Electronic Supplementary Material (ESI) for Analytical Methods.

Supporting information

A non-aggregation colorimetric method for trace lead(II) ions based on the leaching of gold nanorods

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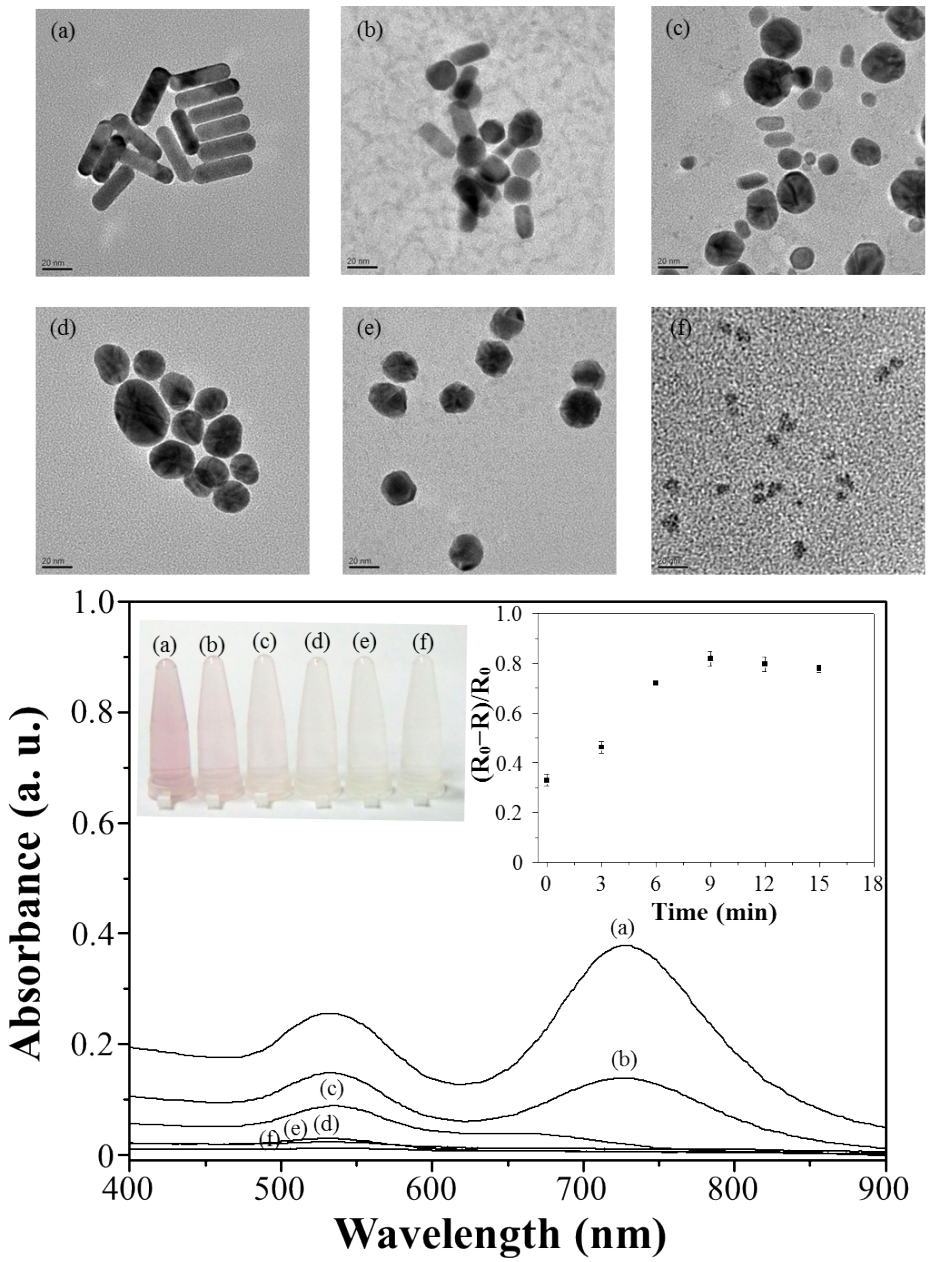


Figure S1. Photograph (left inset), UV–Vis absorption spectra, and TEM images (scale bar = 20 nm) of the Au NRs after different amounts of time in the presence of 100 μM Pb^{2+} and 3.0 mM $S_2O_3^{2-}$ at 50 °C. Right inset: leaching effect ($^{(R_0 - R)}/_{R_0}$) for the $S_2O_3^{2-}$/Au NRs over time, R and R_0 are the SPR band ratios ($^{A_{750}}/_{A_{530}}$) of the Au NRs in the presence and absence of Pb^{2+} ions, respectively.

