Supporting Information

A Microfluidic-based Controllable Synthesis of Rolling or Rigid Ultrathin Gold Nanoplates

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The design of the microfluidic chip

The device design consists of a microchannel (400 μm × 400 μm cross-section and 3 cm long) with three inlets and one outlet. The three inlets have the same channel width of 100 μm, and the angle between two adjacent inlet channels is 20 °. The microfluidic device was fabricated using standard soft lithography with SU8-2100 master mold on a silicon substrate. SU-8 2100 photoresist (MicroChem Corp) was first spin-coated on a 4 inch silicon wafer at 500 rpm for 10 sec followed by 2000 rpm for 30 sec to obtain the desired thickness (400μm). The coated wafer was soft-baked for 1 hr at 95 °C and then exposed to ultraviolet light with exposure energy of 400 mJ/cm^2 through a photomask containing the pattern of microfluidic channels. After exposure, the wafer was baked again at 95 °C for 25min and soaked in SU-8 developer (MicroChem Corp) to dissolve the unexposed photoresist. The patterned SU-8 master mold was then hard-baked at 150 °C for 15 min to anneal microcracks in SU-8. PDMS (Sylgard 184, Dow Corning) molds were cast from the master, and inlets and outlets were created using a 16-gauge blunt-tipped needle. Molds were sealed to glass coverslips after treatment with oxygen plasma. Microbore tubing (Tygon, 0.02”ID) was seated directly into the inlet and outlet holes, providing a water-tight seal. Prior to each experiment, tubing and interior surfaces of the sealed microfluidic device were treated for 10 min at room temperature with isopropyl alcohol and subsequently rinsed with ultrapure (18 MΩ) water. This reduced the incidence of trapped air bubbles during channel loading.

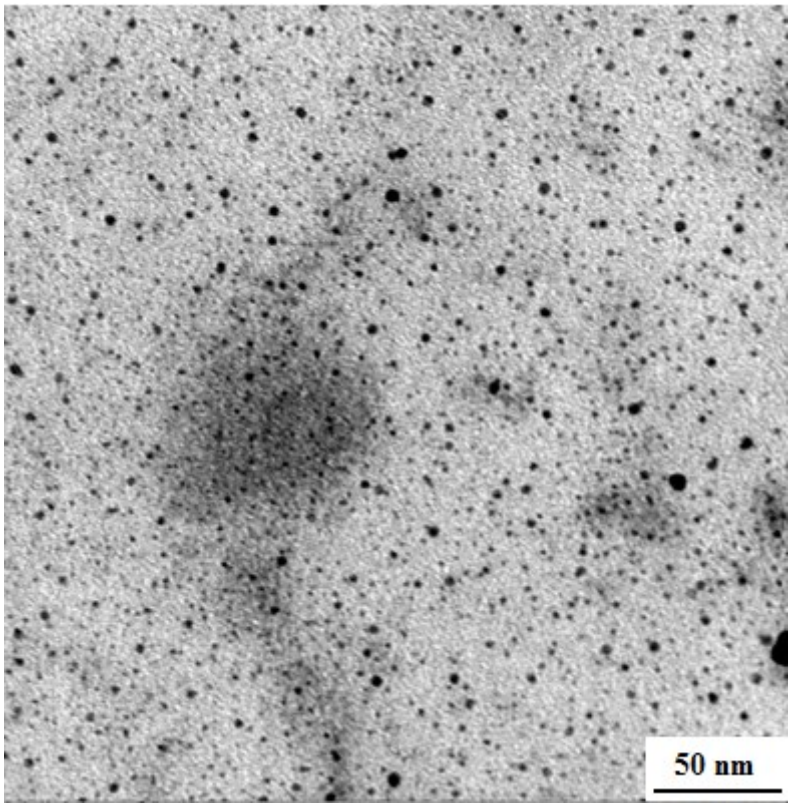

Fig. S1. TEM image of gold seeds with the average size of about 4 nm.

Fig. S2. Experimental setup for microfluidic synthesis of nanoplates. The left is the micro-pump; the middle is the micro-chip or reactor; the right is the collection of product in ice-water.

