Supporting Information

Light-induced Release of DNA from Gold Nanoparticles: Nanoshells and Nanorods

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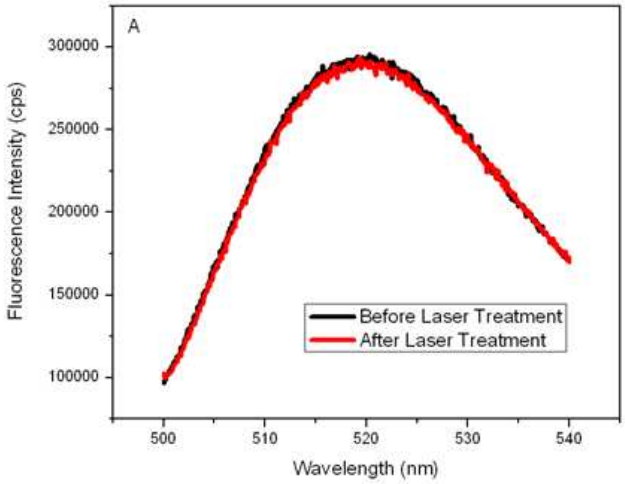

Figure S1. Effect of 800 nm laser irradiation on the fluorescence spectrum of fluorescein. Fluorescence spectra of fluorescein-tagged DNA before (black) and after (red) 800 nm laser irradiation at 1 W/cm^2 for 5 minutes. Laser irradiation has no measurable effect on the fluorescein molecules.

