

Supplementary Information

**A Cost-Effective Aptasensor Capable of Early Diagnosing and
Monitoring Alzheimer's Diseases with the Rapid Analysis of Beta-
Amyloid Peptide 1-40**

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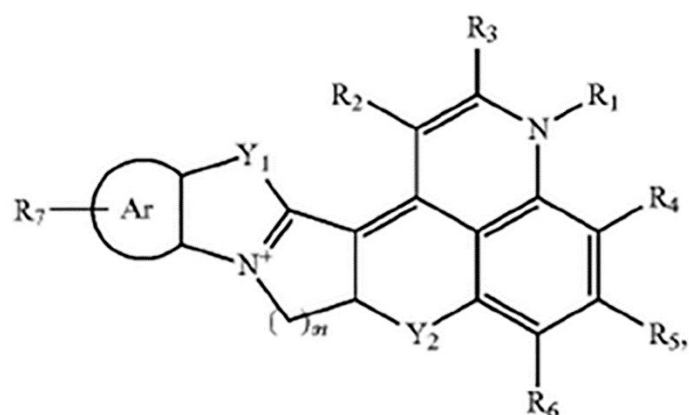
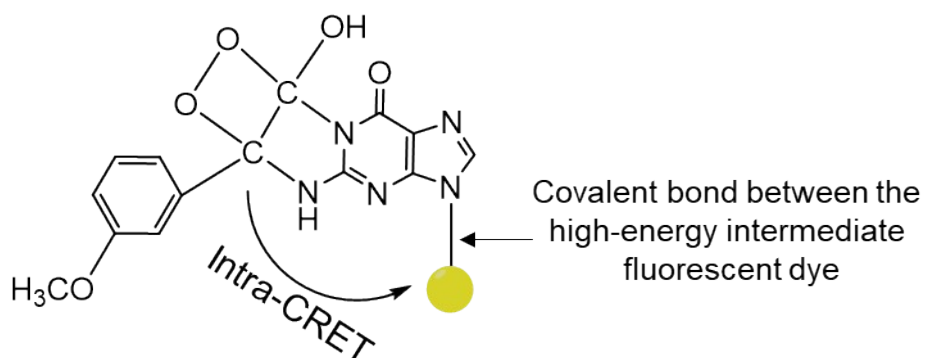
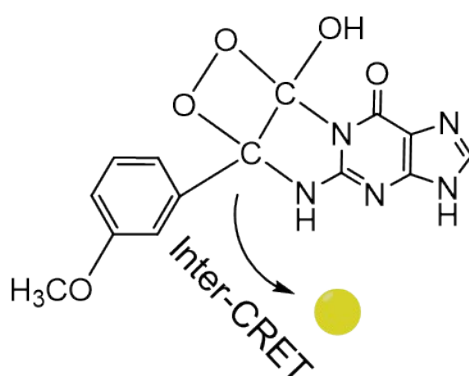


Fig. S1 Merocyanine-based compounds. **Ar** is a substituted or unsubstituted aromatic ring; **Y1** and **Y2** are each independently selected from sulfur, oxygen, selenium, NR₈ and —CR₈=CR₉-; **R1** to **R9** are each independently selected from the group consisting of hydrogen, deuterium, substituted or unsubstituted C1-C10 alkyl, substituted or unsubstituted C2-C10 heteroalkyl containing at least one heteroatom, substituted or unsubstituted C2-C10 alkenyl, substituted or unsubstituted C2-C10 alkynyl, substituted or unsubstituted C1-C10 alkoxy, substituted or unsubstituted aryloxy, substituted or unsubstituted C1-C10 haloalkyl, halogen, cyano, hydroxyl, substituted or unsubstituted amino, substituted or unsubstituted amide, carbamate, sulthydryl, nitro, carboxyl, carboxylate, substituted or unsubstituted aryl, substituted or unsubstituted heteroaryl, substituted or unsubstituted aralkyl, quaternary ammonium, phosphoric acid, phosphate, phosphonate, —COR₁₀, aldehyde, —COOR₁₀, acyl chloride, sulfonic acid, sulfonate, polyalkylene oxide, and -L-Z functional groups. (US patent: “Merocyanine-based compounds, and dyes, kits and contrast medium compositions for labelling biomolecules comprising the same (Registration number: US9969887B2).



Scheme S1. Intra-CRET between the high-energy intermediate and fluorescent dye in guanine chemiluminescence reaction.



Scheme S2. Inter-CRET between high-energy intermediate and fluorescent dye in guanine chemiluminescence reaction. The distance between the high-energy intermediate and fluorescent dye should be shorter than 10 nm.

Table S1 Comparison of the new biosensor and other methods for the quantification of beta-amyloid peptide 1-40.

Method	Time consuming procedure (e.g., centrifugation, washing, multiple incubations)	Analytical time (Hour)	Dynamic range	LOD	Reference
Gold nanoparticle-based aptasensor for colorimetric detection	Yes	~ 2.15	1 – 600 nM	0.56 nM	¹
Cu ²⁺ -Ab-AgNPs immunosensor	Yes	> 26	0.25–150 nM	0.086 nM	²
Capillary electrophoresis with fluorescence detection	Yes	> 10	7,000 – 3,5000 nM	500 nM	³
A label-free biosensor based on graphene and reduced graphene oxide dual-layer with electrochemical detection	Yes	~ 2.5	0.011 – 55 nM	0.002 nM	⁴
Impedimetric micro-immunosensing assay	Yes	~ 1.5	0.001 – 10 ng/ml	0.005 nM	⁵
Label free biosensor with chemiluminescence detection operated based on the inter-CRET	No	~ 1	5 – 500 ng/ml (1.15 – 115 nM)	2 ng/ml (0.46 nM)	This research

Table S2. Recovery test of the biosensor capable of quantifying beta-amyloid peptide 1-40 in CFS. (n = 5)

Sample	Spiked beta-amyloid peptide 1-40 (ng/ml)	Detected beta-amyloid peptide 1-40 (ng/ml)	Recovery (%)
1	15	13.9 (\pm 1.4)	92.7
2	50	53.6 (\pm 3.4)	107.2
3	150	162.5 (\pm 7.9)	108.3

References

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