ELECTRONIC SUPPLEMENTARY INFORMATION

Surfactant-free nanoparticle-DNA conjugates with ultrahigh stability against salt for environmental and biological sensing

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Fig S1. The effect of the number of poly T bases functionalized AuNPs in seawater for a long term



Fig S2. Comparison of the stability of the between AuNP-[5T=5'-HS-TTTTT-3'] and AuNP-[5T-random=5'-HS-TTTTT-ACCTGGGGGAGTAT-3'] in seawater for a long term.



Fig S3. The stability of AuNP-[5T-random=5'-HS-TTTTT-ACCTGGGGGGGGTAT-3'] in seawater with various metal ion concentrations.



Fig S4. Colorimetric detection of adenosine using adenosine aptamer-functionalized AuNP in seawater at 4 °C. There are negligible color change and red-shift in the absorbance peak of adenosine-induced assembly of AuNP-aptamer complexes after 24 hr.



Fig S5. Colorimetric detection of adenosine using none T adenosine aptamer-functionalized AuNP sensor in 1/10 diluted seawater. (A) Without 5T spacers the AuNP-DNA complexes are aggregated in seawater. It suggests that T spacers make the AuNP highly stable in high ionic strength solutions. However, the AuNP-DNA complexes without 5T spacers are highly stable in 1/10 diluted seawater. (B) The color change of none T adenosine and 5T adenosine aptamer-functionalized AuNP in 1/10 diluted seawater. Without 5T spacers the color change of sensor is more clear and the detection limit of sensor decreases up to 0.059 mM. On the other hand, AuNP-aptamer sensor with 5T spacers have the detection limit of 0.2 mM in 1/10 diluted seawater.

0 mMA 0.05 mMA 0.1 mMA 0.3 mMA 0.5 mMA 1 mMA 2 mMA 5 mMA

In Buffer solution (300 mM NaCl and tris acetate buffer)

With 5T spacers adenosine aptamer



Fig S6. Colorimetric detection of adenosine using aptamer-functionalized AuNP sensor in buffer solution. The color change of adenosine aptamer-functionalized AuNP only happens in the presence of adenosine (A=adenosine). This color change is monitored from the red-shift of absorbance of AuNP in the presence of adenosine. The sensor has a detection limit of 0.01 mM in buffer solution.



Fig S7. TEM image of AuNPs. The size of AuNP is about 13.1±0.7 nm

Component	Concentration (mM)
Cl	509
HCO₃ ⁻	1.50
SO4 ²⁻	24.2
Ca ²⁺	10.1
Na⁺	427
Mg ²⁺	57.0
Hg ²⁺	ND
K⁺	9.82
Ni ²⁺	2.60 x 10 ⁻⁵
Cu ²⁺	6.01 x 10 ⁻⁵
Zn ²⁺	7.12 x 10 ⁻⁵
Cd ²⁺	ND
Ba ²⁺	0.228
Sr ²⁺	0.0925
	*ND : Non Detection

Table S1. The concentration of ionic components in seawater (Source : Daeboo Island beach, Korea)measured by the National Instrumentation Center for Environmental Management of Seoul NationalUniversity