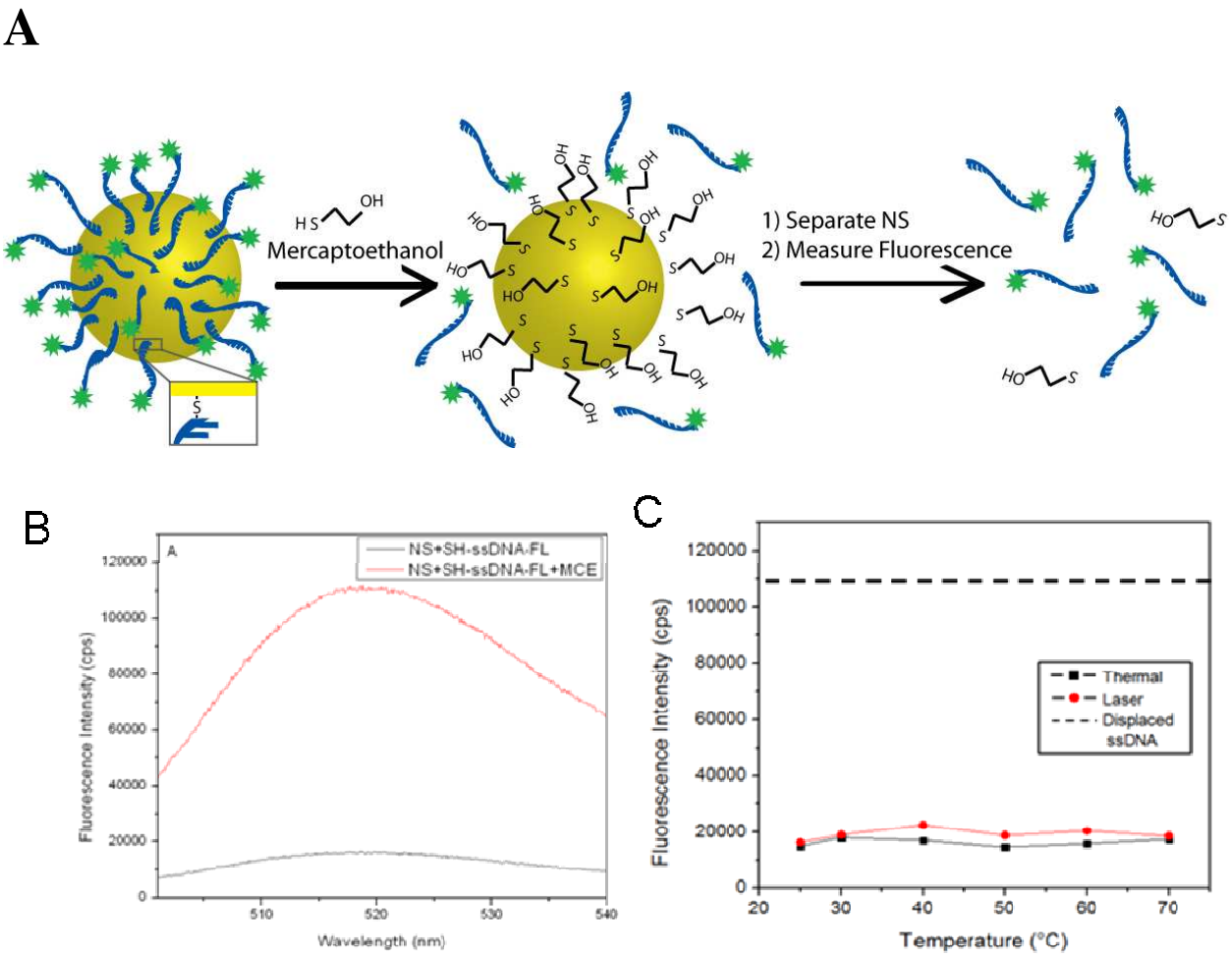

Figure S2. Effect of thermal and laser treatments on Au-thiol bond stability. (A) Schematic of fluorescein-tagged, thiolated ssDNA attached to a NS (left) and displacement with mercaptoethanol (right). (B) The fluorescence spectrum of the supernatant before (black line) and after (red line) displacement by mercaptoethanol (MCE) of the fluorescein-tagged, thiolated ssDNA. (C) Peak fluorescence intensity (λ = 520nm) of fluorescein in the supernatant as a function of solution temperature for thermal treatment (black squares) and laser treatment (red dots). The dashed line (-----) corresponds to complete release, determined by the peak at 520nm from the red curve in (B).

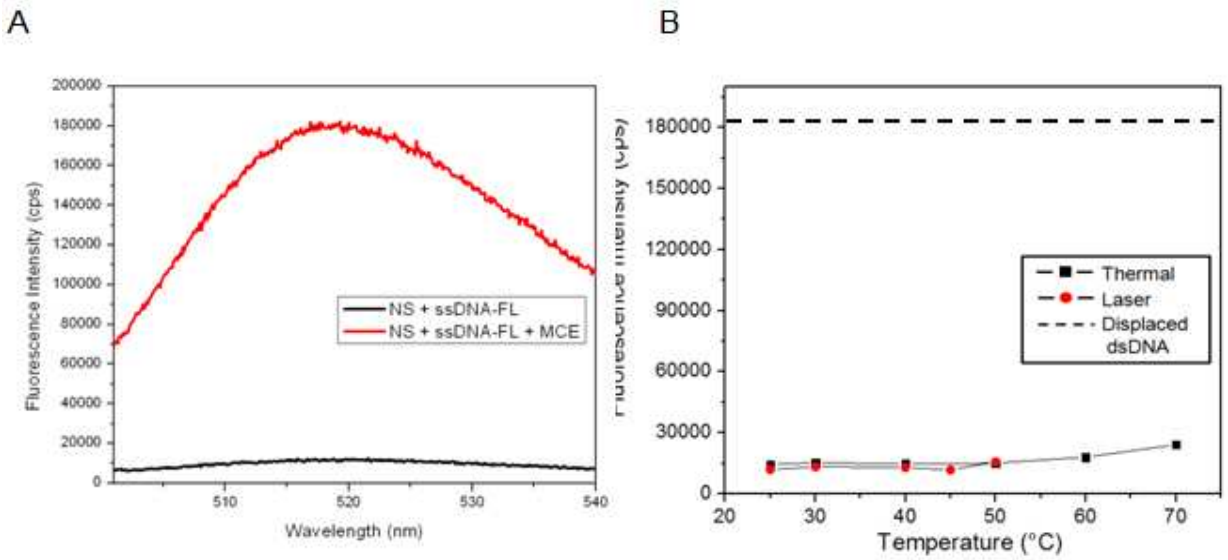

Figure S3. Release of Fluorescein-tagged non-thiolated ssDNA adsorbed to the nanoshell surface. (A) The fluorescence spectrum of the supernatant before (black line) and after (red line) displacement by mercaptoethanol (MCE) of the fluorescein-tagged, non-thiolated ssDNA (B) Peak fluorescence intensity (λ = 520nm) of the supernatants as a function of solution temperature for thermal treatment (black squares) and laser treatment (red dots). The dashed line (-----) corresponds to complete release, determined by measuring the fluorescence intensity after displacement of the fluorescein-tagged, thiolated ssDNA by mercaptoethanol.

