

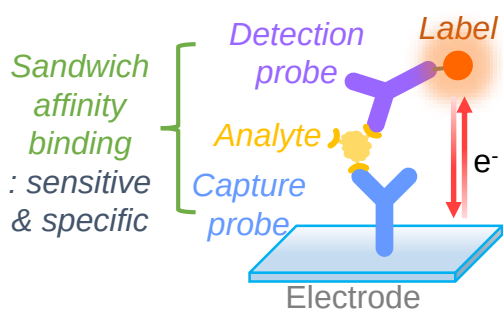
Multiple Redox Label Conjugation Using N3-Terminated Polylysine for Enhanced Electrochemical Aptamer Biosensors



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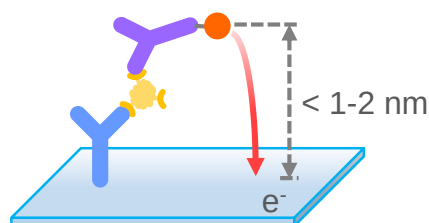


► Introduction



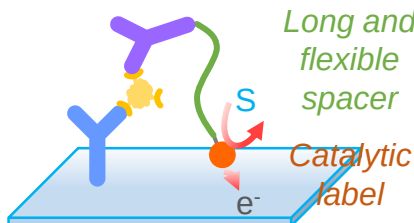
Sandwich affinity binding should be converted into an electrochemical signal by using a chemical or electrochemical reaction of a label.

▪ Direct electron transfer (DET)



More efficient for multiplex and wash-free detection
Challenging to place the label near the electrode after affinity binding

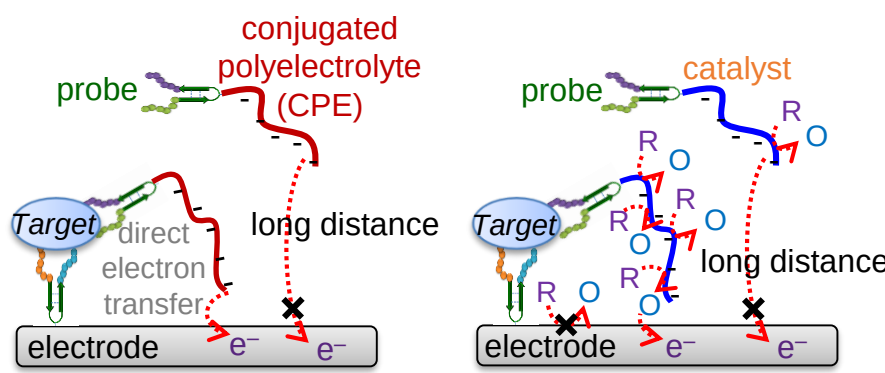
▪ DET + catalytic reaction



Signal amplification using catalytic electron mediation

▪ Direct e- transfer using a conjugated polyelectrolyte

Long, redox-active conjugated polyelectrolyte as a catalytic label

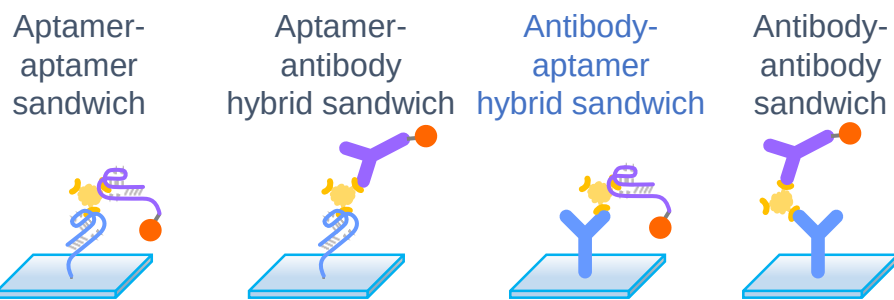


Redox reaction of CPE

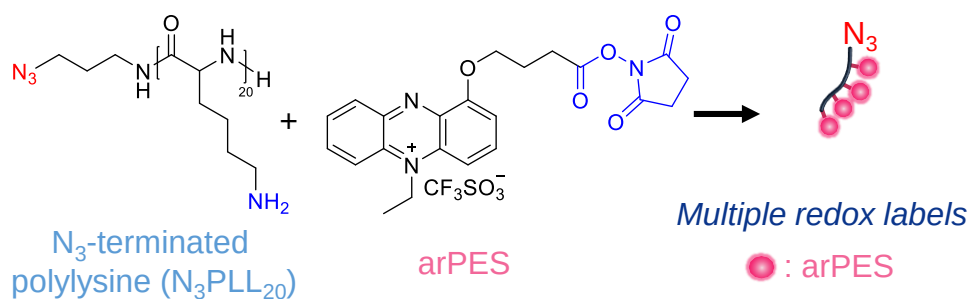
Electrocatalytic reaction of CPE

Long chain length (>10 nm) → easy approach to an electrode
Many redox-active sites → high electrochemical signal

