Supplementary Information

Enhancing the Stability of Single-Stranded DNA onto Gold Nanoparticles for Molecular Machine through Salt and Acid Regulation

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| Name | Sequence and modifications (from 5' to 3') |
|--------------|--|
| SH-T15-R1- | SH-TTTTTTTTTTTTTTTGTAGGGTGAGAGTGA-FAM |
| FAM | |
| SH-T15-R2- | SH-TTTTTTTTTTTTTGGATGGAGGTTGAGGG-FAM |
| FAM | |
| A15-R1-FAM | AAAAAAAAAAAAAAGTAGGGTGAGAGTGA-FAM |
| A15-R2-FAM | AAAAAAAAAAAAAAGGATGGAGGTTGAGGG-FAM |
| SH-T9-R1-FAM | SH-TTTTTTTTTGTAGGGTGAGAGTGA-FAM |
| SH-T9-R2-FAM | SH-TTTTTTTTGGATGGAGGTTGAGGG-FAM |
| A9-R1-FAM | AAAAAAAAGTAGGGTGAGAGTGA-FAM |
| A9-R2-FAM | AAAAAAAAGGATGGAGGTTGAGGG-FAM |
| A5-R1 | AAAAAGTAGGGTGAGAGTGA |
| A5-R2 | AAAAAGGATGGAGGTTGAGGG |
| A9T1-R1 | AAAAAAAATGTAGGGTGAGAGTGA |
| A9T1-R2 | AAAAAAAATGGATGGAGGTTGAGGG |
| A9T2-R1 | AAAAAAAATTGTAGGGTGAGAGTGA |
| A9T2-R2 | AAAAAAAATTGGATGGAGGTTGAGGG |
| A9T3-R1 | AAAAAAAATTTGTAGGGTGAGAGTGA |
| A9T3-R2 | AAAAAAAATTTGGATGGAGGTTGAGGG |
| A9T4-R1 | AAAAAAAATTTTGTAGGGTGAGAGTGA |
| A9T4-R2 | AAAAAAAATTTTGGATGGAGGTTGAGGG |
| A9T5-R1 | AAAAAAAATTTTTGTAGGGTGAGAGTGA |
| A9T5-R2 | AAAAAAAATTTTTGGATGGAGGTTGAGGG |
| A9T6-R1 | AAAAAAAATTTTTTGTAGGGTGAGAGTGA |
| A9T6-R2 | AAAAAAAATTTTTTGGATGGAGGTTGAGGG |
| A9T7-R1 | AAAAAAAATTTTTTTGTAGGGTGAGAGTGA |
| A9T7-R2 | AAAAAAAATTTTTTGGATGGAGGTTGAGGG |
| A9T9-R1 | AAAAAAAATTTTTTTTTGTAGGGTGAGAGTGA |
| A9T9-R2 | AAAAAAAATTTTTTTTGGATGGAGGTTGAGGG |
| A9T11-R1 | AAAAAAAATTTTTTTTTTTGTAGGGTGAGAGTGA |
| A9T11-R2 | AAAAAAAATTTTTTTTTTGGATGGAGGTTGAGGG |
| A9T13-R1 | AAAAAAAATTTTTTTTTTTTTTGTAGGGTGAGAGTGA |
| A9T13-R2 | AAAAAAAATTTTTTTTTTTTGGATGGAGGTTGAGG |
| | G |

S1. The DNA sequences used in fluorescence testing and DNA machine.

 Table S1. The DNA sequences used in fluorescence testing and DNA machine.

S2. Standard curves of fluorescence testing.



Figure S1. Standard curve for fluorescence testing. Each type of DNA-AuNPs shows only one set of standard curves, and the rest of the standard curve has a similar pattern. A: Standard curve of SH-T15-R1 in NaCl solution; B: Standard curve of SH-T15-R1 in NaBr solution; C: Standard curve of SH-T15-R1 in pH 3.0 solution.



S3. UV-visible spectra of the A15T5-DNA-AuNPs samples.

Figure S2. UV-visible spectra of the A15T5-DNA-AuNPs samples. A: The absorbance of A15T5-DNA-AuNPs in NaCl. B: The absorbance of A15T5-DNA-AuNPs in NaBr solution.S4. Photographs of SH-DNA-AuNPs and polyA-DNA-AuNPs dispersed in different salt solutions.

S4. Photographs of SH-DNA-AuNPs and polyA-DNA-AuNPs dispersed in different salt solutions.



Figure S3. Photographs of SH-DNA-AuNPs and polyA-DNA-AuNPs dispersed in different salt solutions.



S5. TEM images of DNA-AuNPs incubated in different concentration of salt.

Figure S4. TEM images of DNA-AuNPs dispersed in different concentration salt.





Figure S5. DLS curves of DNA-AuNPs incubated in different concentration of salt.

S7. UV-visible spectra and surface densities of SH-DNA-AuNPs dispersed in different salt solutions.



Figure S6. UV-visible spectra of SH-DNA-AuNPs samples in different salt solutions. A: The absorbance of SH-DNA-AuNPs in 100 mM and 300 mM NaCl solutions. B: The absorbance of SH-DNA-AuNPs in 100 mM and 300 mM NaBr solutions. C: Surface densities of SH-DNA-AuNPs (strand/AuNP) in different salt solutions.



S8. Photographs of DNA-AuNPs dispersed in different salt solutions.

Figure S7. Photographs of DNA-AuNPs dispersed in different salt solutions.



S9. UV-visible spectra of DNA-AuNPs samples in different salt solutions.

Figure S8. UV-visible spectra of DNA-AuNPs samples in different salt solutions.

S10. TEM images of DNA-AuNPs dispersed in different salt solutions.



Figure S9. TEM images of DNA-AuNPs dispersed in different salt solutions.

S11. DLS curves of A15-DNA-AuNPs dispersed in different pH solutions.



Figure S10. DLS curves of A15-DNA-AuNPs dispersed in different pH solutions.



S12. The influence of DNA/gold ratio on such salt mediated effects.

Figure S11. A: UV-visible spectra of the A9-DNA-AuNPs samples incubated in NaBr solution with different ratios. B: Surface densities of A9-DNA-AuNPs (strand / AuNP) incubated in NaBr solution with different ratios. C: DLS curves of A9-DNA-AuNPs with different ratios. All sequences used in these experiments were DNA with R1. D: TEM images of A9-DNA-AuNPs incubated with different ratios.



S13. The influence of DNA/gold ratio on such pH mediated effects.

Figure S12. A: UV-visible spectra of the A9-DNA-AuNPs samples incubated in pH 3.0 buffer with different ratios. B: Surface densities of A9-DNA-AuNPs (strand / AuNP) in pH 3.0 buffer with different ratios. C: DLS curves of A9-DNA-AuNPs with different ratios. All sequences used in these experiments were DNA with R1.