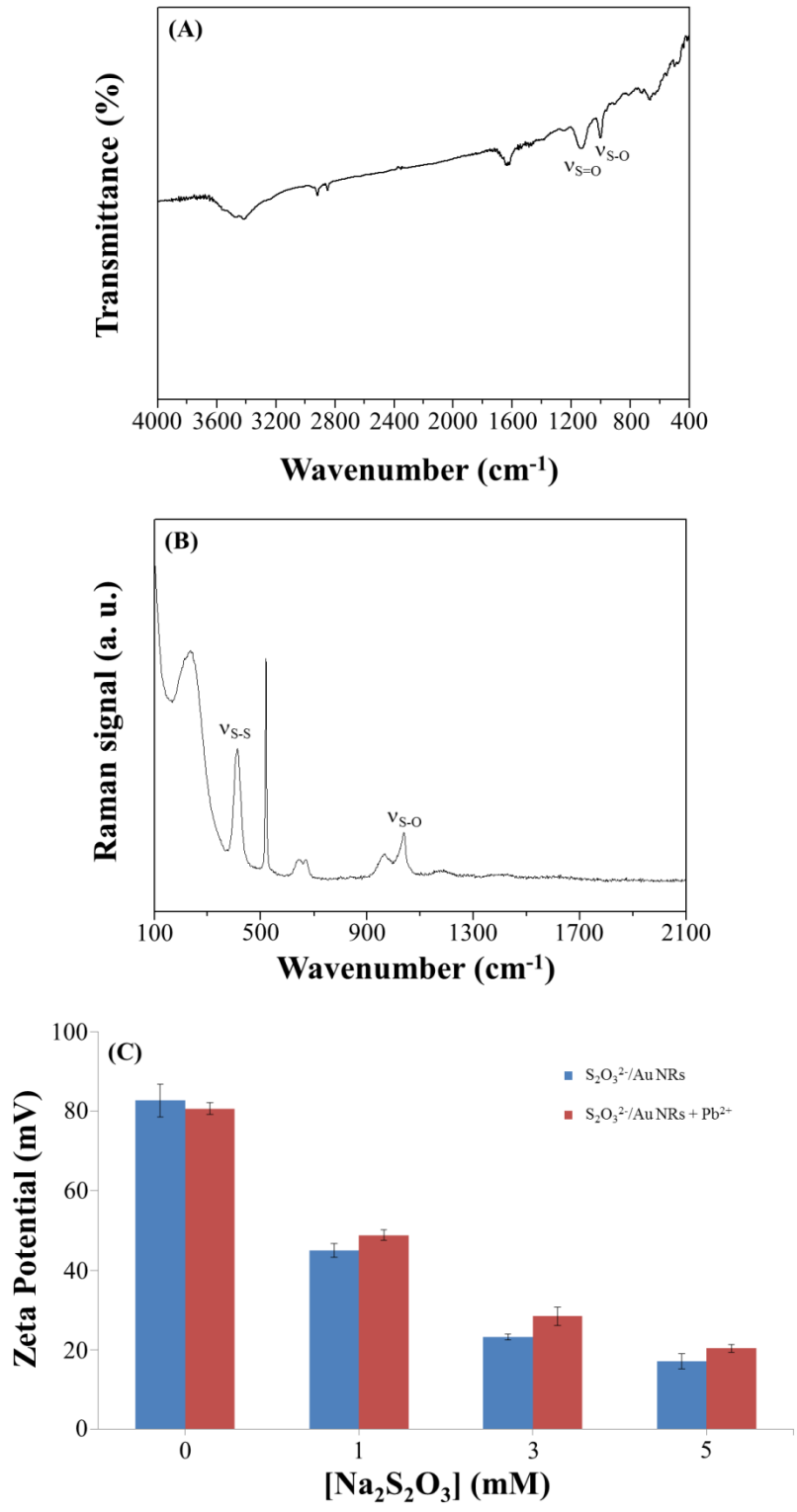
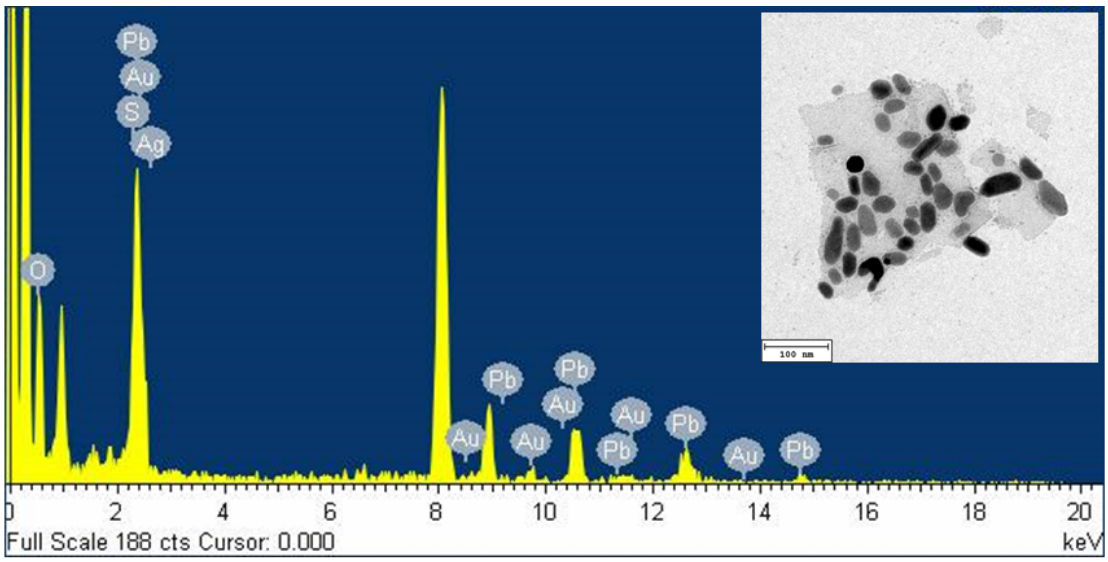


