

Supplementary data

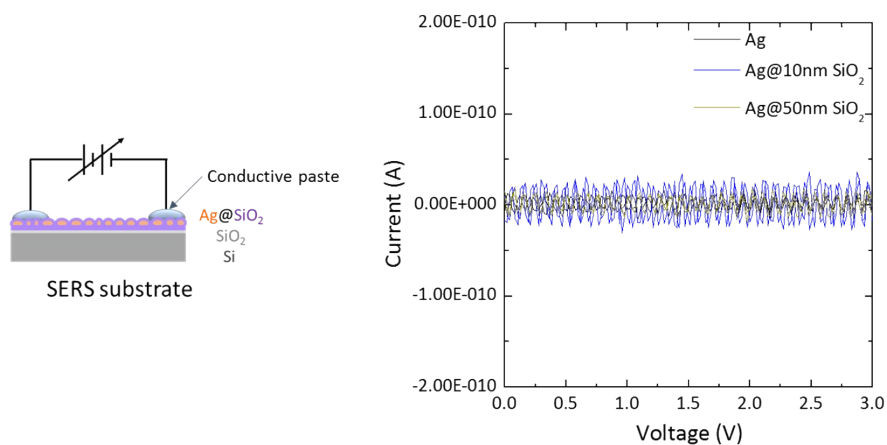


Fig. S1 (a) Schematic illustration of IV curve measurement method. (b) IV curve results of pure Ag nanoparticles, “Ag@10nm SiO₂” structure, and Ag@50nm SiO₂ structure.

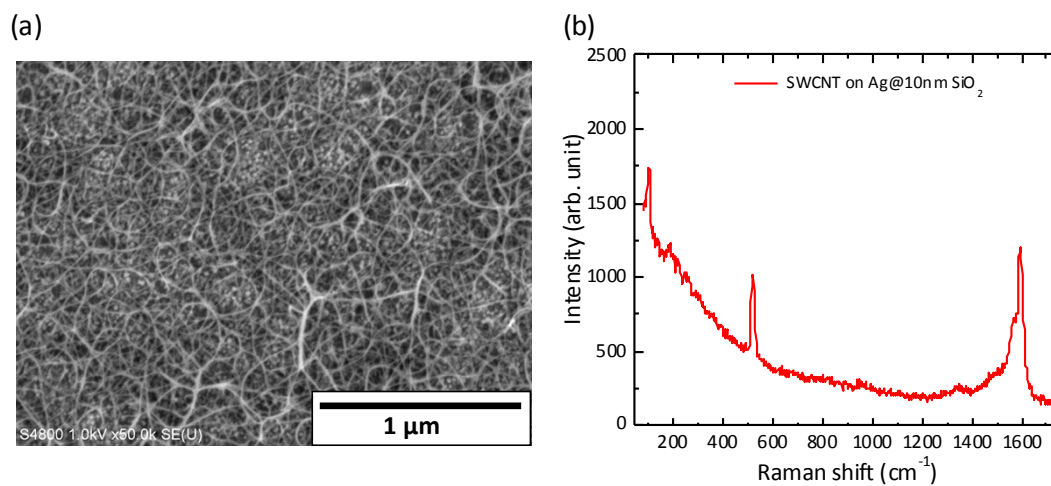


Fig. S2 (a) Representative SEM image and (b) Raman spectrum of SWCNTs synthesized on Ag@10nm SiO₂ SERS substrate.

