Supporting Information

Photo-Induced Electron Transfer-Based Versatile Platform with G-quadruplex/Hemin Complex as Quencher for Construction of DNA Logic Circuits

Shuang Wang,[†,‡] Jian Sun,[†] Jiahui Zhao,[†,§] Shasha Lu,[†,‡] and Xiurong Yang*[,†]

†State Key Laboratory of Electroanalytical Chemistry, Changchun Institute of Applied Chemistry, Changchun, Jilin 130022, China

‡ University of Science and Technology of China, Hefei, Anhui 230026, China

§ University of Chinese Academy of Sciences, Beijing 100039, China

*Fax: +86 431 85689278. E-mail: xryang@ciac.ac.cn

Table S1. All Sequences used in this experiment.

DNA sequences	**5'-3'**
SGMB	ROX-TTGGGTAGGGTCCTTTGTTTGTCGGGTTGGG
SGMB'	ROX-AACCCATCCCAGGAAACAAACAGCCCAACCC
SGMB-a	TCCTTTGTTTGT
TAMRA	TAMRA-TTGGGTAGGGTCCTTTGTTTGTCGGGTTGGG
CY5	CY5- TTGGGTAGGGTCCTTTGTTTGTCGGGTTGGG
Texas Red	Texas Red-TTGGGTAGGGTCCTTTGTTTGTCGGGTTGGG
S1'	CCCGACAAACAAAGGACCCT
S1	AGGGTCCTTTGTTTGTCGGG
S2'	GGACCCTACCCAATGG
S3'	CCCAACCCGACAA
OR1	S2'
OR2	S3'
AND1	TTTTTTTTTTTGGGTACCGACAAACAAAGGGGTACCCAAAAAAAAAAATCACTA
AND2	ATCGCTAGTGATTTTTTTTTTTGGGTACC
INHIBIT1	S1'
INHIBIT2	S1
XOR1	ATCTCATCTCAGTACCCCAACCCGATTGCTGTGTCATAC
XOR2	GTATGACACAGCAACCCAACCCGAGTACTGAGATGAGAT
INHIBIT-OR1	S1'
INHIBIT-OR2	S1
INHIBIT-OR3	S2'
Na	TTTTTTTTTTTGGGTACCCCCAACCCGAGGTACCCAAAAAAAAAAATCACTACTAGTC
Nb	ATCTCATCTCAGTACTAGTGATTTTTTTTTTTGGGTACCTTGCTGTGTCATAC
Nc	TTTTTTTTTTTGGGTACCCCCAACCCGAGGTACCCAAAAAAAAAAATCACTA
Nd	GTATGACACAGCAATAGTGATTTTTTTTTTTGGGTACCGTACTGAGATGAGAT
BS	TTTTTTTTTTGACAAACAAAGGA
RS	TCCTTTGTTTGTCAAAAAAAAAA

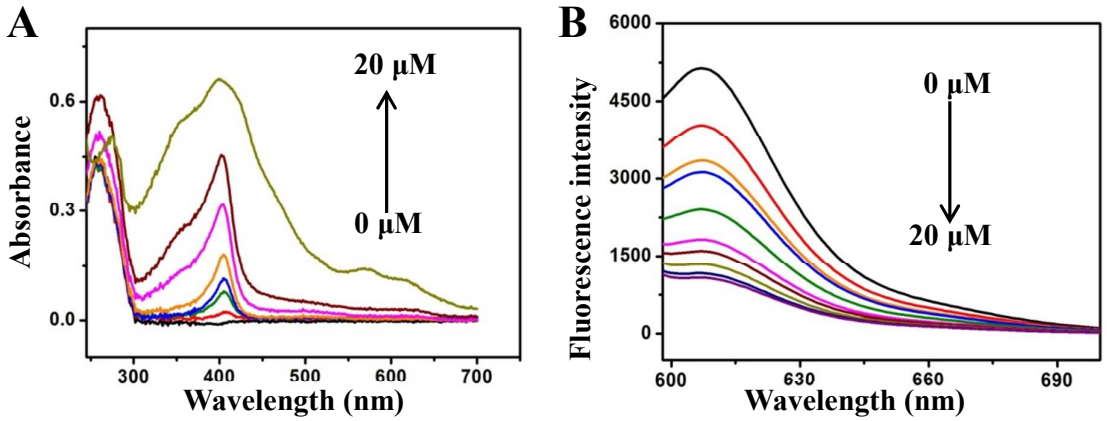


Figure S1. UV−vis absorbance (A) and fluorenscence (B) spectra of SGMB in the presence of increased hemin ranging from 0 μM to 20 μM. The concentrations of SGMB, K^+ were 1 μM, 25 mM, respectively.

