# Supporting Information

# Pores with Longitudinal Irregularities Distinguish Objects by Shape

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**Table S1**. Zeta potential measurements of particles performed using Zetasizer Nano ZS, Malvern Instruments Ltd. 1 mM KCl was used to lower conductivity of the medium.

| **Type of particle** | **Zeta potential (mV), measured in 1 mM KCl, pH 8, 0.1 %Tween 80** |
|---|---|
| 410 nm spherical particles | -54.8 ± 7.8 |
| 230 nm x 590 nm rods | -6.9 ± 0.2 |
| 210 nm x 1950 nm rods | -37.4 ± 1.5 |

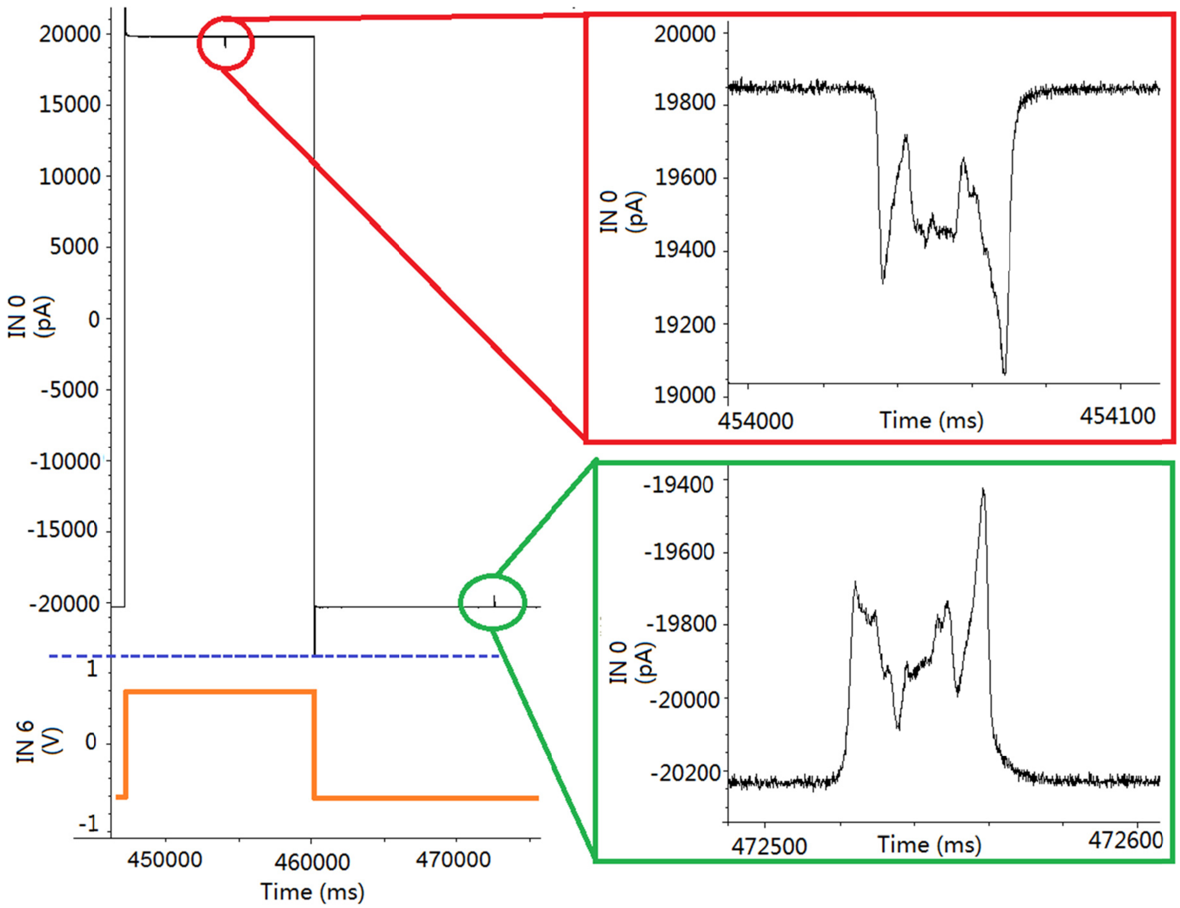



**Figure S1**. Example of a single 230 nm x 590 nm rod transporting back and forth through a pore with an average opening diameter of 770 nm. The voltage was manually switched immediately after the rod exited the pore. The panels on the right show details of current modulations in each event. These experiments were performed at pH 10, which increased the surface charge on the particles and pore walls, thus accentuated the current decrease at the pulse end. The signal IN 0 in our measuring system indicates ion current in pA. The input signal IN 6 is the applied voltage.

