Supporting information

# Photoresistance Switching of Plasmonic Nanopores

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This supporting information contains the following:

## Normalized current changes at +100 mV

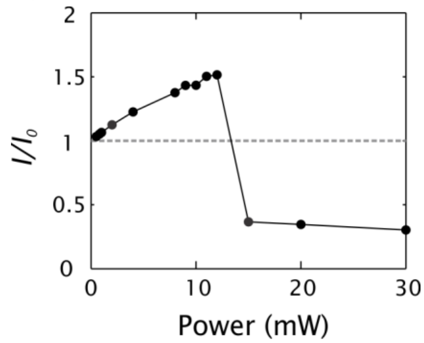


**Figure S1.** Normalized current deviation $I/I_0$ as a function of laser power at +100 mV. The dashed line of $I/I_0 = 1$ devides the figure to top area of current increase and bottom area of current decrease.

## Calibration of the motorized power sweeps

The laser illumination power was controlled using a motorized rotatable lambda half wave plate that controlled the polarization of the beam before it traveled through a polarization beam splitter. A second wave plate after the beam splitter enabled control of the polarization of the final excitation beam (longitudinal or transverse). The power after the second wave plate was further reduced by a neutral density (ND) filter and recorded with a power meter for different angles of the wave plate (Fig. S2a). The resulting calibration curves enabled conversion of wave plate angle to power.

For power sweeps during ionic recording, we first set the angle of the motorized rotatable wave plate at a certain degree (0 degree), then switched on the laser so that we could observe the laser induced response (i). Next, we rotated the wave plate at different angular velocities back and forth (ii, typically between 0 and 120 degrees), after which the laser was switched off (iii). An example of such measurement is presented in Fig. S2b. Using the calibration curve, the time traces could be converted to $I/I_0$ versus laser power (Fig S2c).

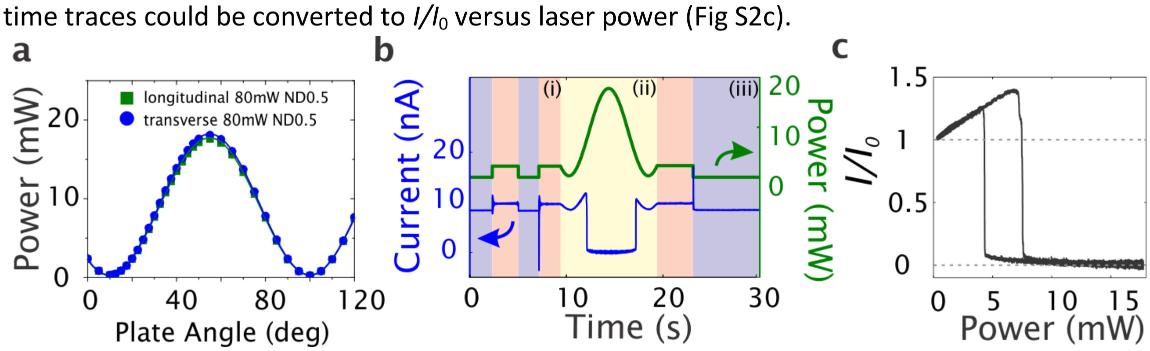


**Figure S2.** The procedure of power sweep measurements. (a) Output laser power as a function of angle of the motorized rotatable wave plate. The blue dots correspond to longitudinal excitation and the green ones correspond to transverse polarization. (b) Example of power sweep recording, here with angular velocity of 7.5 degree/s at +100 mV and with longitudinal excitation. The blue curve represents the ionic current and the green curve shows the output power as a function of time. (c) The normalized current as a function of power, which is derived from (b) using the calibration curve in (a).