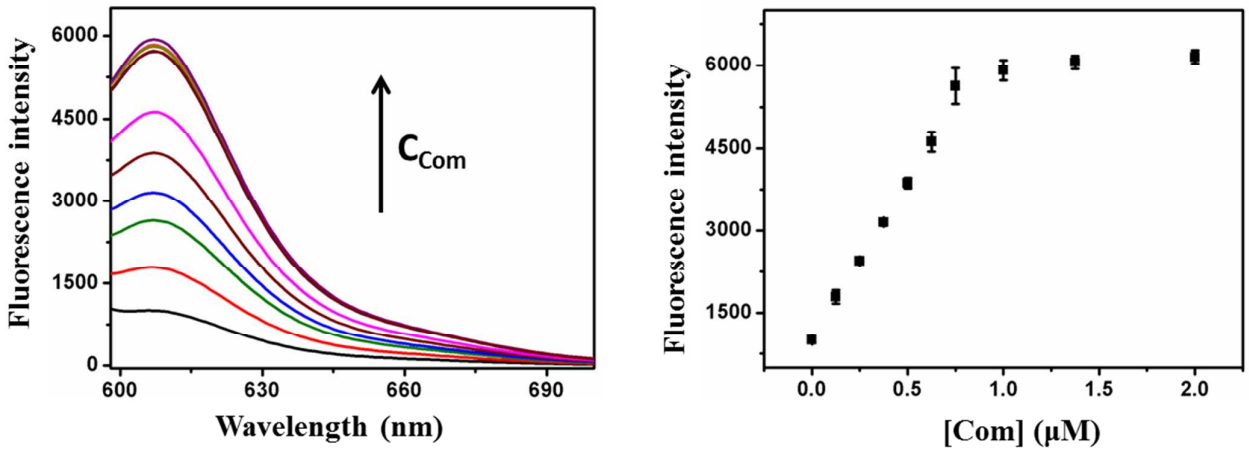


Figure S2. Fluorenscence (A) spectra and fluorenscence intensity changes (B) of SGMB in the presence of increased complementary strands (S1' as an example) ranging from 0 μM to 2 μM. The concentrations of SGMB, K^+, Hemin were 1 μM, 25 mM, 10 μM respectively.

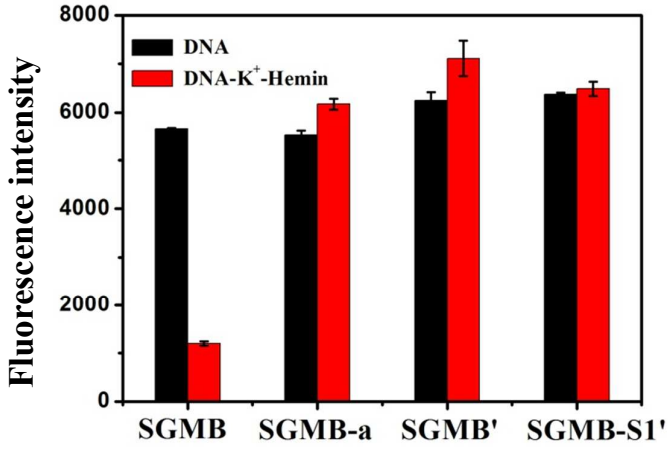


Figure S3. PET effect of different DNA sequences. The fluorenscence intensity of SGMB with different DNA sequences in the absence and presence of K^+ and hemin. The concentrations of SGMB, K^+ were 1 μM, 25 mM, respectively.