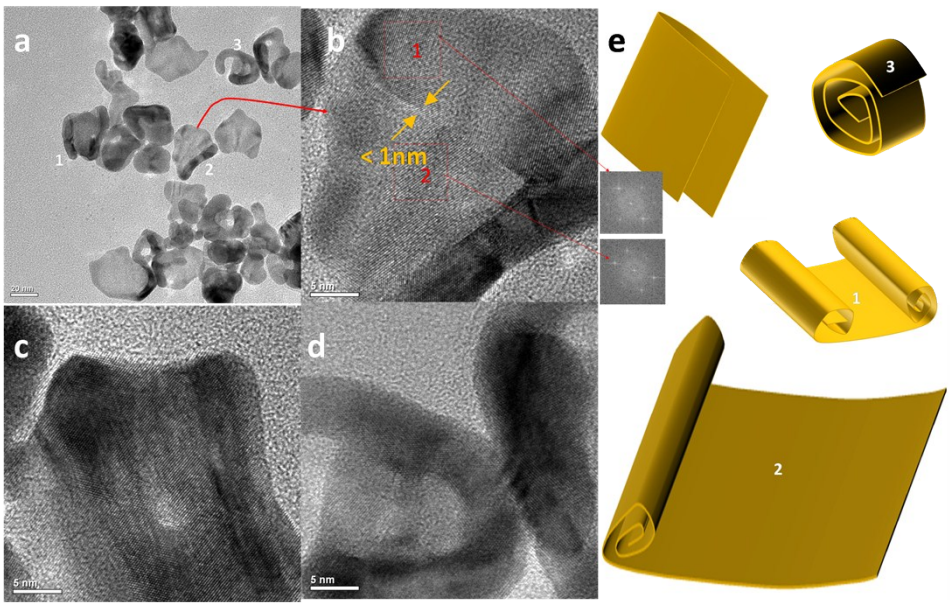

Fig. S3. (a)TEM images of the products prepared at 70 μL/min. Especially, (**b**) a magnified TEM image to show the folding of an ultrathin gold nanoplate, the yellow arrows show its thickness less than 1 nm; (**c,d**) incomplete rolling of a thin nanoplate. The right side (**e**) presents some schemes to show the complete/incomplete folding or rolling of ultrathin gold nanoplates observed on TEM images. The FFT shown in (**e**) correspond to the two regions shown in (**b**)

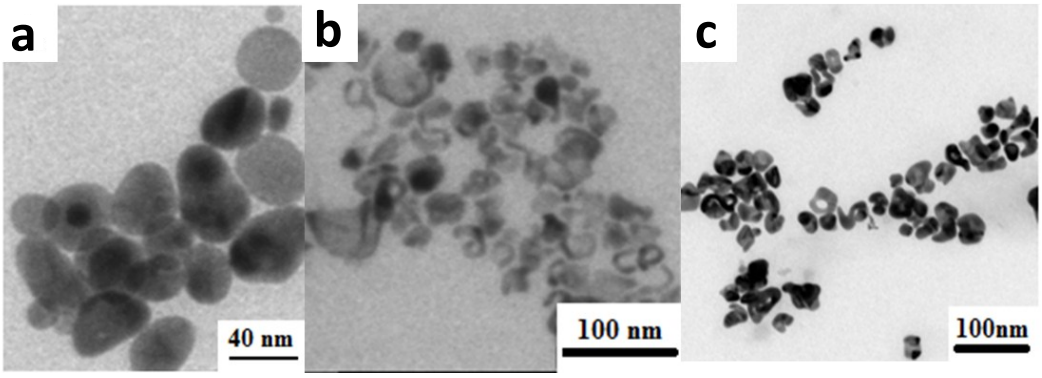

Fig. S4. TEM images of gold nanoplates synthesized through the microfluidic system at the injection rate of (a) 10μL /min, (b) 30μL /min and (c) 50μL /min respectively.

