Temperature Estimation during Pulsed Laser Sintering of Silver Nanoparticles

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Supplementary Information

$$h=\begin{cases}0.54\dfrac{k}{L}Ra_L^{1/4} & T>T_{\text{ext}},\quad 10^4\le Ra_L\le 10^7\\ 0.15\dfrac{k}{L}Ra_L^{1/3} & T>T_{\text{ext}},\quad 10^7\le Ra_L\le 10^{11}\\ 0.27\dfrac{k}{L}Ra_L^{1/4} & T\le T_{\text{ext}},\quad 10^5\le Ra_L\le 10^{10}\end{cases} \tag{S1}$$

Equation S1. Convection heat transfer coefficient h used in the numerical model, where, k, L, and Ra_L are thermal conductivity, characteristic length, and Rayleigh number, respectively.

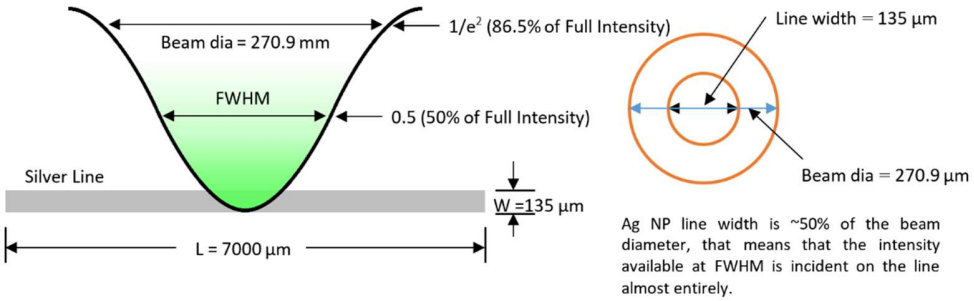

Figure S1. Illustration of a Gaussian Beam profile which depicts the chosen beam diameter (270.9 µm) selected for the pulsed laser operation in comparison to the printed Ag NP line width of 135 µm.

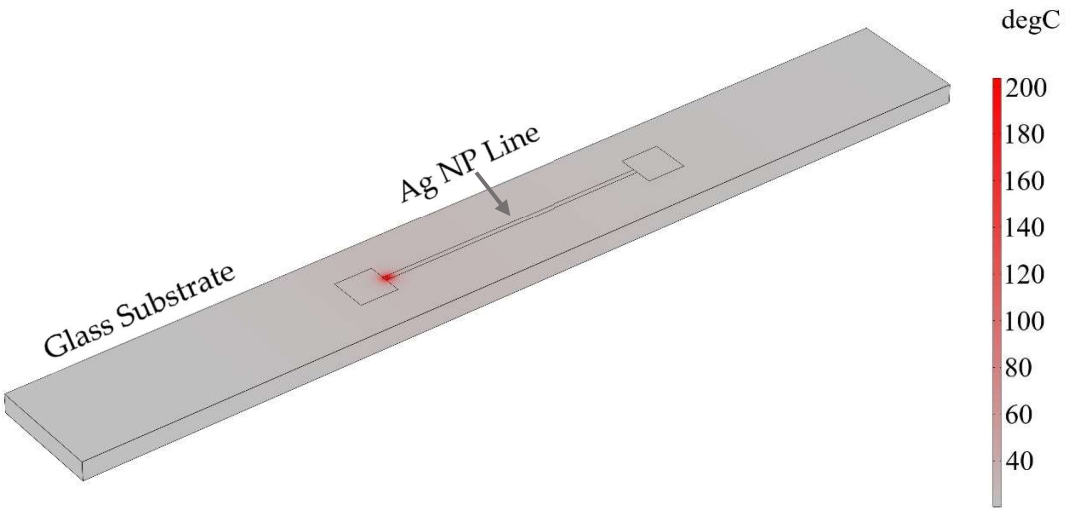

Figure S2. 3-D model used for the temperature estimation during pulsed laser sintering of inkjet-printed Ag NP line on a glass substrate.

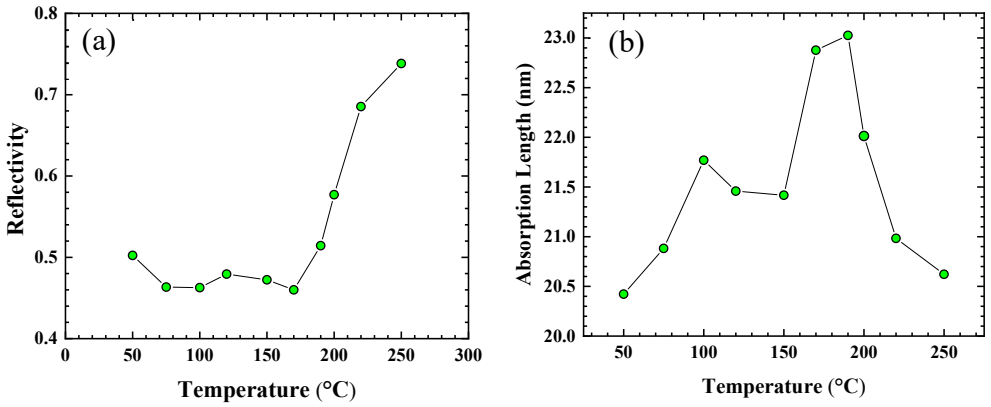

Figure S3. Normal Reflectivity and Absorption length of Ag NP structures measured with ellipsometry at different sintering temperature.