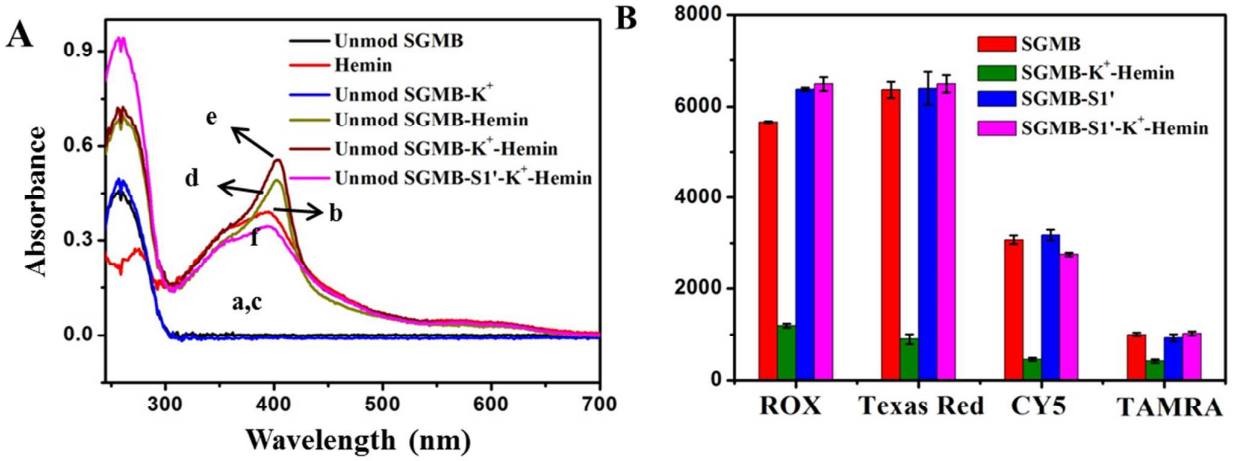


Figure S4. The effect of different fluorescent dyes for the produce and suppression of PET effect. (A) UV−vis absorbance spectra of (a) Unmodified SGMB, (b) hemin, (c) Unmodified SGMB-K^+, (d) Unmodified SGMB-hemin, (e) Unmodified SGMB-K^+-hemin, and (f) Unmodified SGMB-S1'-K^+-Hemin. (B) The fluorenscence intensity of SGMB (red bar), SGMB-K^+-hemin (olive bar), SGMB-S1'(blue bar), and SGMB-S1'-K^+-Hemin (magenta bar). The SGMBs modified by different fluorescent dye, such as ROX, Texas Red, CY5 and TAMRA. The concentrations of SGMBs, K^+ were 1 μM, 25 mM, respectively.

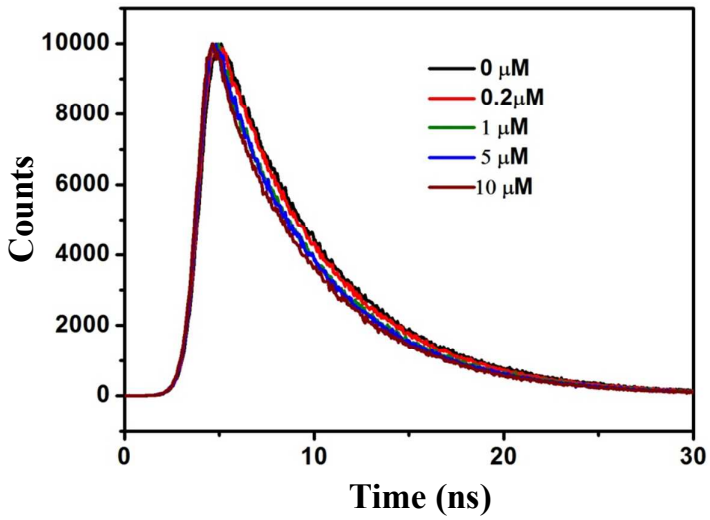
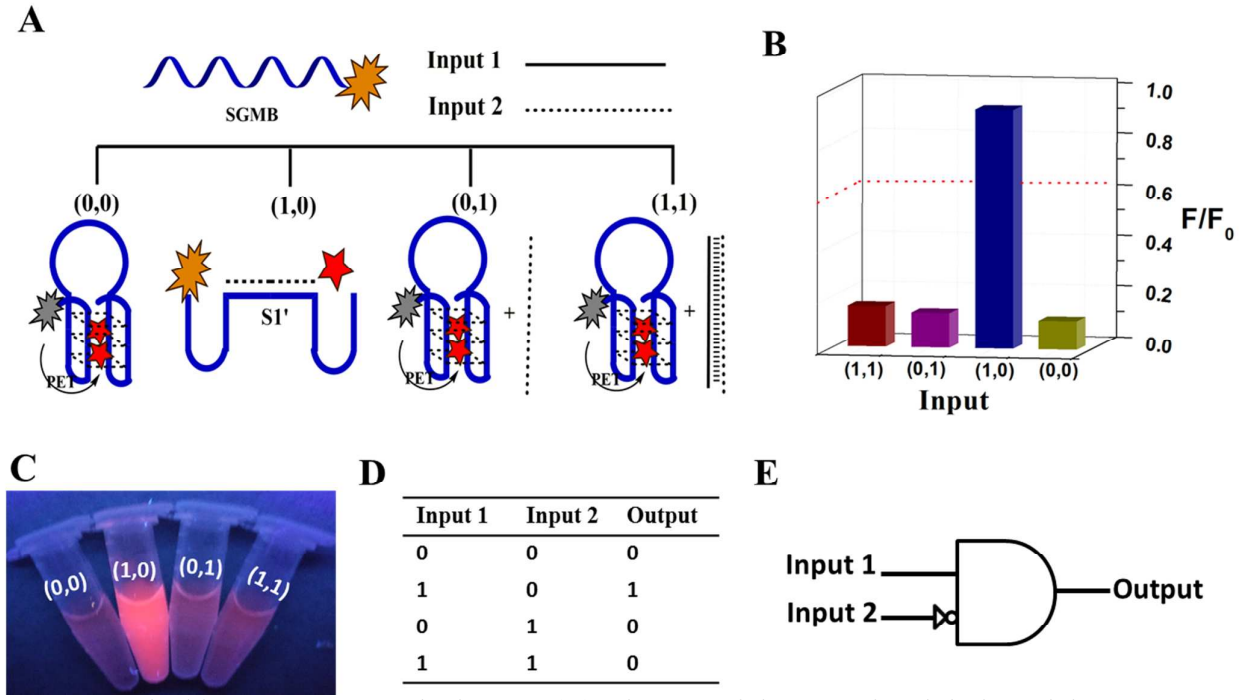


