

Aggregation Emission of AuNCs Induced by Chitosan Self-assembled multilayers and Sensitive Sensing for Water Content in Ethanol

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Experimental section

Determination of quantum yield and fluorescence lifetime

A certain amount of quinine sulfate fluorescent standard substance was dissolved in 0.05 M sulfuric acid solution as the standard solution, and the quantum yield (QY) of AuNCs were determined by the relative method.

As shown in figure S1, we used absorbance as abscissa and corresponding fluorescence intensity as ordinate to fit curves, and got two curves with positive correlation. Their slope k was proportional to their QY, so the fluorescence QY of AuNCs were calculated as 7.01% by using the formula $QY_1 = [(k_1/k_2) \times QY_2]$. Generally, AuNCs obtained by ligand protection method because of efficient nonradiative transition through ligands in aqueous solution, resulting in a quantum yield generally not higher than 1%, and the QY of AuNCs synthesized by us has been obviously increased.

The average fluorescence lifetime of AuNCs corresponding to the maximum emission wavelength in aqueous solution was measured by using a 445 nm laser lamp on a steady/transient fluorescence spectrometer. The data processing needs to be fitted by double exponential equation. The average lifetime of AuNCs were 2.230 μ s by fitting the data with double exponential equation.

Fluorescence interface sensing for water content in ethanol by Cs/AuNCs SAMs

The prepared Quartz/(PDDA/PSS)₂/Cs/AuNCs SAMs were placed in 1 mL of absolute ethanol and were excited at a wavelength of 420 nm, and the fluorescence intensity at emission peak was recorded as F_0 . After added a small amount of ultrapure water with a micro-injector, the fluorescence intensity of emission peak was recorded as F .

Figures

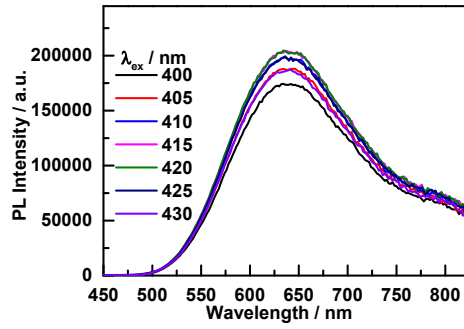


Figure S1 Fluorescence spectra of AuNCs at different excitation wavelengths

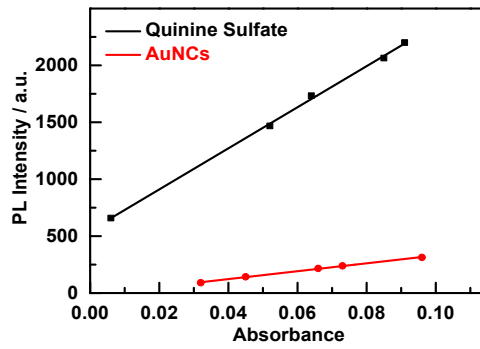


Figure S2 Linear fitting curve between fluorescence intensity and absorbance

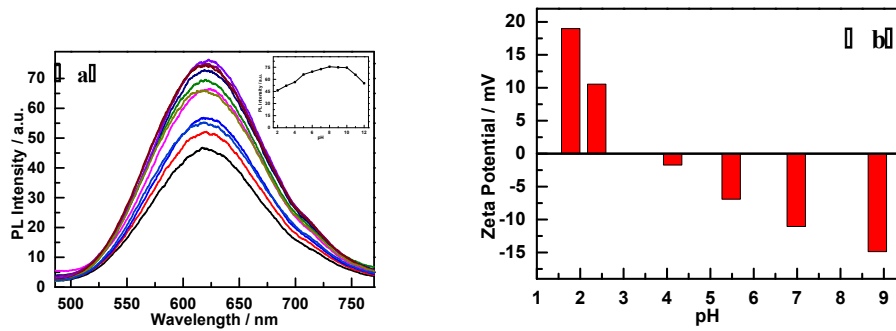


Figure S3 Characterization of AuNCs at different pH (a) Fluorescence spectra (the illustration showed the relationship between fluorescence intensity and pH); (b) Zeta potential

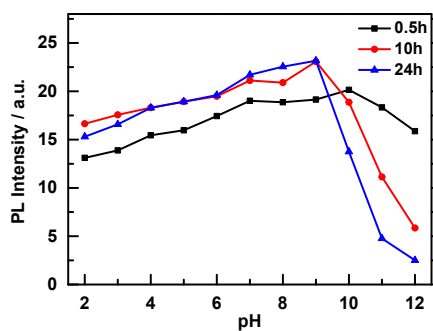


Figure S4 The variation of fluorescence intensity of AuNCs with pH under different storage time