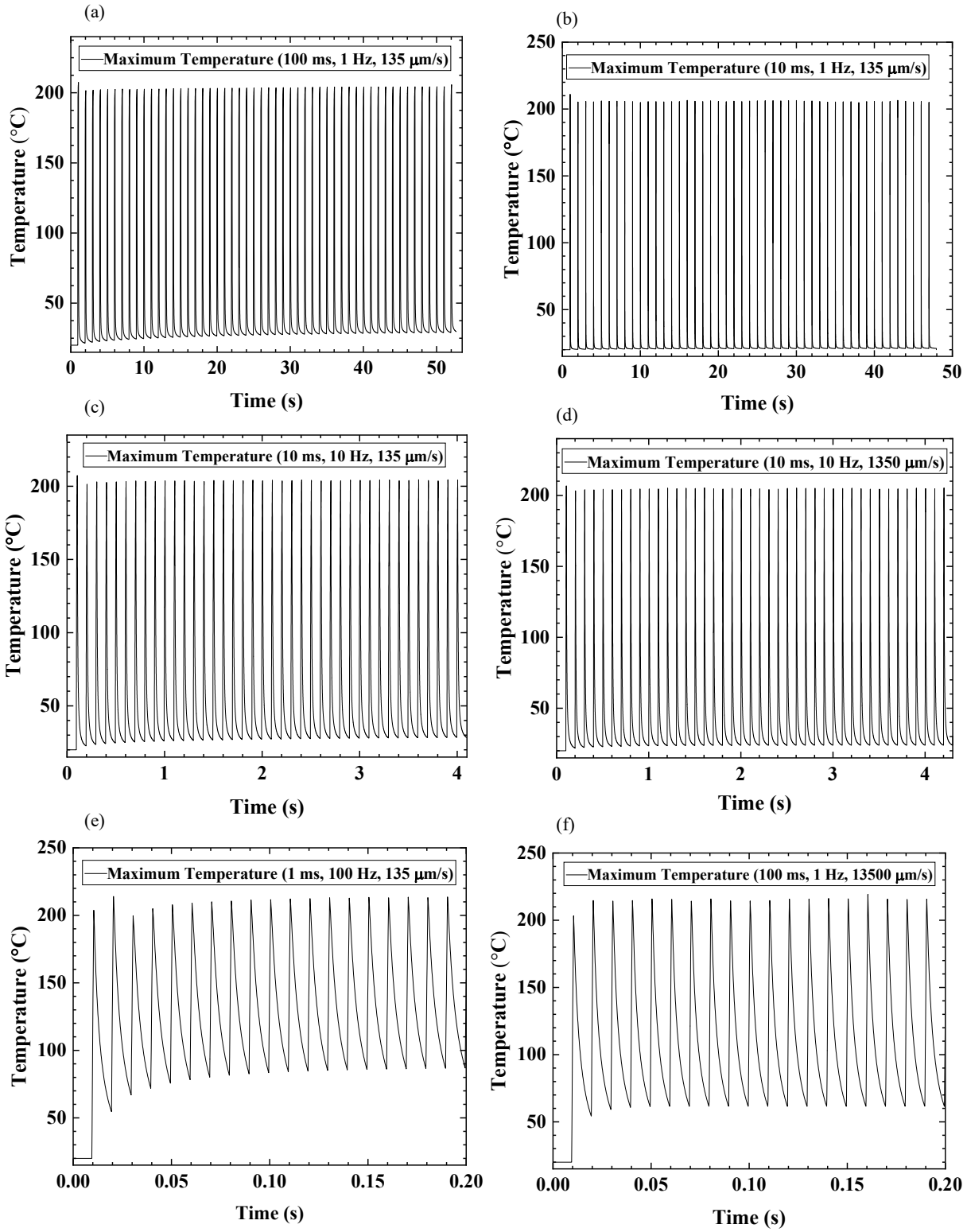

Figure S4. Maximum temperature plots for (a) 100 ms, 1 Hz, 135 μm/s, 276 mW (b) 10 ms 1 Hz and 135 μm/s, 276 mW. (c) 10 ms, 10 Hz, 135 μm/s and 420 mW (d) 10 ms, 10 Hz, 1350 μm/s and 420 mW (e) 1 ms, 100 Hz, 135 μm/s and 1.7 W (f) 1 ms, 100 Hz, 13500 μm/s and 1.7 W.