Figure S2. (A) FT-IR spectrum, (B) Raman spectrum, and (C) Zeta potential of the Au NRs in the presence of different concentrations of $S_2O_3^{2-}$ (0–5 mM).



Element	Peak Area	Area Sigma	k factor	Abs Corrn.	Weight%	Weight% Sigma	Atomic%
O K	120	43	1.309	1.000	8.79	3.05	35.48
S K	358	71	1.047	1.000	20.98	4.11	42.22
Ag L	12	28	2.033	1.000	1.31	3.16	0.78
Au M	36	61	1.458	1.000	2.91	4.83	0.95
Pb M	737	109	1.603	1.000	66.01	6.17	20.56
Totals					100.00		

Figure S3. EDS spectrum of the Au NRs in the presence of 3.0 mM $S_2O_3^{2-}$ and 100 μM Pb^{2+} at 50 °C.

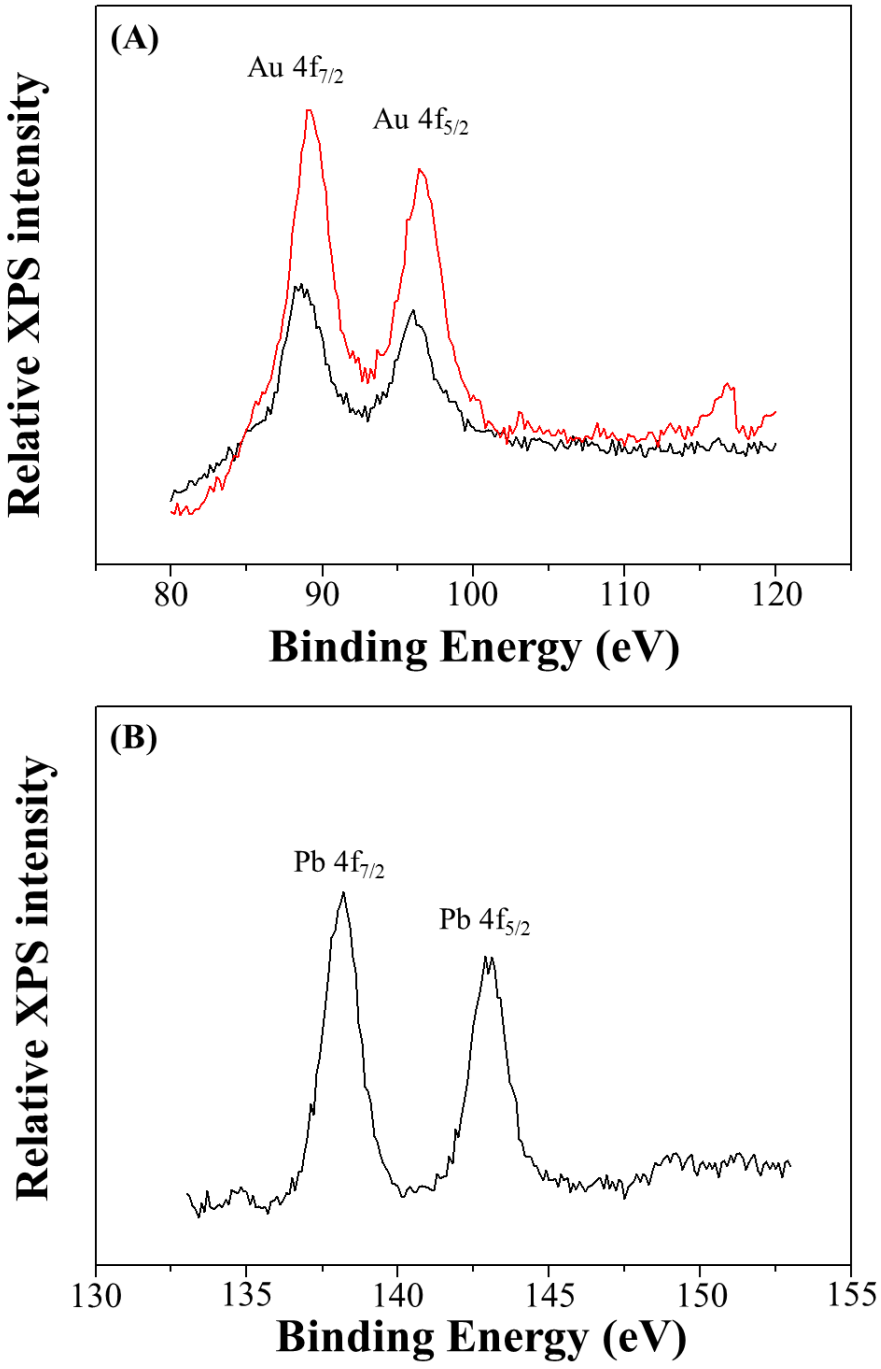


Figure S4. (A) Binding energies of the $4f_{7/2}$ and $4f_{5/2}$ electrons of the $S_2O_3^{2-}$/Au NRs in the absence (black line) and presence (red line) of Pb^{2+} ions. (B) Relative XPS intensity plotted against the binding energy, with the peaks for the Pb $4f_{7/2}$ and $4f_{5/2}$ electrons marked.

