Electronic Supplementary Information (ESI) for Chemical Communications

Reconfigurable opto-thermoelectric printing of colloidal particles

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Materials preparation. An Au plasmonic substrate was fabricated by depositing a 4.5 nm Au thin film on a glass slide with thermal deposition (Denton thermal evaporator, base pressure: 1×10^{-5} Torr) followed by thermal annealing at 550 °C for 2 hours. As-purchased polystyrene (PS) sphere solution was mixed with a solution of CTAC molecules and NaCl salt at a volume ratio of 1:20000. Patterning and releasing of 1 μm and 2 μm PS spheres were achieved with the CTAC and NaCl concentrations of 5 mM and 100 mM, respectively. Patterning and releasing of 500 nm PS spheres were achieved with the CTAC and NaCl concentrations of 10 mM and 100 mM, respectively.

Optical setup. A 532 nm diode-pumped solid-state (DPSS) laser (Coherent, Genesis MX STM-1 W) was used. The laser beam was expanded with a 5× beam expander (Thorlabs) and focused onto the Au plasmonic substrate with a 40× objective (Nikon, NA 0.75) in a Nikon inverted microscope. The substrate was placed on a motorized stage. For dark-field optical imaging, an air condenser was used to focus the incident white light onto the substrate from the top and the scattering light was collected with a 40× objective from the bottom.

Supplementary Figures.

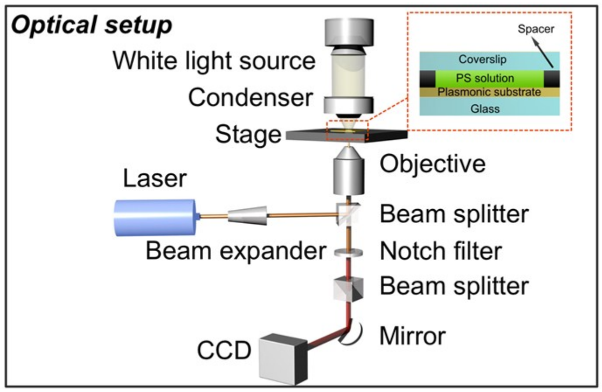

Figure S1: Schematic illustration of our optical setup for the opto-thermoelectric printing (OTP). In this illustration, polystyrene colloidal particles (indicated by PS solution) are printed on the plasmonic substrates.

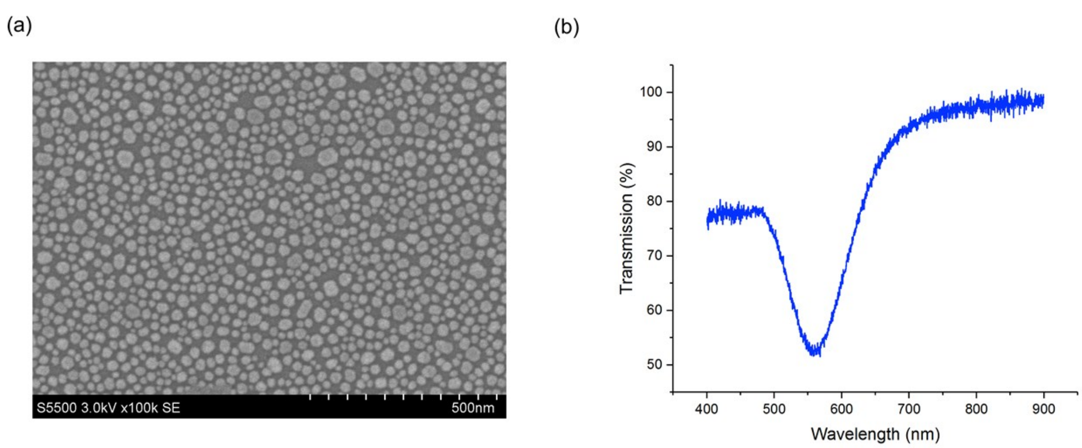

Figure S2: (a) Scanning electron micrograph and (b) optical transmission spectrum of the plasmonic substrate consisted of networked Au nanoparticles of sizes of 20-40 nm.

