Supplementary Materials for

Rapid and Sensitive Detection of Influenza B Virus Employing Nanocomposite Spheres Based on Ag-doped $ZnIn_2S_4$ Quantum Dots

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Characterization

UV-vis absorbance spectra were obtained on a Shimadzu UV 2600 spectropolarimeter (Japan). Transmission electron microscopy (TEM) measurements were carried out under a field-emission high-resolution transmission electron microscopy Talos F200X (Thermo Scientific, USA). Fluorescence spectra, three-dimensional (3D) fluorescence spectra, and relative quantum yields were performed on a Shimadzu RF-6000 Spectro Fluorophotometer (Japan). Fourier transform infrared (FT-IR) spectrum was collected from a Nicolet 5700 (Thermo Nicolet Corporation, USA) IR spectrometer in the range of 4000-500 cm^{-1}. Powder X-ray diffraction (XRD) dates were measured using a Bruker D8 discover X-ray diffractometer (Bruker, Germany). Zeta (ζ) potential was carried out at 25 °C using a Zetasizer Nano-ZS from Malvern Instruments.

Ethical Statement

All experiments were carried out by the relevant laws and institutional guidelines as per the Institutional Ethics Committee of Southeast University. The School of Chemistry and Chemical Engineering, Southeast University, has approved the experiments.

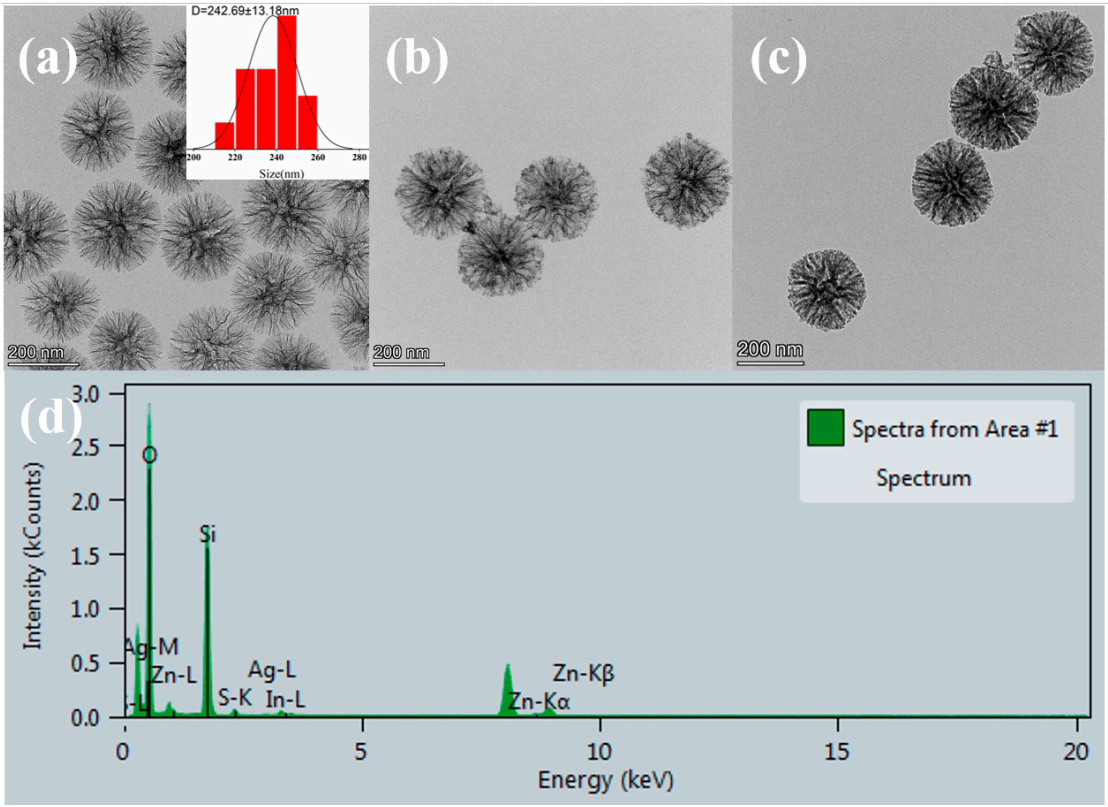

Figure S1. a)TEM images of DMSNs and the corresponding particle size distribution (inset); b)TEM image of Ag: ZIS QDs @ DMSNs; c)TEM image of SiO_2 @ Ag: ZIS QDs @ DMSNs; d) EDS mapping images of SiO_2 @ Ag: ZIS QDs @ DMSNs.

