Supplementary Information

for

Interfacial effect of dual ultra-thin SiO2 core-triple shell Au@SiO2@Ag@SiO2 for ultra-sensitive Trinitrotoluene (TNT) detection

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Figure S1. Scanning electron microscopy (SEM) images of (a, b) Au@SiO$_2$@Ag@SiO$_2$, (c) Au@Ag@SiO$_2$, (d) Au@Ag, (e) Ag@SiO$_2$, and (f) Au@SiO$_2$@Ag.

Figure S2. The UV–vis–NIR spectra of the Au@SiO$_2$@Ag@SiO$_2$, Au@Ag@SiO$_2$, Au@Ag, Ag@SiO$_2$, and Au@SiO$_2$@Ag NPs, respectively.
Figure S3. Transmission electron microscopy (TEM) images of the Au@SiO$_2$@Ag@SiO$_2$ with 3.0 mL (a), 3.1 mL (b), 3.2 mL (c), 3.3 mL (d) of sodium silicate in experiment procedure.

Figure S4. Raman spectra of 10$^{-3}$ M R6G adsorbed on silicon wafer under non-SERS conditions.
Figure S5. 2D patterns of E-field amplitude (|E|) of Ag@SiO$_2$ model (a, b) and Au@SiO$_2$@Ag@SiO$_2$ model (c, d). The maximum E-field amplitude (|E|) for Au@SiO$_2$@Ag@SiO$_2$ model and Ag@SiO$_2$ model is 4.6 and 3.4, respectively.

Figure S6. UV-vis absorption spectra of the 2,4,6-TNT, 4-ATP, DNT and 4-ATP complex, TNT and 4-ATP complex, 2,4,6-TNT and 4-ATP complex, 2,4,5-TNT and 4-ATP complex, 2,3,6-TNT and 4-ATP complex, 2,3,4-TNT and 4-ATP complex, respectively.
Figure S7. SERS spectra of $10^{-12}$ M NB (Nitrobenzene) adsorbed on 4-ATP functionalized Au@SiO$_2$@Ag@SiO$_2$ substrates.