The reason for not observing release from adsorbed DNA is because any DNA that is released, after the aliquot is allowed to cool, it can bind back to the DNA non-specifically. Also, there will not be any significant release due to charge transfer, because this is ssDNA, so there will be no increased Coulombic repulsion if charge transfer occurs.

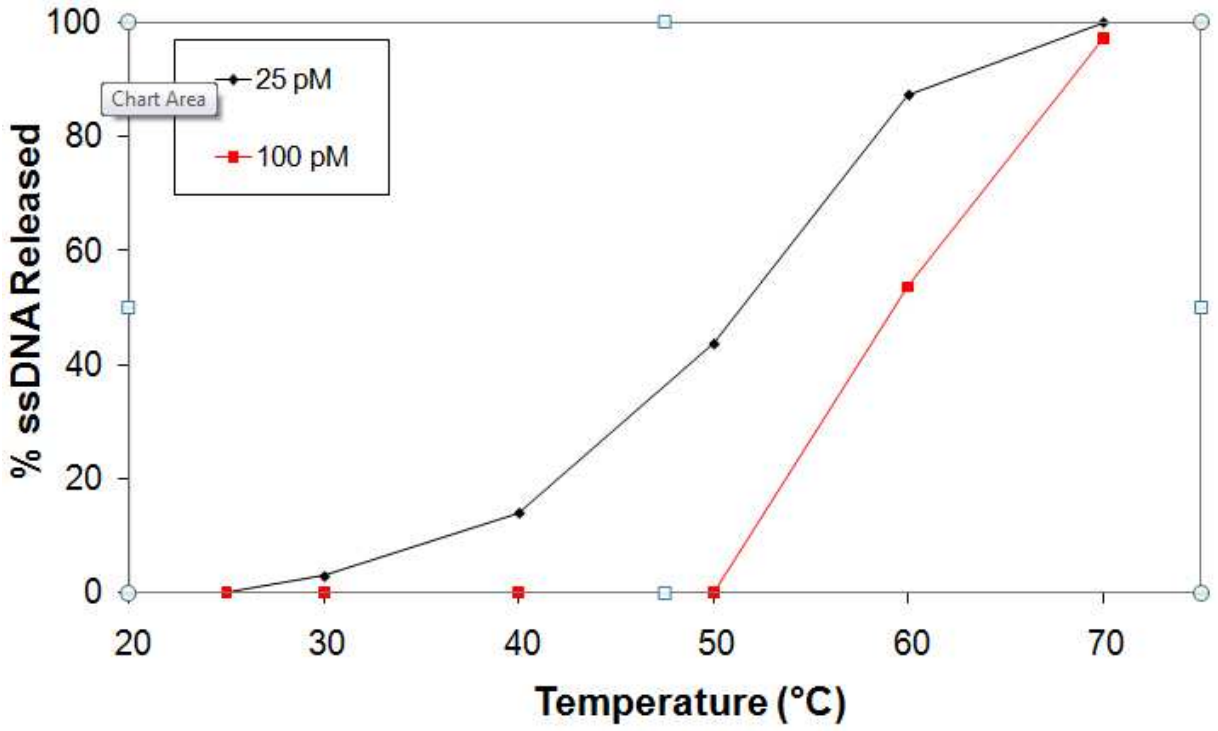

Figure S4. Percent ssDNA released versus solution temperature for dsDNA that is attached to gold nanoshells. One strand of the dsDNA is thiolated and attaches to the gold surface. The complementary sequence is non-thiolated and tagged with a fluorescein molecule. At each datapoint, an aliquot is taken out, the complementary sequence in the supernatant is separated from the nanoshells by centrifugation. Next, the fluorescence of the fluorescein-tagged ssDNA in the supernatant is measured and normalized by nanoshell concentration. Melting temperature is dependent on NS concentration because DNA concentration is directly proportional to NS concentration. As the NS concentration increases, the melting temperature increases.

