Electronic Supplementary Material (ESI) for Nanoscale.
This journal is © The Royal Society of Chemistry 2018

Supporting Information for

A signal-on, colorimetric determination of deoxyribonuclease I activity utilizing photoinduced synthesis of gold nanoparticles

By Ye Lim Jung,[ab] Chang Yeol Lee,[a] Jung Hun Park,[a] Ki Soo Park*[c] and Hyun Gyu Park*[a]

[a] Department of Chemical and Biomolecular Engineering (BK 21+ program), KAIST, Daehak-ro 291, Yuseong-gu, Daejeon 34141, Republic of Korea

[b] Department of Business Opportunity Analysis, Technology Commercialization Analysis Center, Korea Institute of Science and Technology Information (KISTI), Seoul 130-741, Republic of Korea

[c] Department of Biological Engineering, College of Engineering, Konkuk University, Seoul 05029, Republic of Korea

* To whom correspondence should be addressed.

E-mail: hgpark@kaist.ac.kr (H.G. Park); Phone: +82-42-350-3932; Fax: +82-42-350-3910.

E-mail: kskonkuk@gmail.com (K.S. Park); Phone: +82-2-450-3742; Fax: +82-2-450-3742.

Table S1 The residual PS DNA probe concentrations after the treatment with various concentrations of DNase I and the removal of cleaved oligonucleotide fragments.

DNase I (U/mL)	PS DNA probe (ng/μL)
0	509
0.5	371
2	349
5	232
15	124
30	97
50	71

Fig. S1 The expected mechanism for the photoinduced synthesis of AuNPs in the presence of threonine (Thr).

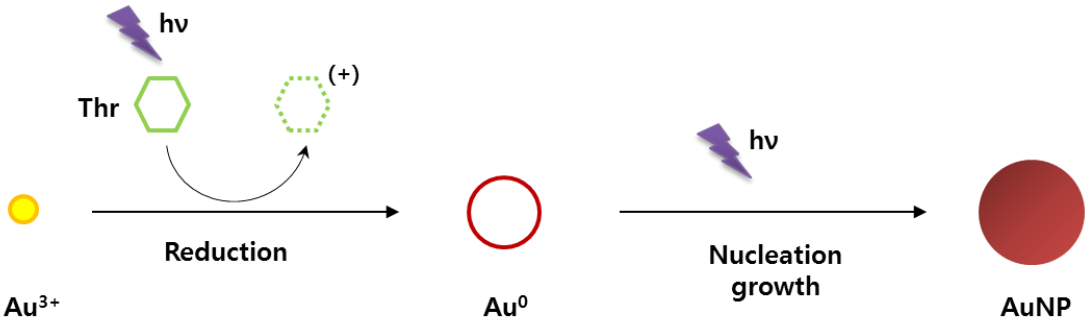
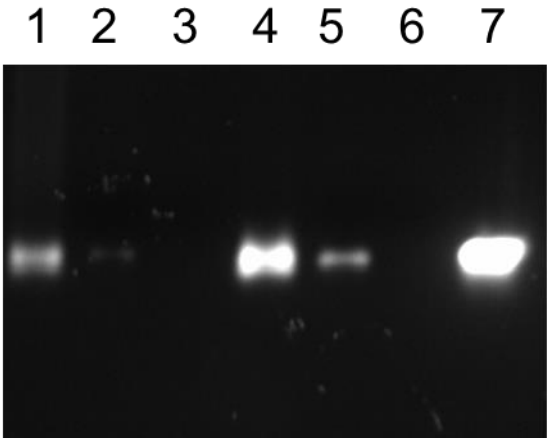


Fig. S2 DNase I-catalyzed hydrolysis of natural and PS DNA probe (80 nucleobases). 1: natural DNA probe treated with 10 U/mL DNase I, 2: natural DNA probe treated with 50 U/mL DNase I, 3: natural DNA probe treated with 100 U/mL DNase I, 4: PS DNA probe treated with 10 U/mL DNase I, 5: PS DNA probe treated with 50 U/mL DNase I, 6: PS DNA probe treated with 100 U/mL DNase I, 7: PS DNA probe without DNase I treatment.



The effect of PS bonds on DNase I-catalyzed hydrolysis

As shown in Fig. S2, PS DNA probe (lane 4-6) was efficiently digested by DNase I despite the slight reduction in the digestion efficiency as compared to that of natural DNA probe (lane 1-3). With this designed PS DNA Probe, DNase I activity was successfully analyzed with the signal-on colorimetric response even in bovine urine sample (Table 1). In future, the number and position of PS bonds in DNA probe will be optimized to improve the detection sensitivity.

Fig. S3 TEM image of AuNPs produced by UV irradiation on the sample containing $HAuCl_4$ and Thr in the absence of PS DNA probe. Field emission transmission electron microscopy (TEM) (Tecnai, FEI, Netherlands) operating at an acceleration voltage of 200 kV, was employed for the characterization of the synthesized AuNPs. The sample was prepared by depositing the AuNP solution onto a carbon-coated copper TEM grid, followed by drying at room temperature.

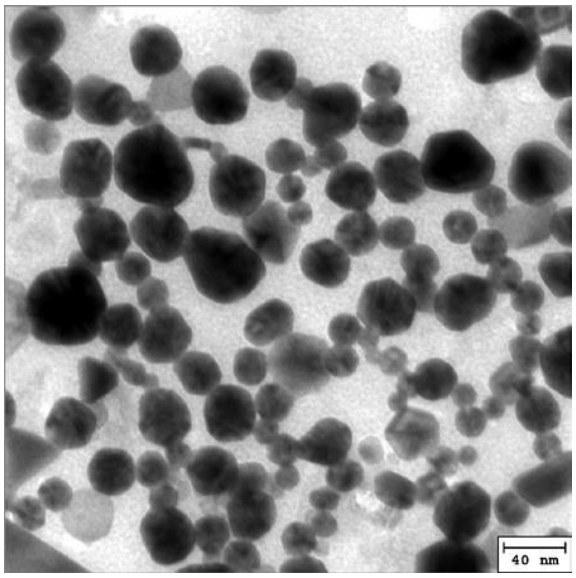


Fig. S4 The linear relationship between the absorbance at 530 nm (A_{530}) and the concentration of DNase I spiked in the bovine urine (0.5-15 U/mL).

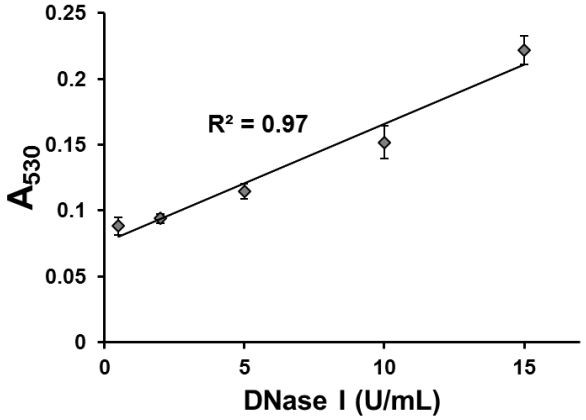


Fig. S5 Inhibition of dNTPαS against the photoinduced synthesis of AuNPs. UV–vis absorption spectra (Left) and absorbances at 530 nm (A_{530}) (Right) of the samples containing $HAuCl_4$ and Thr in the presence of various concentrations of dNTPαS (a) or natural dNTP (b) upon UV light irradiation. The inset photographs show the color changes of the corresponding samples.