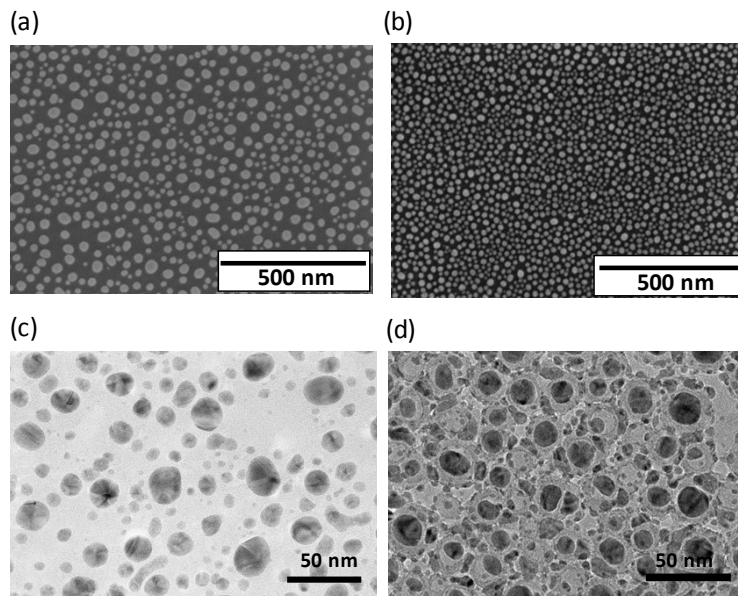


Fig. S3 (a)(b) Representative SEM images and (c)(d) TEM images of different bathes of samples.

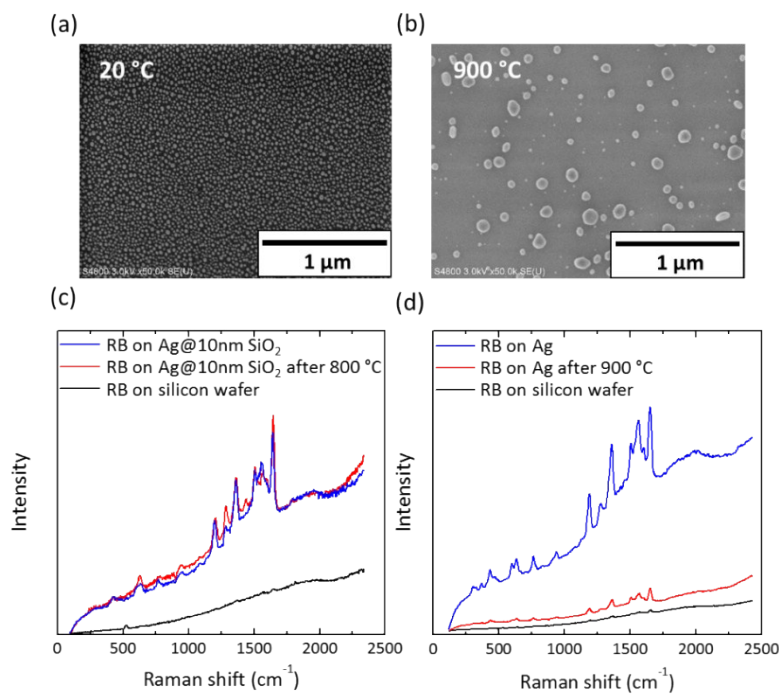


Fig. S4. Representative SEM images of Ag nanoparticle at room temperature (a) original particle; (b) after annealing at 900 °C; (c) Comparison of Raman spectra of Rhodamine B on Ag@10nm SiO₂ substrate and after annealing at 800 °C; (d) Comparison of Raman spectra of Rhodamine B on Ag substrate and after annealing at 900 °C.

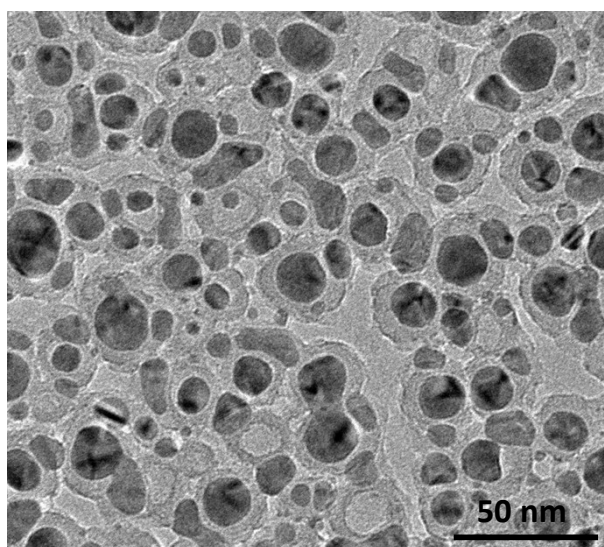


Fig. S5. Low magnification TEM image of Ag@10nm SiO₂ nanoparticles after annealing at 800 °C.