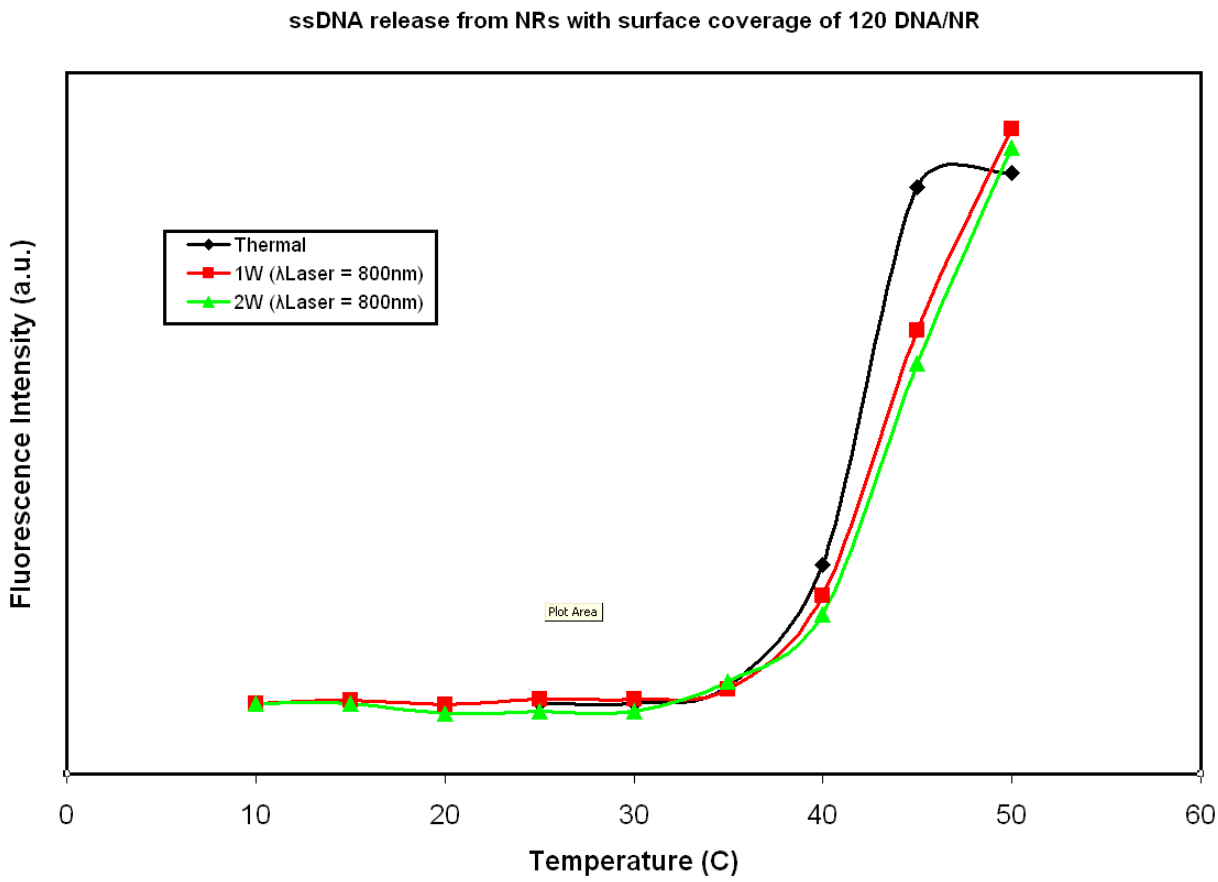

Figure S5. ssDNA release from dsDNA-NRs with surface coverage of 120 DNA/NR. Fluorescence intensity (a.u.) versus solution temperature (°C).

Dividing by the NR concentration would give a release curve of number of ssDNA released/NR. However, this was not done, because it is obvious from this raw data that the laser does not result in any observable light-triggered release of ssDNA.

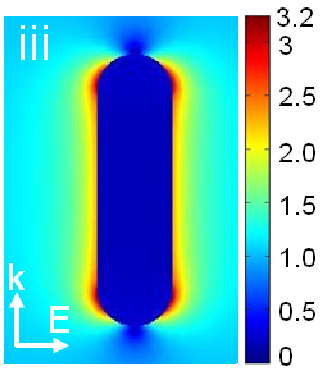

Figure S6. Near-field Intensity enhancements of nanorods ([w, l] = [13, 47] nm) calculated using the Finite-Element Method (FEM). Enhancement at nanorod surface (transverse plasmon) when excited at λ = 800 nm.