Supporting Information

**Figure S1.** TEM images of silica-coated AgNS (AgNS@SiO$_2$): (a) 4-BBT labeled (AgNS$_4$-BBT@SiO$_2$), and (b) 4-CBT labeled (AgNS$_4$-CBT@SiO$_2$).
Figure S2. PA spectra of different kinds of nanoparticles (AgNS, AuNP and AuNR, 150 pM each) under various laser wavelength (680-900 nm) with D.I. water as a control.
Figure S3. (a) SERS spectra of different kinds of nanoparticles (AgNS, AuNP and AuNR, 150 pM each), labeled with 4-FBT (1 mM). (b) SERS intensity profile (386 cm$^{-1}$ of 4-FBT) of each nanoparticle without normalization. SERS spectra were obtained using portable-Raman system by 785-nm photoexcitation, 30-mW laser power, and light acquisition time of 5 s
Figure S4. Full-range SERS spectra of AgNS$_4$-FBT@SiO$_2$ (green line), AgNS$_4$-BBT@SiO$_2$ (blue line) and AgNS$_4$-CBT@SiO$_2$ (red line). SERS spectra were obtained using portable-Raman system by 785-nm photoexcitation, 15-mW laser power, and light acquisition time of 3 s
**Figure S5.** PA spectra of AgNS@SiO$_2$ at various concentrations under different laser wavelength.

The range of wavelength is 680-950 nm, the concentration of AgNS@SiO$_2$ is from 1000 pM to 15.8 pM, and 1% BSA solution in PBS as a control.
Figure S6. Relative SERS intensity profile of AgNS@SiO$_2$ with incubation time at various conditions for stability of our nanoprobes. 1075 cm$^{-1}$ of 4-FBT peak were used for analysis of this data.
Figure S7. Size and distribution of each AgNS@SiO₂ measuring by nanoparticle tracking analysis (NTA)
Figure S8. (a) PA spectrum with various concentration of AgNS@SiO$_2$ for showing PA sensitivity in vivo skin of rat. (b) SERS intensity about 1075 cm$^{-1}$ of 4-FBT with various concentration of AgNS$_4$-FBT@SiO$_2$ for showing SERS sensitivity in vivo skin of rat. (c) SERS spectrum with various concentration of AgNS$_4$-FBT@SiO$_2$. SERS spectra were obtained using portable-Raman system by 785-nm photoexcitation, 60-mW laser power, and light acquisition time of 10 s.
Figure S9. *In vivo* PA detection of axillary SLN of a rat with AgNS@SiO$_2$ mixture (1:1:1 ratio, 1 nM, 100 μL). (a) Control PA MAP image of a rat’s left axillary region. (b) Post-injection PA MAP image of a rat’s left thigh after 40 min, (c) 80 min, (d) 120 min, and (e) 160 min of injections.
Figure S10. *In vivo* 3D PA images of axillary of a rat with AgNS@SiO$_2$ mixture (1:1:1 ratio, 1 nM, 100 μL). (a) Control PA MAP 3D image of a rat’s left axillary region. (b) Post-injection PA MAP 3D image of a rat’s left thigh after injection (30 min). (c) Differences of PA SLN 3D images between (a) and (b).
Figure S11. *In vivo* detection of axillary SLN of a rat with AgNS@SiO$_2$ mixture (ratio: 1:3:5, 1 nM, 100 μL). (a) Control PA MAP image of a rat’s left axillary region. (b) Post-injection PA MAP image of a rat’s left thigh after injection. (c) Photograph of control and the injected SLN. (d) *Ex vivo* PA image of control and the injected SLN (Bottom)