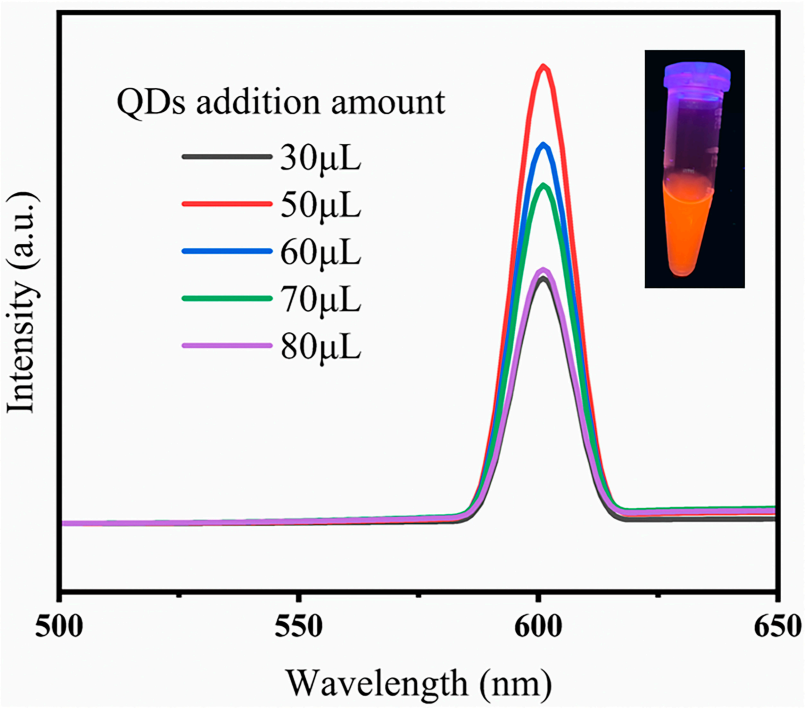

Figure S2. The effect of QDs addition amount on the fluorescence properties of SiO_2@Ag: ZIS QDs @ DMSNs (the inset is the fluorescence photos of SiO_2@Ag: ZIS QDs @ DMSNs).

Figure S3. Photo of Ag: ZIS QDs @ DMSNs aqueous solutions at different pH values under a 365nm fluorescent lamp.

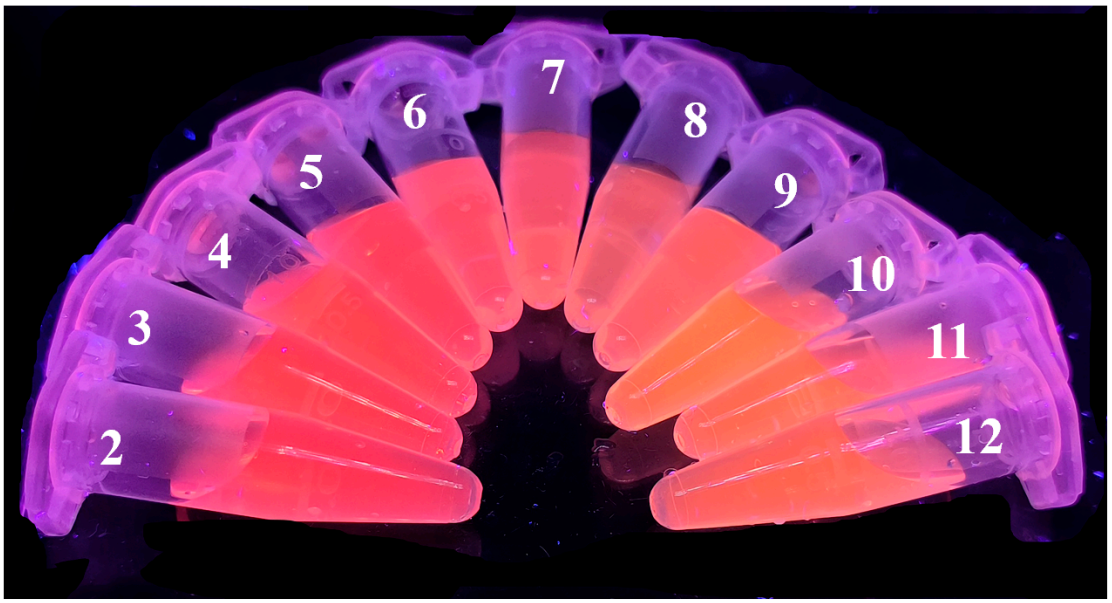

Figure S4. Photo of SiO_2@Ag: ZIS QDs @ DMSNs aqueous solutions at different pH values under a 365nm fluorescent lamp.