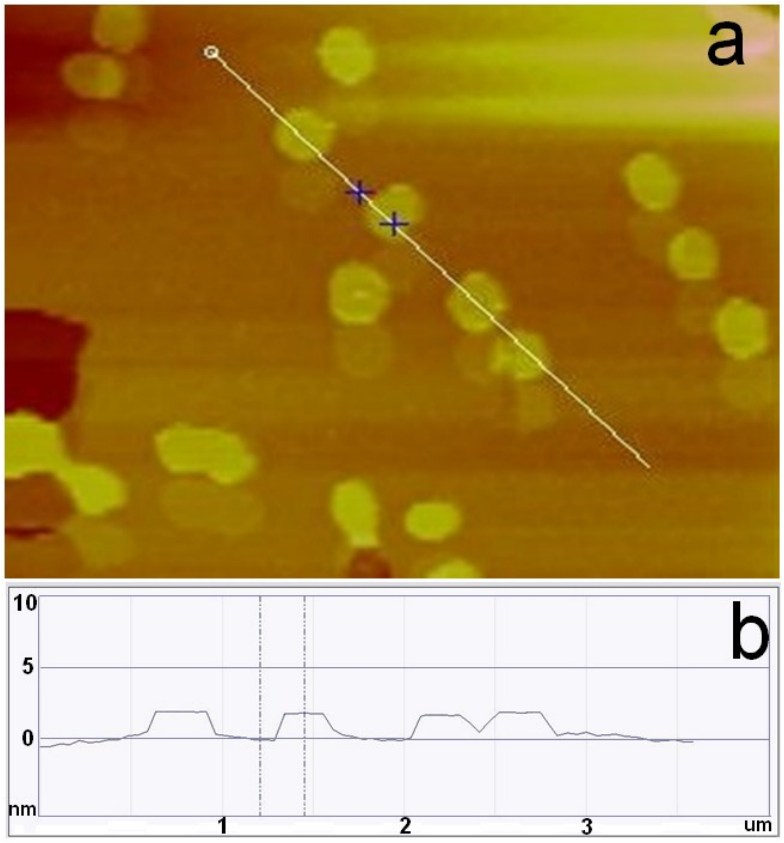

Fig. S5. Thickness measurement of gold rigid nanoplates prepared at 10μL /min. (a) Typical AFM image and (b) the corresponding height profile to show the thickness (~2.5 nm) of a few Au nanoplates.

From the AFM image on many nanoplates, we can see that all these products are thin nanoplates with flat surface and average thickness of about 2.5 nm.

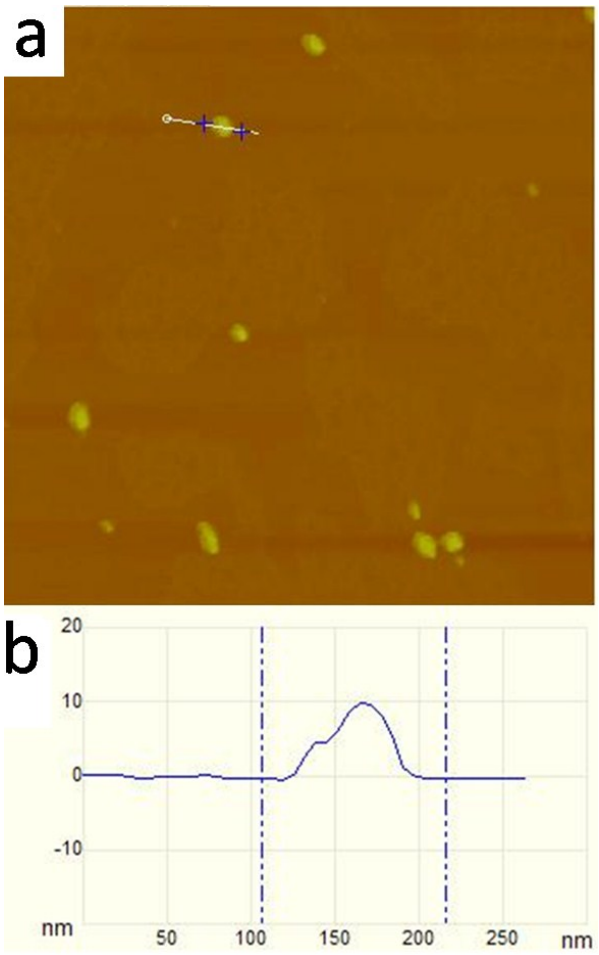

Fig. S6. Thickness measurement of the rolled-up gold nanoplates prepared at 50μL /min. (a) Typical AFM image and (b) the corresponding height profile. The bumped height profile indicates the possible rolling model.

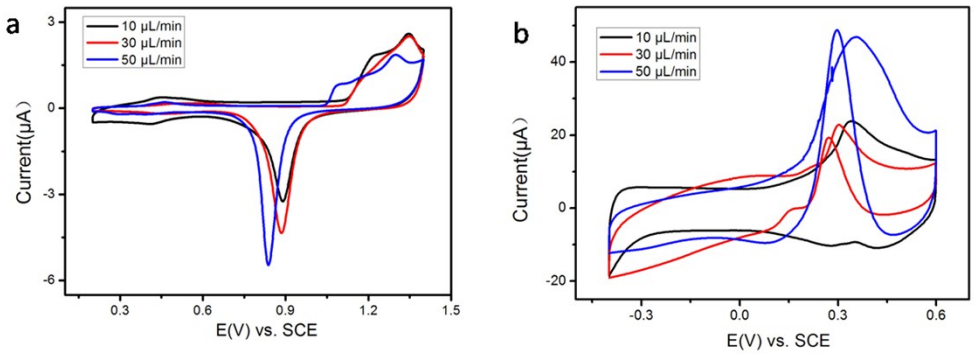

Fig. S7 (a) The cylic voltammograms of nanoplates prepared at 10μL/min, 30μL/min and 50μL/min modified electrodes in (a) 0.5 M H_2SO_4, (b) in PBS (pH7.4) in presence of 10 mM glucose recorded at 50 mV s^{-1} and at 20°C.