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Supporting Information

The nucleic acid probe based on DNA-templated silver nanoclusters for turn-on fluorescence detection of tumor suppressor gene p53

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Table S1. Names and sequences of all the DNAs used in the experiment

| DNAs       | Sequences (5’-3’)                                                                 |
|------------|----------------------------------------------------------------------------------|
| p53 probe 1| CCCCCCCTTAACCCGAGTCTCCAGTGTGATGAGGGGTT                                            |
| p53 probe 2| CCCCCCCTAACTCCCCGAGTCTTCCAGTGTGATGAGGGGAG                                           |
| p53 probe 3| CCCCCCCTTAATCCCCGAGTCTTCCAGTGTGATGAGGGGAT                                           |
| p53 probe1-2| AAGAGGGGAGTCTTCCAGTGTGATGACCCCTTAAACCC                                              |
| p53 probe2-2| TTAGGGGAGTCTTCCAGTGTGATGACCCCTAATCCCC                                              |
| p53 probe3-2| TTAAGGGGAGTCTTCCAGTGTGATGACCCCTTAAATCCCC                                              |
| p53         | TCATCACACTGGAAGACTC                                                                |
| m1 p53      | TCATCACACTGGAAAACCT                                                                |
| m2 p53      | TCATCACACTGGAAGACTA                                                                |
| 2m p53      | TCAACACACTGGAAAACCT                                                                |

Table S2. The lifetimes of DNA-Ag NCs before and after the interaction between probes and targets

|          | P53 probe 1-Ag NCs | P53 probe 1-p53/ Ag NCs |
|----------|-------------------|-------------------------|
| τ1 (ns)  | 0.22              | 1.14                    |
| α1 (%)   | 49.79             | 20.76                   |
| τ2 (ns)  | 2.28              | 2.53                    |
| α2 (%)   | 36.7              | 77.49                   |
| τ3 (ns)  | 7.72              | 8.37                    |
| α3 (%)   | 13.51             | 1.76                    |
| τavg (ns)| 1.99              | 2.34                    |
| χ²       | 1.159             | 1.028                   |
Table S3. Comparison of various fluorescent methods for p53 gene detection

| Methods                      | Linear range       | Limit of detection | Reference |
|------------------------------|--------------------|--------------------|-----------|
| Colorimetric detection       | —                  | 10 nmol            | [1]       |
| Fluorescence                 | 15 nmol – 750 nmol | 4 nmol             | [2]       |
| Fluorescence                 | 100 pM – 40 nM     | 1 pM               | [3]       |
| Fluorescence                 | —                  | 0.07 fM            | [4]       |
| Electrochemiluminescence     | 0.1 nmol – 15 nmol | 0.03 nmol          | [5]       |
| Electrochemiluminescence     | 0.2 pM – 200 nM    | 0.1 pM             | [6]       |
| Electrochemiluminescence     | 0.001 – 0.01 nM    | 0.68 nM            | [7]       |
| Quartz crystal microbalance  | 0.5 nM – 20 nM     | 0.3 nM             | [8]       |

References

1. H. X. Li, L. Rothberg, P NATL ACAD SCI USA, 2004, 101, 14036.
2. R. H. Yang, J. Y. Jin, Chen Y., N. Shao, H. Z. Kang, Z. Y. Xiao, Z. W. Tang, Y. R. Wu, Z. Zhu, W. H. Tan, JACS, 2008, 130, 8351.
3. H. Xu, C. Xue, R. Zhang, Y. Chen, F. Li, Z. Shen, L. Jia, Z. S. Wu, Sens. Actuators, B, 2017, 243, 1240.
4. X. Li, J. Song, Q. W. Xue, H. Y. Zhao, M. Liu, B. L. Chen, Y. Liu, W. Jiang and C. Z. Li, Analyst, 2017, 142, 3598.
5. Y. Liu, X. Q. Chen, Q. Ma, Biosens. Bioelectr., 2018, 117, 240.
6. X. Wang, X. Zhang, P. He, Y. Fang, Biosens. Bioelectr., 2011, 26, 3608.
7. J. B. Raoof, R. Ojani, S. M. Golabi, E. Hamidi-Asl, M. S. Hejazi, Sens. Actuators B, 2011, 157, 20.
8. D. Wang, W. Tang, X. Wu, X. Wang, G. Chen, Q. Chen, N. Li, F. Liu, Anal. Chem., 2012, 84, 7008.
Figure S1. The relative fluorescence intensity \( \frac{F-F_0}{F_0} \) is recorded by the response of p53 gene to p53 probe 1, 2, 3, 1-2, 2-2 and 3-2. \( F \) and \( F_0 \) represent the emission intensity of Ag NCs in the presence and in the absence of p53, respectively. Error bars are calculated from three parallel experiments.

Figure S2. The corresponding photographs of p53 probe 1-Ag NCs (left) and p53 probe 1/ p53-Ag NCs (right) under the room light (A) and hand-held UV lamp (B) irradiation (365 nm), respectively.
Figure S3 Effects of (A) the incubation time with NaHB₄ and (B) the pH value of buffer solution on the synthesis of DNA-AgNCs. The error bars are standard deviations of three repetitive measurements.

Figure S4 The TCSPC data for p53 probe 1-Ag NCs (A) and p53 probe 1/p53-Ag NCs (B), (a) the response of the instrument (red curve), DNA-Ag NCs (black curve) and the fitted curve (green curve), (b) The weighted residuals time scan of the fitted curve (excitation at 405 nm and emission at 600 nm).
Figure S5 (A) The fluorescent emission spectra of DNA-Ag NCs synthesized in 1% fetal bovine serum samples are recorded with different concentrations of target p53. The concentration of the p53 probe 1 used is all 2.5 μM. (B) The relationship between the fluorescence intensity and the concentration of target. (C) The linear relationship between the fluorescence intensity and the concentration of p53 gene ranging from 250 to 2500 nM. The error bars are obtained according to three independent experimental results.