Figure S5. The fluorenscence lifetime of SGMB in the presence of increased Hemin. The concentrations of SGMB, K^+ were 1 μM, 25 mM, respectively.



Input 1	Input 2	Output
0	0	0
1	0	1
0	1	0
1	1	0

Figure S6. The binary "INHIBIT" logic gate. (A) Diagram of the operational design of the "INHIBIT" gate. (B) The F/F_0 608 of ROX. (C) The corresponding fluorescence image (D) The truth table of the "INHIBIT" logic gate. (E) Electronic equivalent circuitry. The concentrations of SGMB, K^+ were 1 μM, 25 mM, respectively.

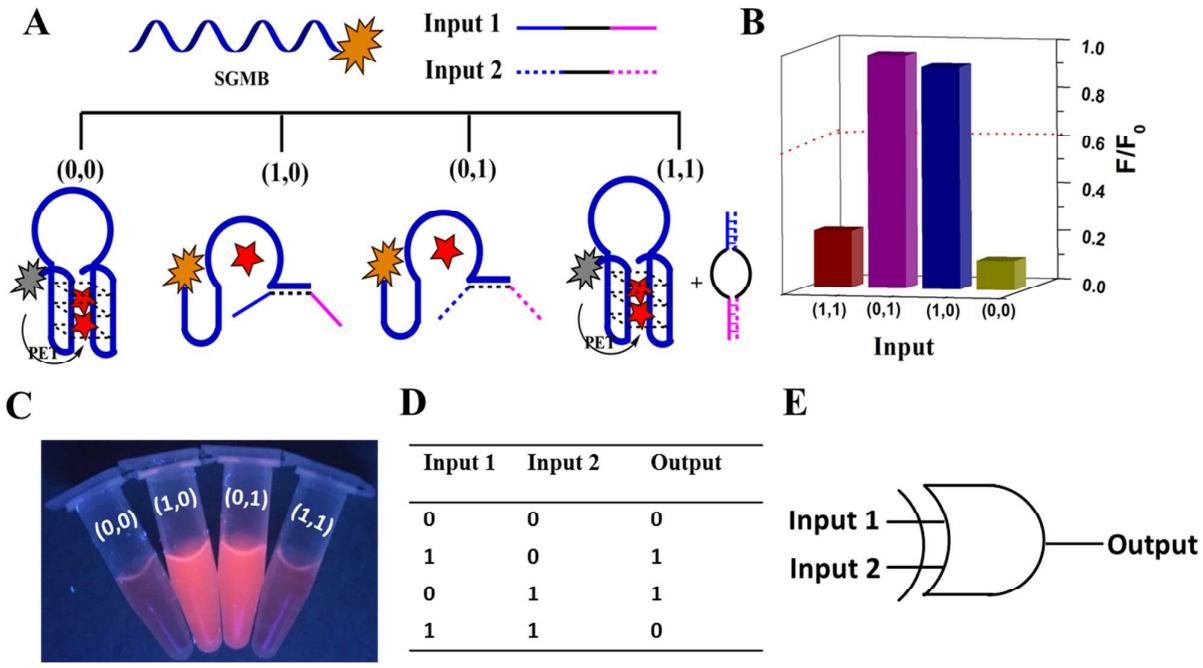


Figure S7. The binary "XOR" logic gate. (A) Schematic illustration of the operational design of the "XOR" gate. (B) The F/F_0 608 of ROX. (C) The corresponding fluorescence image (D) The truth table of the "XOR" logic gate. (E) Electronic equivalent circuitry. The concentrations of SGMB, K^+ were 1 μM, 25 mM, respectively.

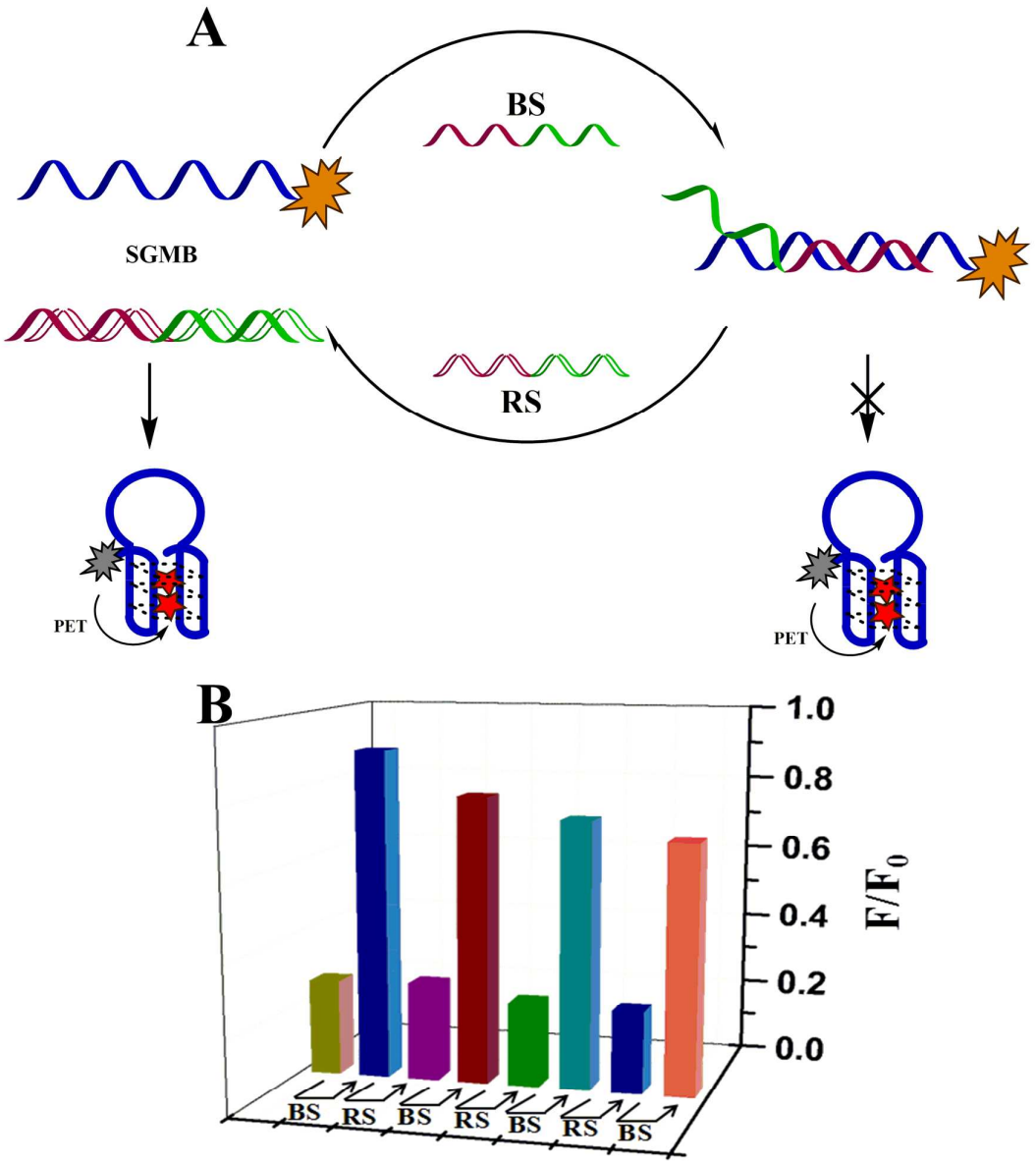
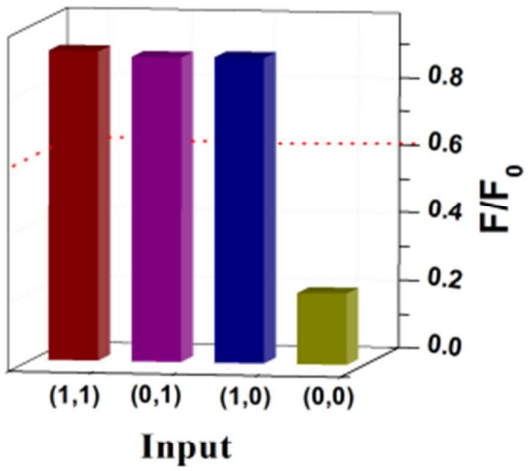