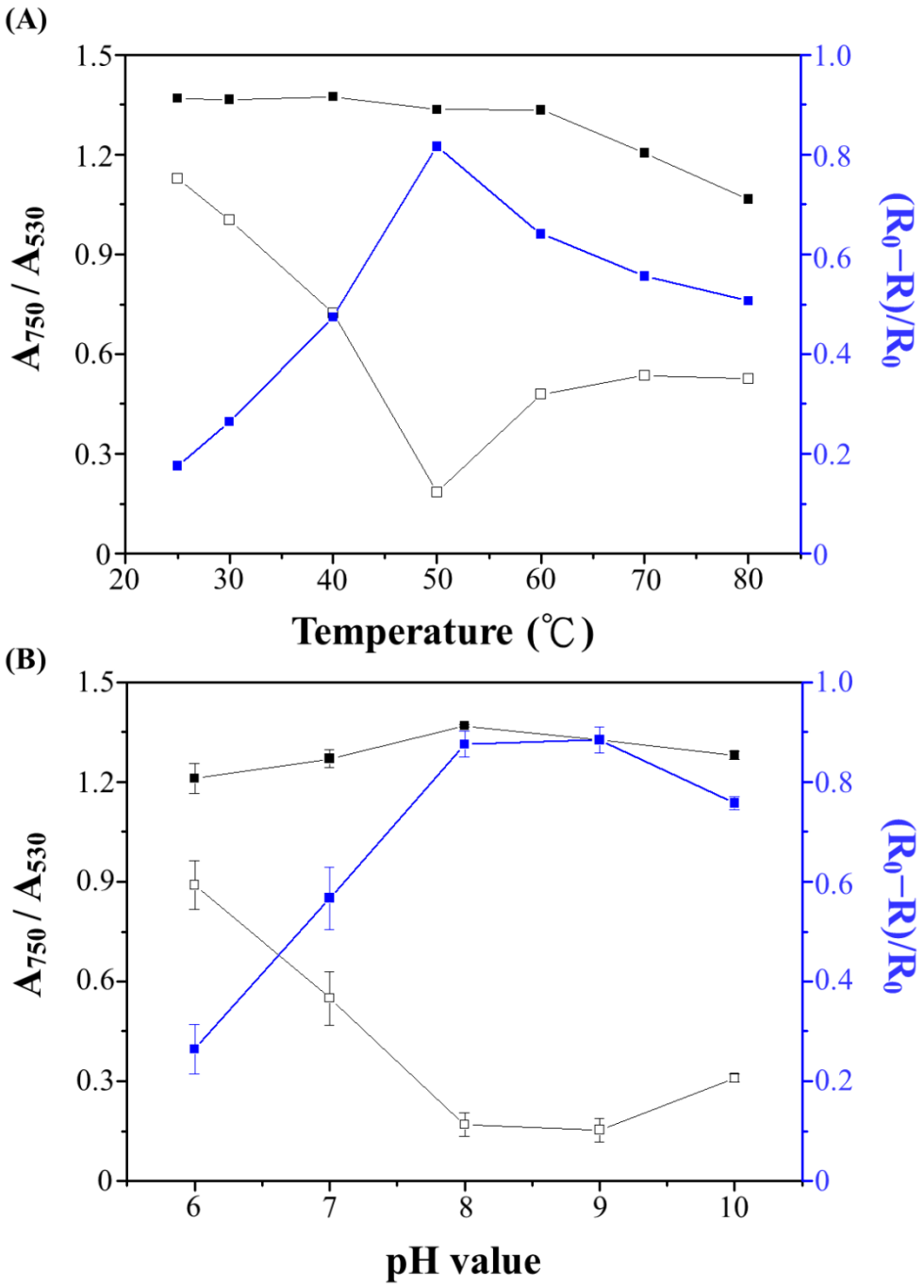


Figure S5. Absorbance ratios and leaching effects for the $S_2O_3^{2-}$/Au NRs in the absence (■) and presence (□) of Pb^{2+}, using a Tris-HCl buffer solution (10 mM), at different (A) temperatures and (B) pH values. The error bars represent the standard deviations for triplicate experiments.