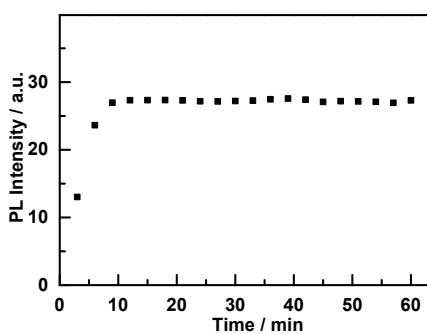


Figure S5 Variation curve of fluorescence intensity of AuNCs with Cs addition time

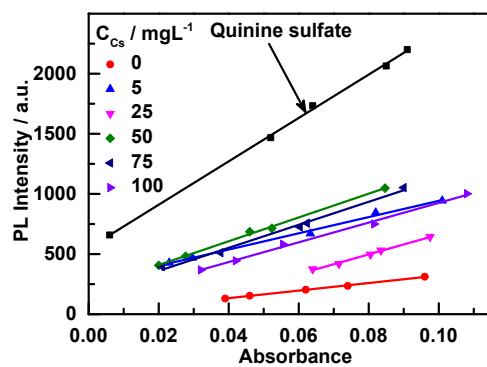


Figure S6 Linear fitting curve between fluorescence intensity and absorbance of quinine sulfate solution and Cs@AuNCs with different concentration of Cs

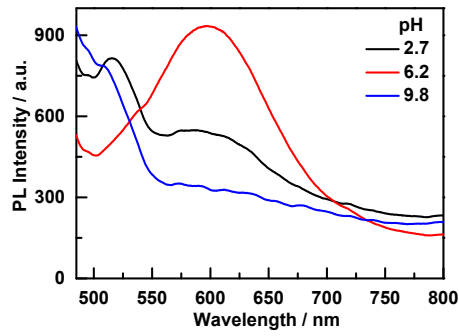


Figure S7 Effect of pH in AuNCs on fluorescence spectra of Cs/AuNCs SAMs

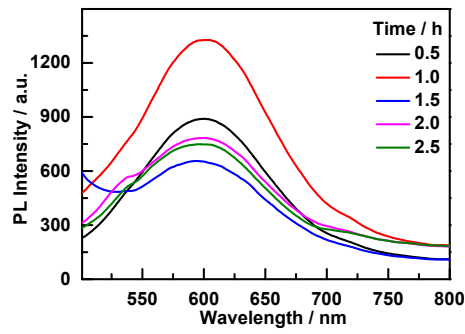


Figure S8 Effect of AuNCs assembly time on fluorescence spectra of Cs/AuNCs SAMs

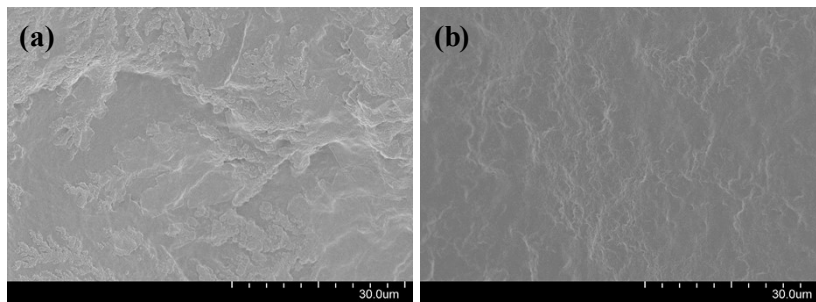


Figure S9 Scanning electron micrographs of SAMs (a) FTO/(PDDA/PSS)₂/PDDA/AuNCs; (b) FTO/(PDDA/PSS)₂/Cs/AuNCs SAMs

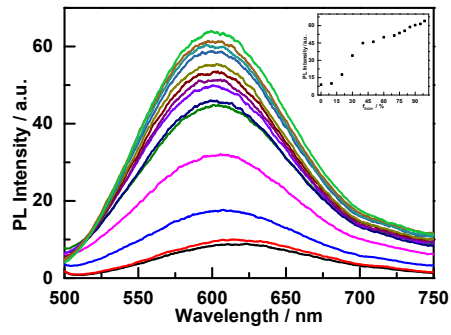


Figure S10 Fluorescence spectra of AuNCs in different proportions of ethanol/water mixed solvent (the illustration showed the relationship curve between fluorescence intensity and ethanol content in mixed solvent)