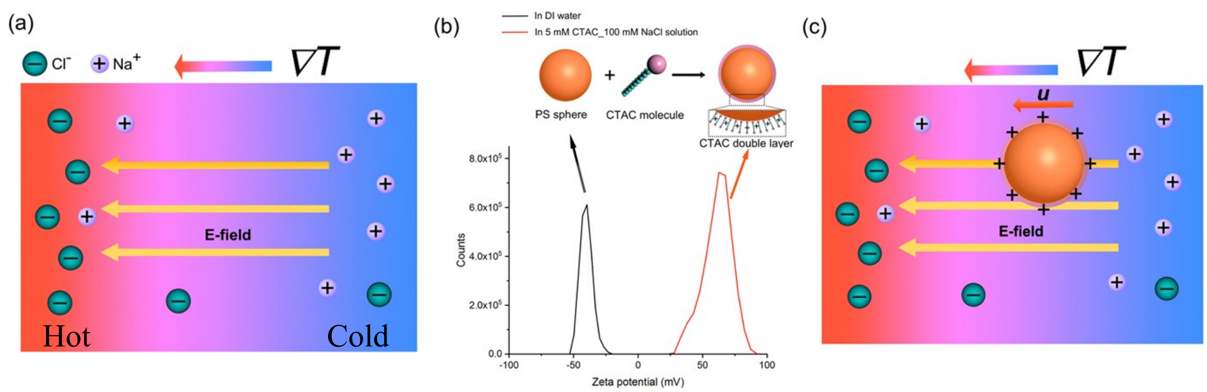

Figure S3: **Thermoelectric transport of CTAC-modified PS spheres**. (a) Separation of Na^+ and Cl^- ions in a temperature gradient ∇T creates a thermoelectric field directing from the cold to the hot region. (b) Surface zeta potential distributions of as-purchased PS spheres suspended in deionized (DI) water and CTAC-modified PS spheres suspended in NaCl solution. The size of the PS spheres is 2 µm. The CTAC and NaCl concentrations are 5 mM and 100 mM, respectively. (c) Migration of a positively charged PS sphere from the cold to the hot region under the thermoelectric field.

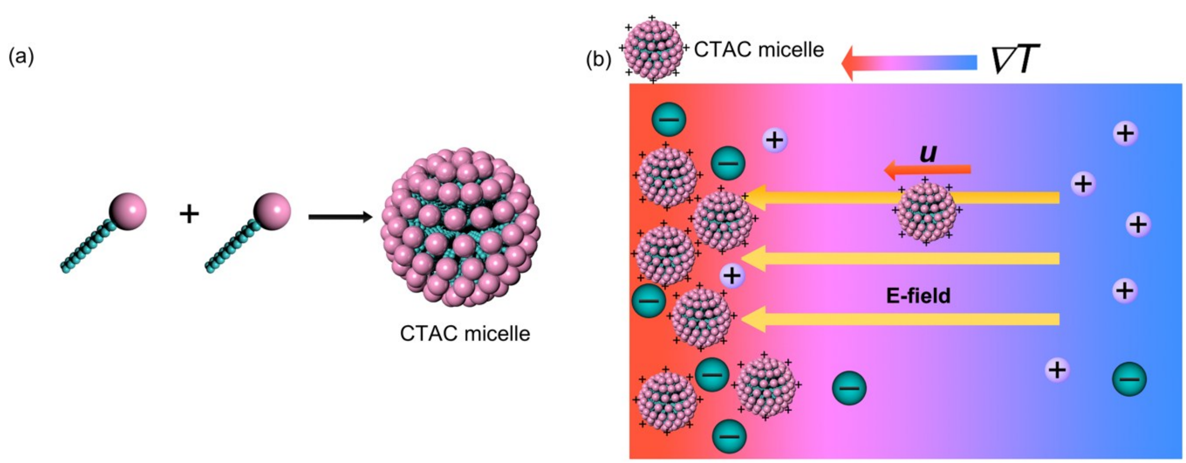

Figure S4: **Thermoelectric transport of CTAC micelles.** (a) Formation of CTAC micelles above the critical micelle concentration (c_{cmc}). (b) Transport and accumulation of positively charged CTAC micelles at the hot region under the thermoelectric field.