## Power sweep measurement at transverse excitation

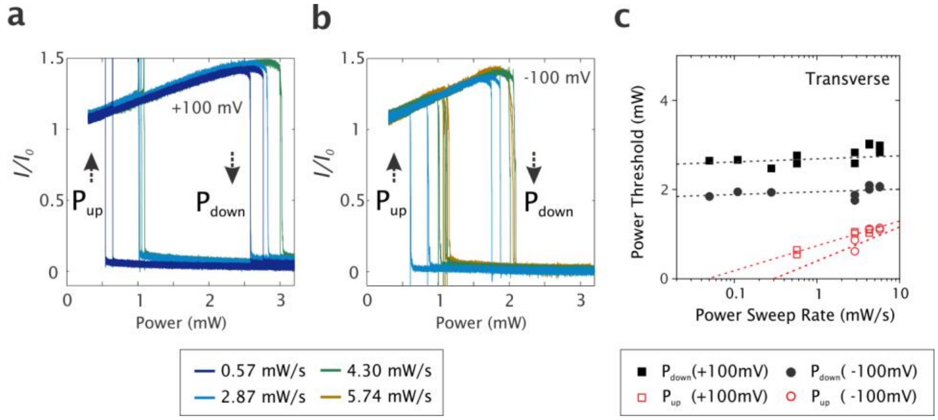


**Figure S3.** Normalized ionic current at transverse excitation at (a) +100 mV and (b) -100 mV, during power sweeps at different sweep rates. (c) Transition thresholds ($P_{down}$ and $P_{up}$) as a function of sweep rate in transverse mode.

## High proton concentration measurement

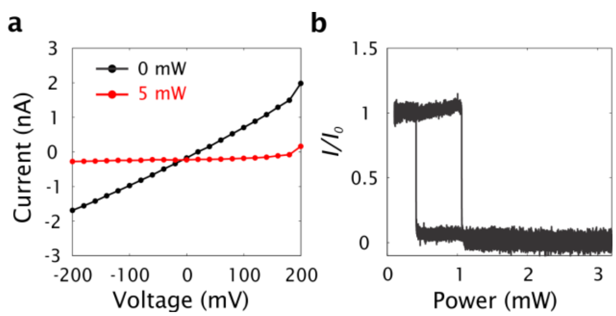


**Figure S4.** Ionic current measurement in 0.1 M HCl (transverse mode). (a) *I-V* curve at 0 mW (black) and 5 mW (red) (b) Power sweep at +100 mV.

## Current noise and current profiles

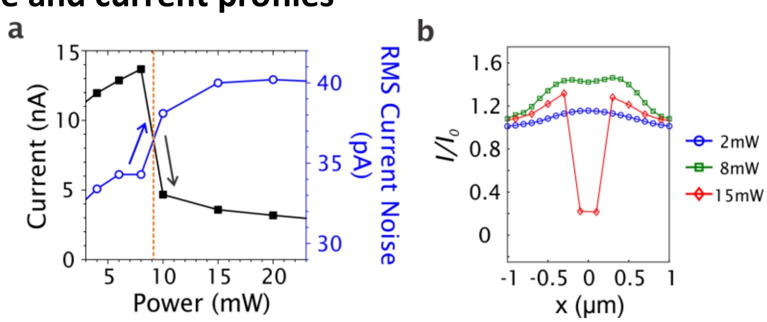


**Figure S5.** Current noise and relative conductance profiles. (a) Nanopore current at 100 mV and RMS current noise filtered at 2 kHz as a function of laser power (transverse excitation aligned with nanopore). (b) Variation in the ionic current through a nanopore as a function of position of the focused laser with respect to the pore center. The three scans were acquired at 100 mV, at 2 mW (blue), 8 mW (green) and 15 mW (red). We note that the scan at 15 mW is measured on a different device from the scans at 2 mW and 8 mW.