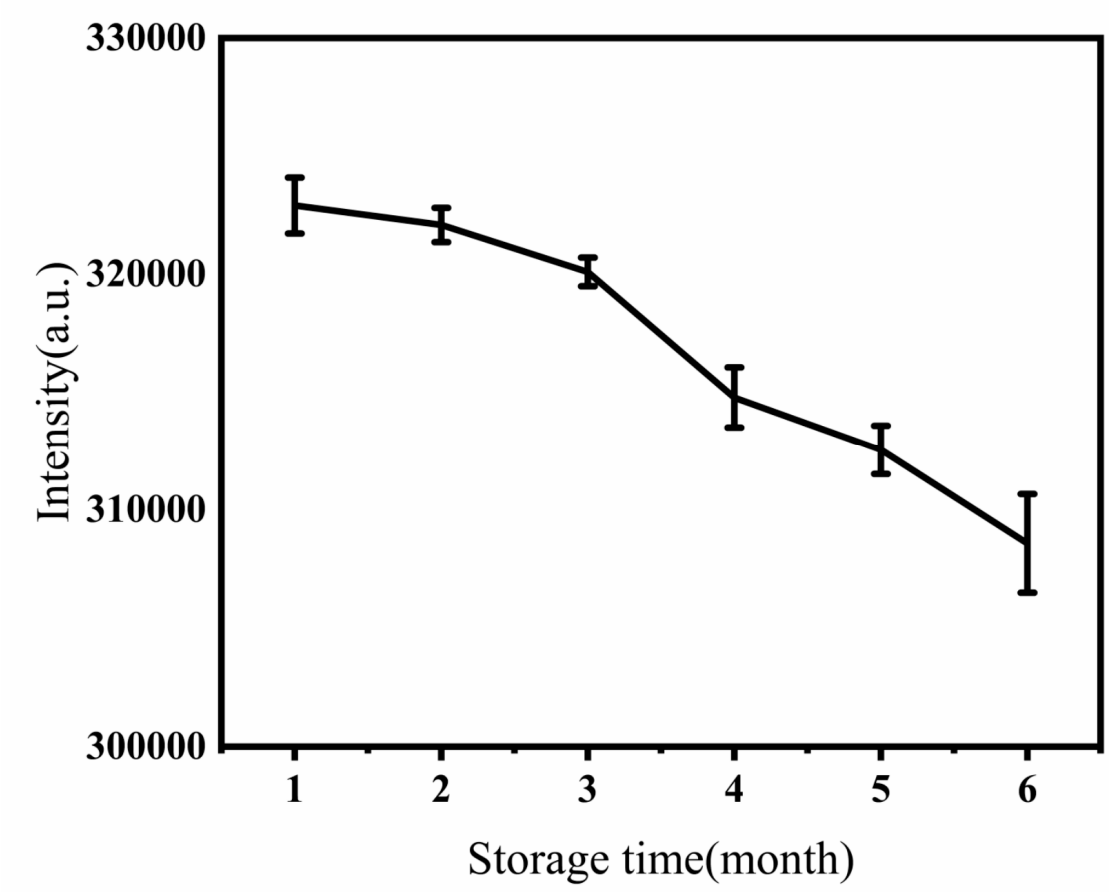

Figure S5. Fluorescence signal intensity of SiO_2@Ag: ZIS QDs @ DMSNs under long-term storage.