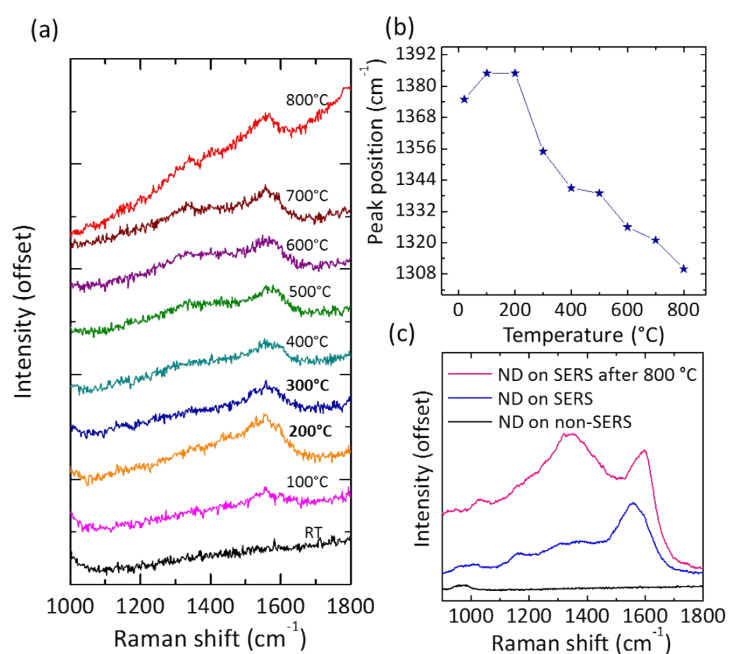


Fig. S6 (a) Temperature-dependent *In situ* Raman spectra of nanodiamonds during thermally annealed process on silicon wafer; (b) The G-band positions from analysis of the temperature-dependent *in situ* Raman spectra as a function of temperature; (c) Raman spectra of nanodiamonds on SERS, non-SERS area, and on SERS area after annealing process.

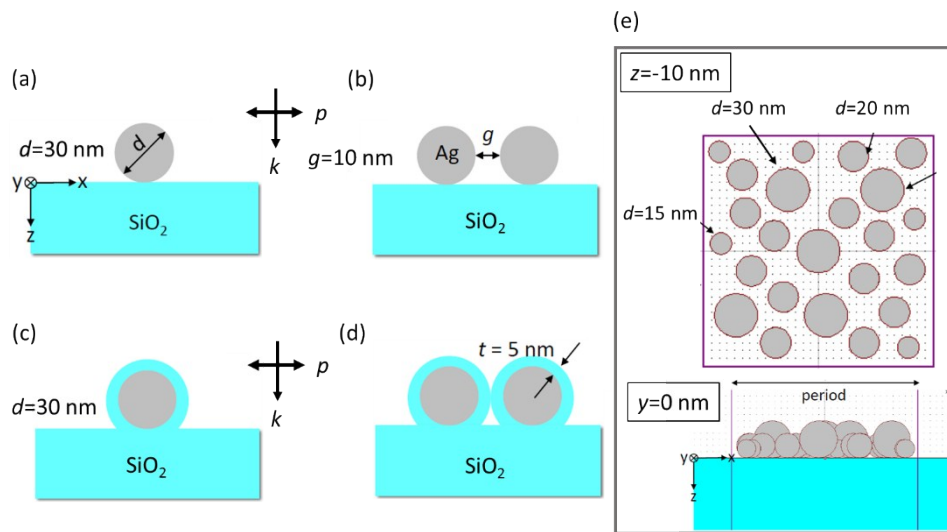


Fig. S7 Schematic illustration of 3D FDTD simulation mode. (a) Single 30 nm Ag nanoparticle; (b) double 30 nm Ag nanoparticles with a 10 nm gap; (c) Single 30 nm Ag nanoparticle with 5 nm capping SiO₂ layer; (d) double 30 nm Ag nanoparticles with 5 nm capping SiO₂ layer; (e) Randomly distribution of particles size and gap model.