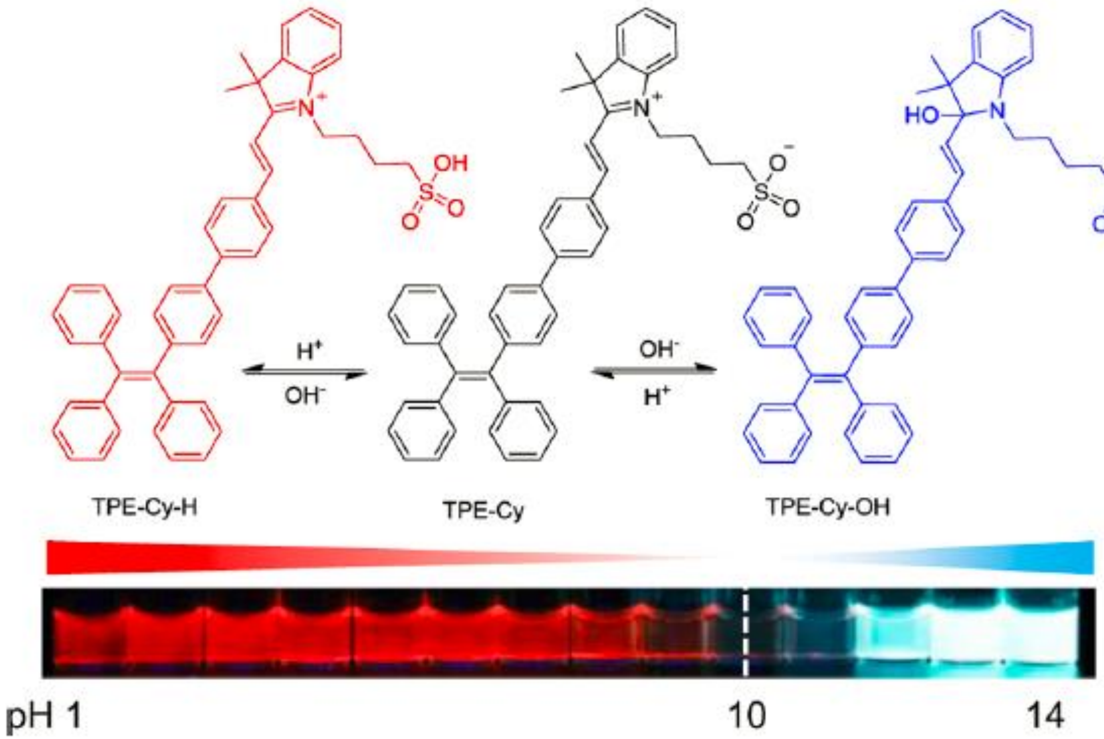


Figure 5. Schematic representation of glutathione reductase activity assay by TPE-DCV.

Xiaoding Lou, Ben Zhong Tang* *Scientific reports*, 2014, **4**, 4272

Others

Intracellular pH



Scheme 1. Working Principle: Fluorescent Response of TPECy to pH Change

Sijie Chen, Ben Zhong Tang* J. Am. Chem. Soc. 2013, **135**, 4926