**Supporting Information**

**Facile synthesis and characterization of Au nanoclusters-silica fluorescent composite nanospheres**

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**Figure S1.** The fluorescence emission spectrum of Au NCs(black) and the composite nanospheres(red) upon excitation at 500 nm.



**Figure S2.** The illumination time with UV light the normalized fluorescence intensity of Au NCs (red) and Au NCs-silica composite nanospheres(black). Each point depicted the average measurements of three times. Error bars were calculated based on the standard deviation of three measurements.

Figure S1 indicated the fluorescence emission spectrum of Au NCs (black line), which was in red region around 610 nm, due to intra-band transitions of free electrons of the Au nanoclusters [1]. Compared the fluorescence emission spectrum of Au NCs, a small blue shift was observed for the fluorescence emission spectrum of Au NCs-silica composite nanospheres (Figure S1, red line), which may arise from the reduction of polarity in the local environment of BSA-Au25 after attaching to the surface of silica nanospheres [2].

Figure S2 depicted the effect of illumination time with UV light on the fluorescence intensity of Au NCs (red line) and the Au NCs-silica composite nanospheres (black line). It can be seen that the normalized FL intensity of Au NCs reduced more rapidly than that of Au NCs-silica composite nanospheres under UV light irritation, indicating Au NCs-silica composite nanospheres have better stability than BSA/Au NCs.

[1] C. A. J. Lin, T. Y. Yang, C. H. Lee, S. H. Huang, R. A. Sperling, M. Zanella, J. K. Li, J. L. Shen, H. H. Wang, H. I. Yeh, W. J. Parak, W. H. Chang, “Synthesis, Characterization, and Bioconjugation of Fluorescent Gold Nanoclusters toward Biological Labeling Applications,” *ACS Nano* vol. 3, no.2, pp. 395–401, 2009.

[2] P. Yu, X. Wen, Y. Toh, Y. Lee, and J. Tang, “Optical properties of gold particle-cluster core-satellite nanoassemblies,” RSC Advances, 2013.