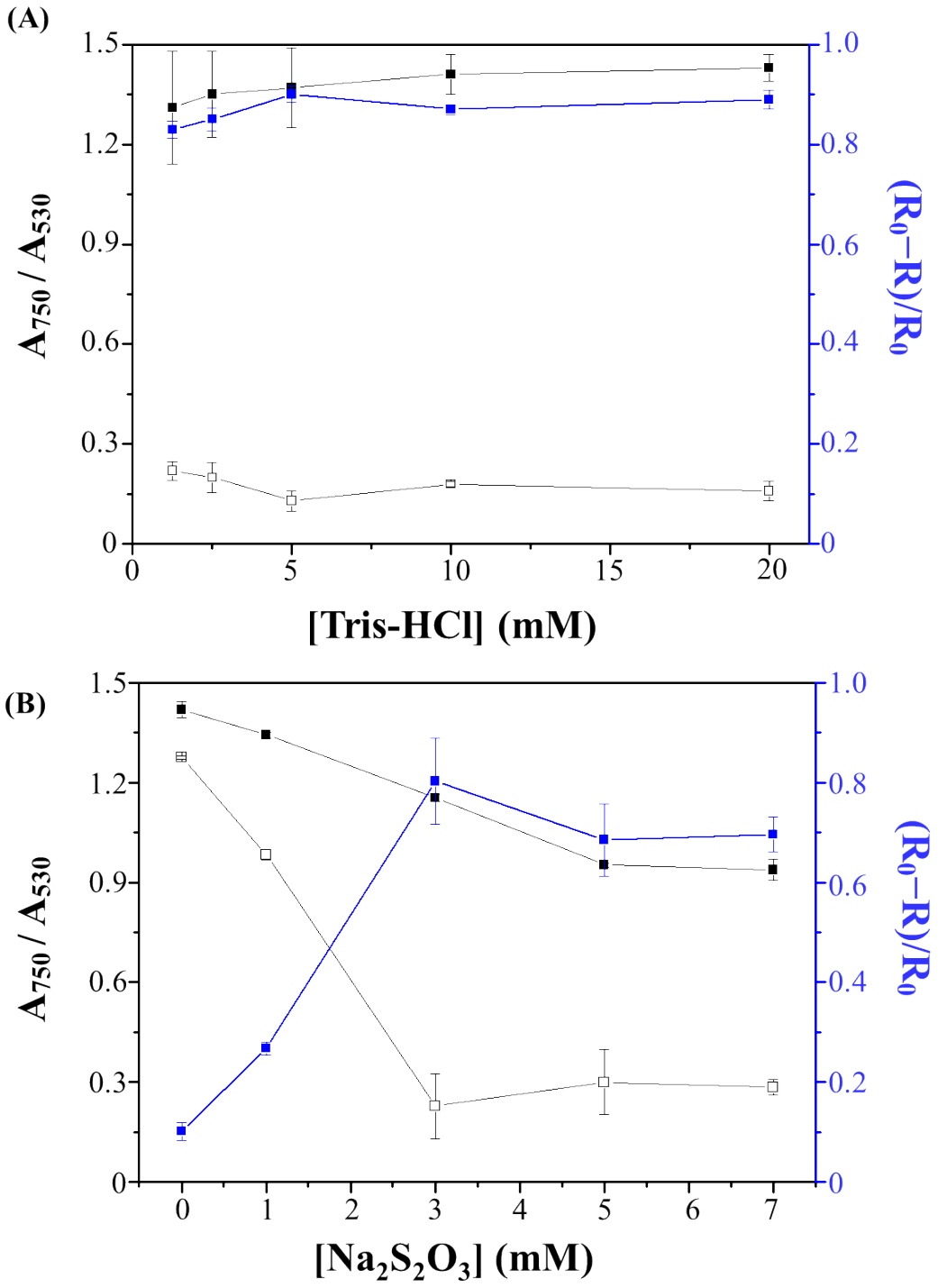


Figure S6. Absorbance ratios and leaching effects for the Au NRs in the absence (■) and presence (□) of Pb^{2+} at different concentrations of (A) Tris-HCl buffer and (B) $Na_2S_2O_3$. The error bars represent the standard deviations for triplicate experiments.