▪ Possible sandwich-type electrochemical biosensors

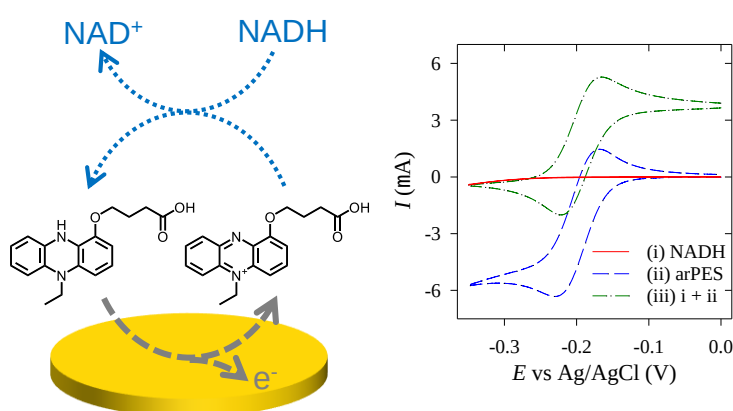


▪ Synthesis of multiple labels

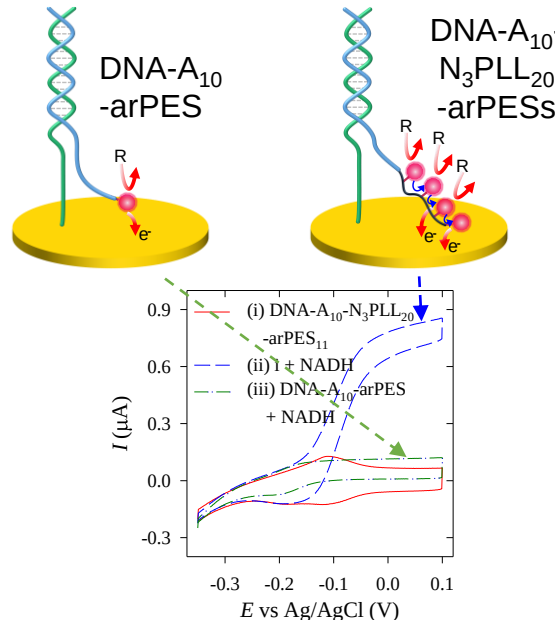


► Results and discussion

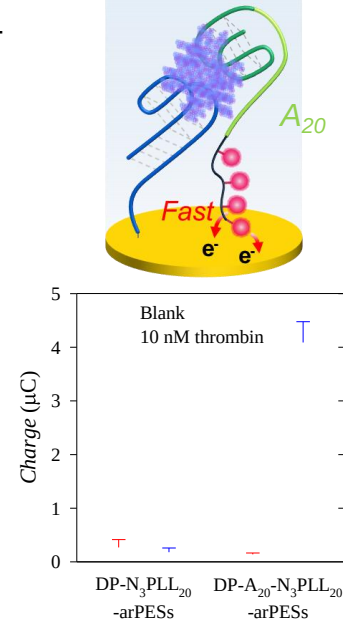
▪ Catalytic signal amplification by multiple labels