Figure S8. The set-reset function of SGMB probe. (A) The SGMB was been blocked by binding with blocking strands (BS), and was released by the detachment of releasing strands (RS), accompanied by alternately changed fluorescence intensity ratio (B).

A



B

Input 1	Input 2	Output
0	0	0
1	0	1
0	1	1
1	1	1

C

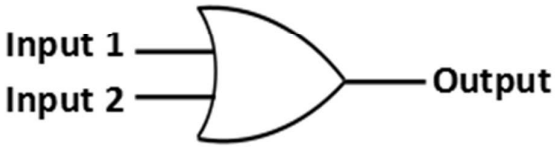


Figure S9. The "OR" logic operation in human blood serum. (A) The F/F_0 of ROX at 608 nm. (B) The truth table of "OR" logic gate. (C) Electronic equivalent circuitry. The concentrations of SGMB, K^+ were 1 μM, 25 mM, respectively.

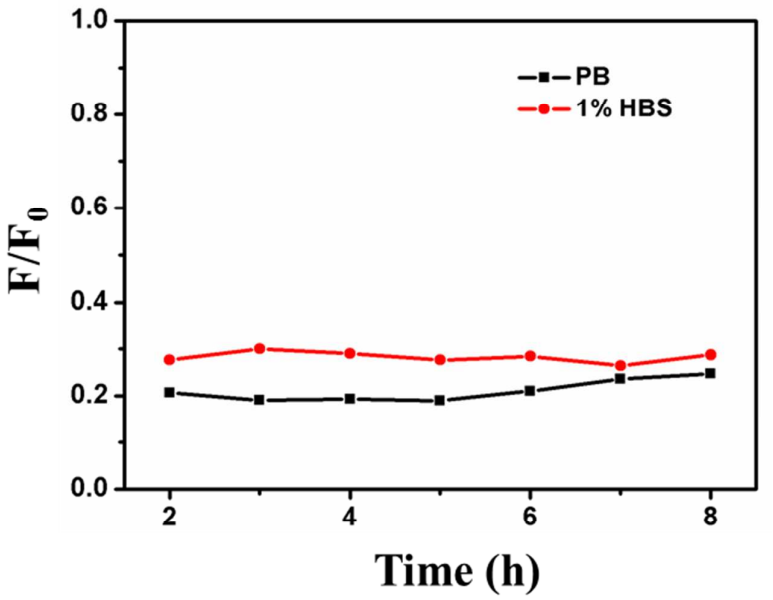


Figure S10. The stability of the SGMB platform in serum. Timecourse curvilinear of the fluorescence intensity ratio in PB (black line) and human blood serum (red line).