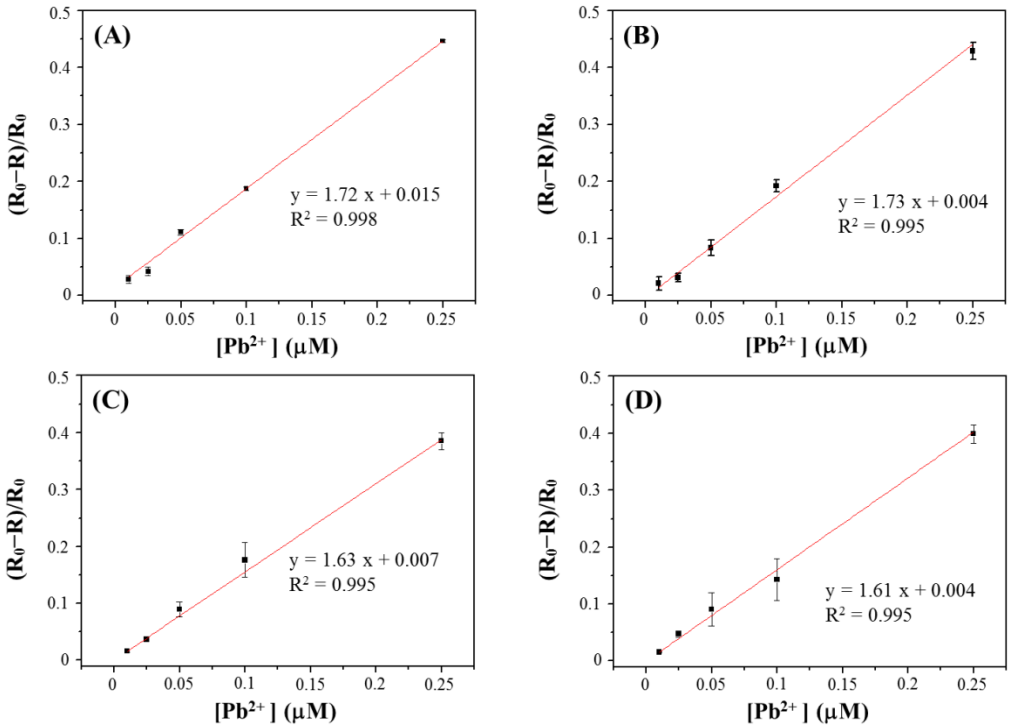


Figure S7. Standard addition analyses of (A) pond water, (B) lake water, (C) seawater, and (D) urine samples using the $S_2O_3^{2-}$/Au NRs probe. Aliquots of the samples were spiked with Pb^{2+} (0.01–0.25 μM). The other conditions were the same as described in Figure 4.