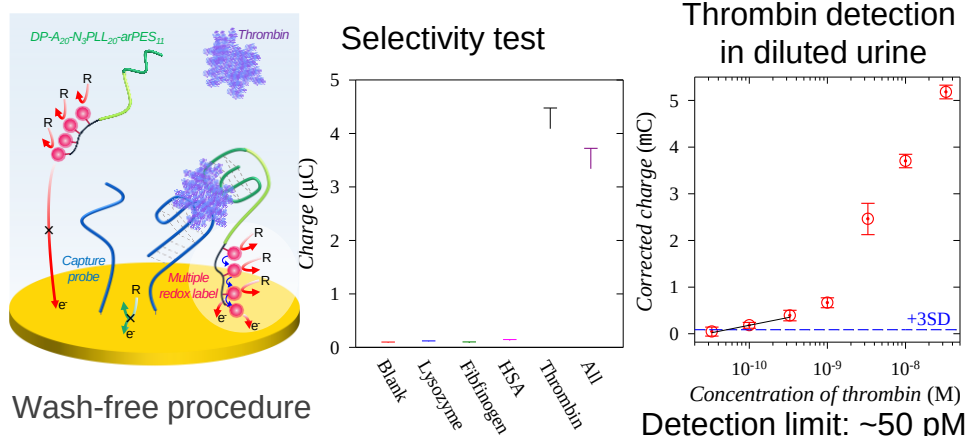
Effect of multiple redox labels



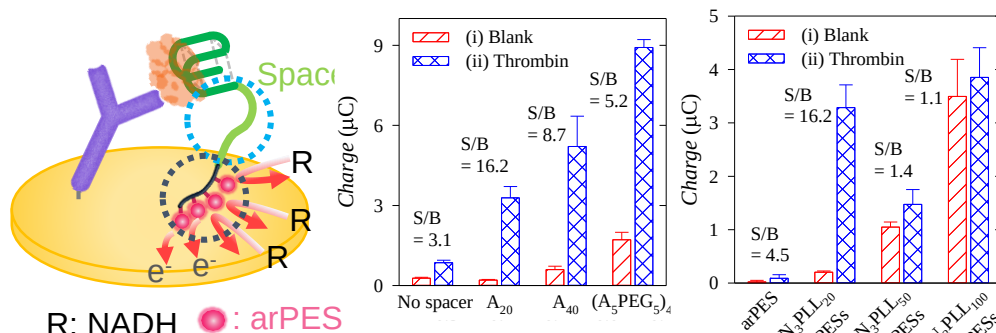
Effect of A₂₀ spacer



▪ Aptamer-aptamer sandwich-type thrombin detection



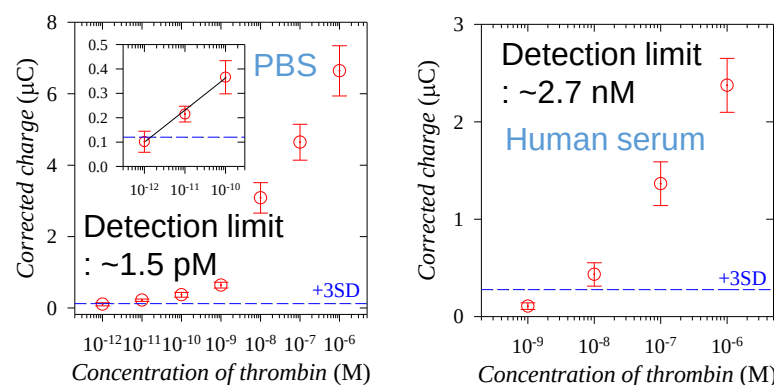
▪ Antibody-aptamer hybrid sandwich



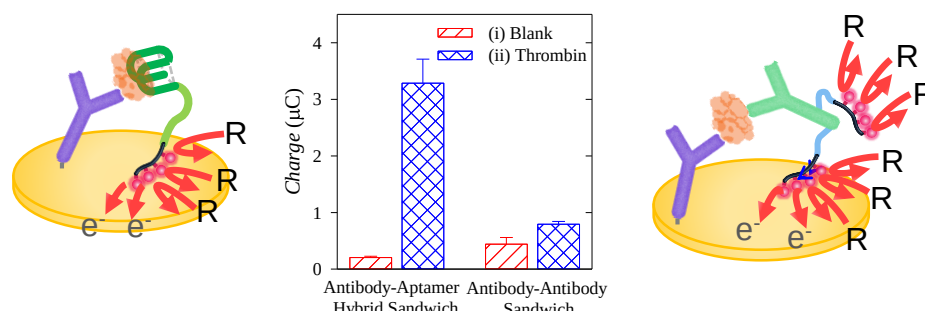
Longer length of a spacer → Increased nonspecific adsorption of the detection probe

Longer length of polylysine (PLL) → Interference of PLL to thrombin-aptamer binding

▪ Sandwich-type detection of thrombin in human serum



▪ Antibody-aptamer hybrid vs. antibody-antibody



► Summary

- Wash-free, sandwich-type thrombin detection using DET and catalytic signal amplification.
- Multiple redox labels (arPES) conjugated via polylinker enable high signal amplification. Flexible spacer design minimizes nonspecific adsorption and facilitates efficient electron transfer.
- Antibody-aptamer hybrid sandwich improves selectivity and allows DET in complex biological samples.