## Stepwise drops in the ionic current

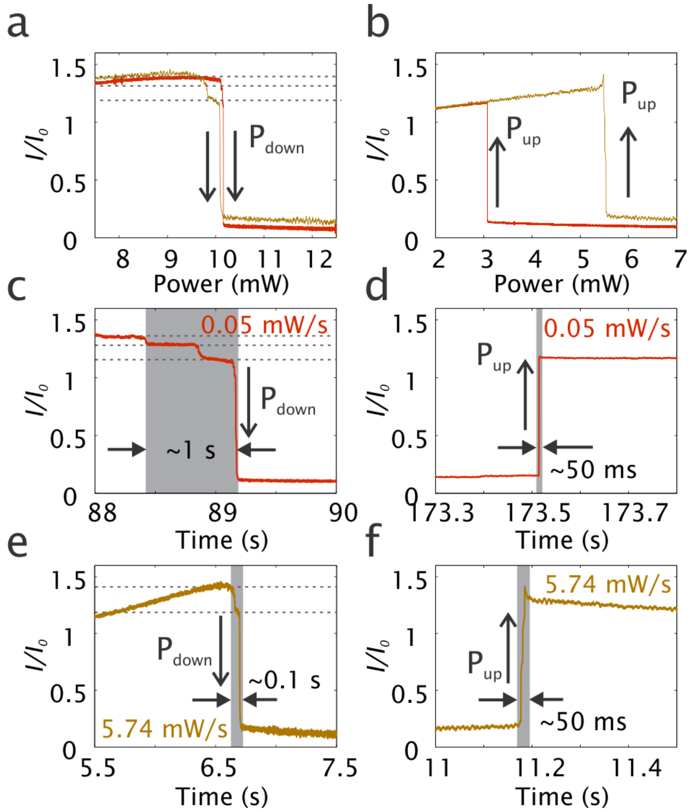


**Figure S6.** Multi-level current steps as a function of illumination power (a-b) and time (c-f), respectively. (a) $P_{down}$ and (b) $P_{up}$ are the zoomed curves of Figure 3a. Only the curves with highest velocity (in red) and slowest velocity (in yellow) are shown here. Dashed lines show the normalized current levels. (c-d) The time series of transitions at the power sweep rate of 0.05 mW/s, (e-f) at the power sweep rate of 5.74 mW/s. The grey areas indicate the duration time for each individual transition events.

## Remote photoresistance switch on gratings

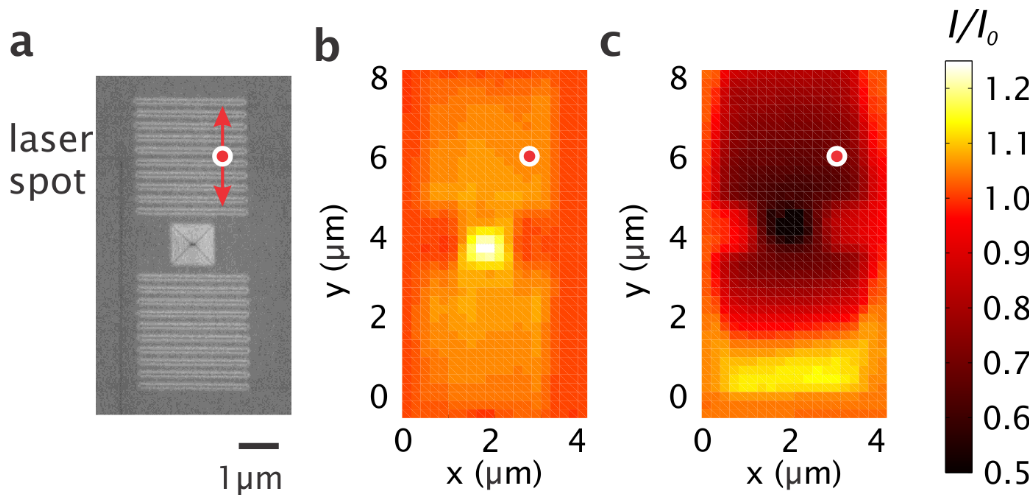


**Figure S7.** Ionic mapping in the *x*-*y* plane with transverse excitation at +100 mV. (a) Schematic representation of the laser spot on the plasmonic structure of a nanocavity with gratings. The arrow indicates the transverse polarization, which was used for this measurement. The white and red circle marks the approximate laser spot size. (b) 2D ionic current map by scanning the entire plasmonic structure at 2 mW. (c) 2D ionic current map at 15 mW.