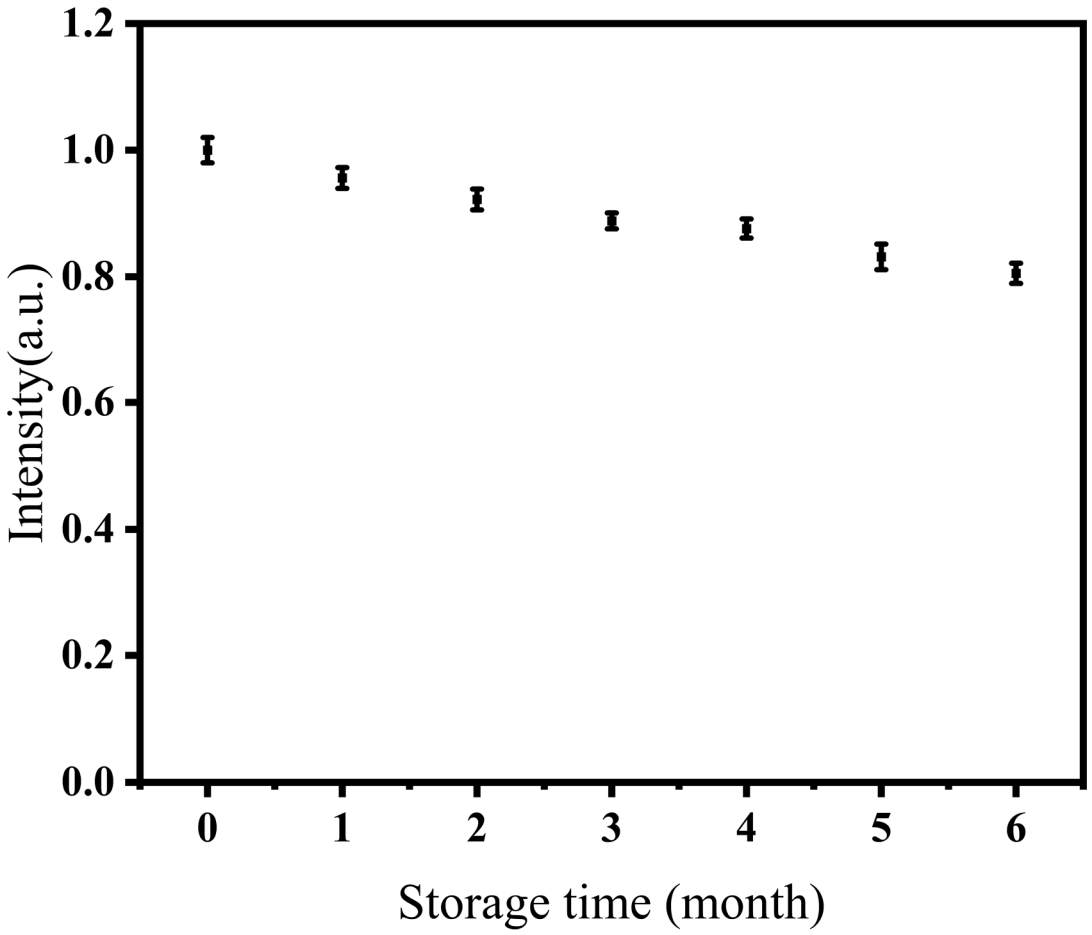

Figure S6. Study on the Stability of SiO_2@Ag: ZIS QDs@DMSNs-LFIA.

Table S1. The results of the coefficient of variation (CV) of SiO_2@Ag: ZIS QDs @DMSNs -LFIA (IBV).

Sample (ng/mL)	Intra-CV (%)	Inter-CV (%)
100	6.94±0.59	8.3±0.52

Table S2. Summary of IBV detection with some different detection methods.

Methods	Limit of Detections	Disadvantage
SERS/photothermal-based dual-modal LFIA	93.75 pg/mL [1]	Complex and requires specialized equipment
Colloidal gold test strip	6 ng/mL [1]	Low sensitivity
Colorimetric assay	0.04 ng/mL [2]	Require professional technicians
AlphaLISA assay	0.24 ng/mL [3]	Requires specialized equipment
This work	1 ng/mL	

References

1. Liang, J.; Wu, L.; Wang, Y.; Liang, W.; Hao, Y.; Tan, M.; He, G.; Lv, D.; Wang, Z.; Zeng, T.; et al. SERS/photothermal-based dual-modal lateral flow immunoassays for sensitive and simultaneous antigen detection of respiratory viral infections. *Sens. Actuators B Chem*. **2023**, *389*. DOI: 10.1016/j.snb.2023.133875.
2. Raji, M. A.; Aloraij, Y.; Alhamlan, F.; Suaifan, G.; Weber, K.; Cialla-May, D.; Popp, J.; Zourob, M. Development of rapid colorimetric assay for the detection of Influenza A and B viruses. *Talanta* **2021**, *221*. DOI: 10.1016/j.talanta.2020.121468.
3. Zong, H.; Zhang, S.; Shang, X.; Jiang, H.; Zhao, Z.; Chen, S.; Wang, X.; Wang, Y.; Jiang, Y.; Li, X.; et al. Development of an AlphaLISA assay for sensitive and accurate detection of influenza B virus. *Front Med (Lausanne)* **2023**, *10*, 1155551. DOI: 10.3389/fmed.2023.1155551.