**Supporting Information**

**Rough Fe3O4/Gold nanostructure Enhanced Fluorescence of Quantum dots for *Salmonella typhimurium* Detection in Cabbage**

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Supplementary Figure S1 shows energy-dispersive X-ray spectroscopy (EDS) spectra of urchin-like Fe3O4@Au NPs. Three positions (**a**, **b**, **c**) on the urchin-like Fe3O4@Au NP specimen were selected to confirm the presence of O, Fe, and Au atoms in the NPs. The mass percentages of the elements in the EDS spectra are shown in Table S1. The spectra show that the branches (point **a** in the TEM image in Figure S1) and the centers (point **b**) of the urchin-like Fe3O4@Au NPs are composed predominantly of Au, with little Fe or O. Point **c** is located on the remaining Fe3O4 NPs, the gray particles in the TEM image.

Fig 2-v1.tif

Figure S1. EDS spectra of urchin-like Fe3O4@Au NPs. Points in the TEM image illustrate a branch of the urchin-like NP (a), the center (b), and the remaining Fe3O4 NPs (c).

Table S1. Mass percentages of elements in EDS spectra

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Position | O | Fe | Au | Total (Mass %) |
| a | 12.6 | 0 | 87.4 | 100 |
| b | 1.4 | 0 | 98.6 | 100 |
| c | 56.1 | 43.9 | 0 | 100 |

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Figure S2. UV-Vis spectra of triethanolamine reduction of HAuCl4 in the absence (a) and presence (b) of particle seeds.

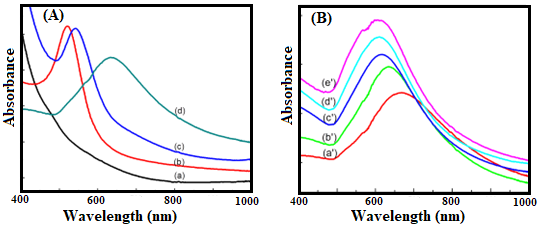


Figure S3. (A) UV-visible spectra of Fe3O4 NPs (a), Au NPs (b), and spherical (c) and urchin-like (d) Fe3O4@Au NP solutions. (B) UV-visible absorption spectra of urchin-like Fe3O4@Au NP solutions in Fe3O4@Au seed NP solutions with different volume ratios. The reactive volume increases from 100 to 500 μL for lines (a′) to (e′).

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Figure S4. (A, B) AFM images of (A) spherical and (B) urchin-like Fe3O4@Au surfaces. (C) PL spectra of Au QDs on the spherical and urchin-like Fe3O4@Au substrates. (D) PL time profiles of the Au QDs on spherical and urchin-like Fe3O4@Au surfaces.

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Figure S5.ELISA results of aptamer conjugation withurchin-like Fe3O4@Au NPs film (A) & Au QDs.

A graph of red rectangular bars

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Figure S6.The selectivity of the proposed method: (A) S. typhimurium; (B) S. aureus; (C) E. coli; (D) Shewanella oneidensis; (E) Enterobacter aerogenes; (F) Proteus mirabilis; (G) Citrobacter freundii; (H) Citrobacter diversus; (I) Enterobacter cloacae and (J)Bacillus.

Diagram of energy transfer and energy transfer

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Scheme S1. Schematic presentation of detection method.

A picture containing fruit, screenshot, design

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Scheme S2. Illustration of metal-enhanced fluorescence between quantum dots and (A) spherical Fe3O4@Au NPs and (B) urchin-like Fe3O4@Au NPs. The polymer spacer is composed of (PDDA/PAA/PDDA)1 layers. The base layer is composed of (PDDA/PAA)2/PDDA layers.

**Table S2:** Comparison study with the commercial kit

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Concentration of *S. typhimurium* (CFU mL-1) | | | | |
| 100 | 200 | 300 | 400 | 500 |
| Commercial Kit | X | √ | √ | √ | √ |
| Present study | √ | √ | √ | √ | √ |

**Table S3:** Comparison study with the recent reported articles

|  |  |  |
| --- | --- | --- |
| No of Article | LOD (CFU mL-1) | Ref. |
| 1 | 100 | 1 |
| 2 | 7 | 2 |
| 3 | 100 | 3 |
| 4 | 36 | [4](https://doi.org/10.1039/D1AY00493J) |
| 5 | 32 | Present study |

**Table S4:** Zeta potential measurement with different temperature.

|  |  |
| --- | --- |
| **Time (month)** | **Zeta Potential (mV)** |
| 1 | -31.2 |
| 6 | -30.8 |
| 12 | -30.2 |

**Table S5:** Reproducibility of results with different batches of nanoparticles.

**References**

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[DOI: 10.1039/D1AY00493J](https://doi.org/10.1039/D1AY00493J)