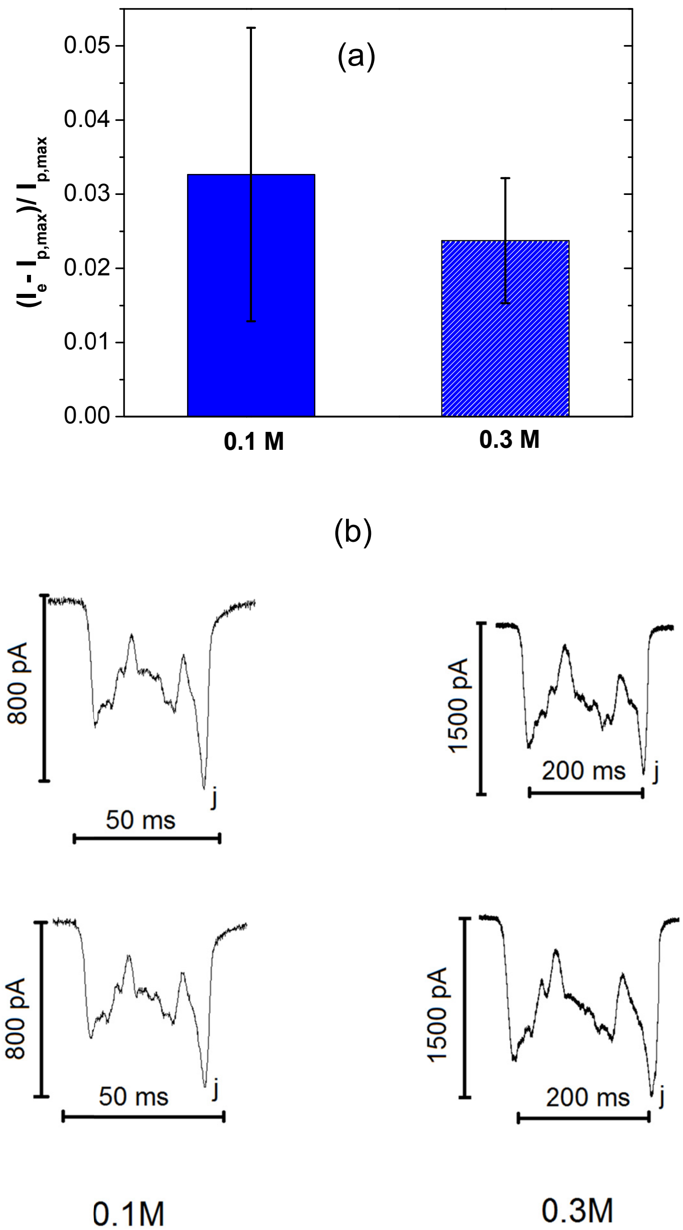



**Figure S2.** (a) Analysis of the maximum current decrease, $I_{p,max}$ (marked as peak j in Figure 2 in the main text, and in (b)) observed at the end of translocations of 230 nm x 590 nm rods through a single pore with an average open diameter of 770 nm. $I_e$ stands for ion current value of an empty pore. The experiments were performed in two KCl concentrations. The current decrease $I_{p,max}$ diminished in the higher KCl concentration pointing to the electrostatic origin of the current decrease upon the rod exit. The error bars indicate one standard deviation from the average ($I_e$-$I_{p,max}$); 300 and 75 events were recorded in 0.1 M and 0.3 M KCl, respectively. (b) Example ion current pulses of single rods recorded in 0.1 and 0.3 M KCl, at 0.6 V; two pulses in each concentration are shown.

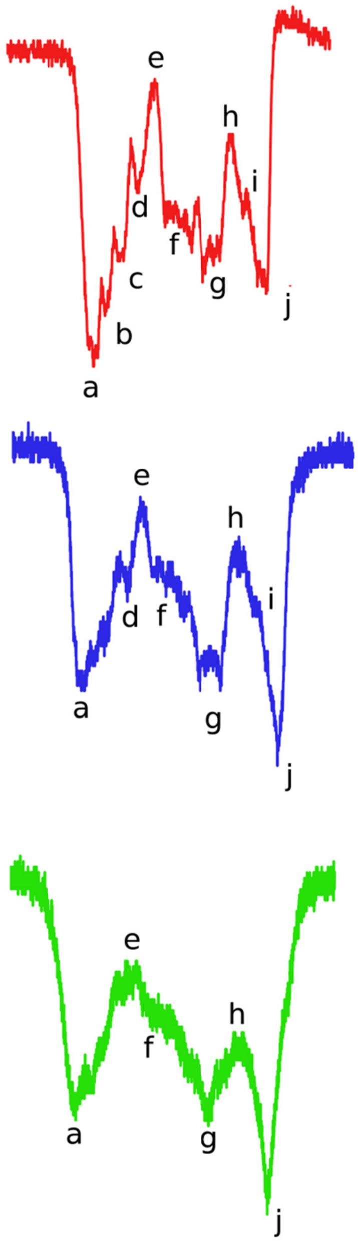
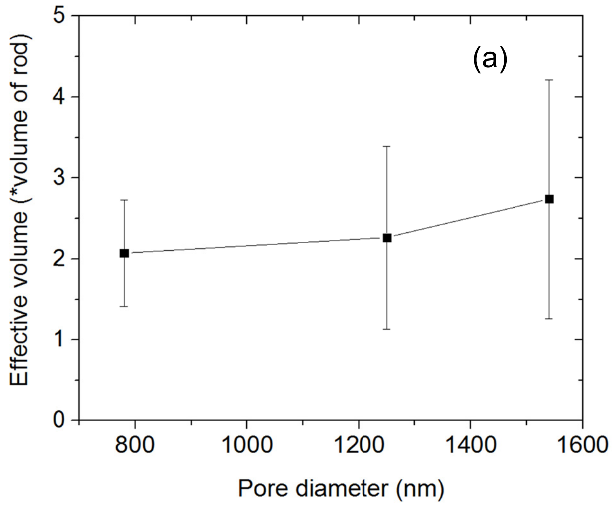



**Figure S3**. Analysis of sub-peaks observed in resistive pulses of 410 nm spheres (in red) and two types of rods (230 nm x 590 nm, and 210 nm x 1950 nm in blue and green, respectively) in a 770 nm pore. Resistive pulses of spheres contain the largest number of sub-peaks; due to averaging effects caused by the rods, their pulses contain less peaks and valleys. Resistive pulses of rods contain a large current decrease in the last part corresponding to the particle exit (marked as j); this part of the pulses was not taken into account in the quantitative analysis of current blockage. In calculating the average event amplitude (Figure 3a), peaks were integrated between peaks ‘a’ and ‘g’.



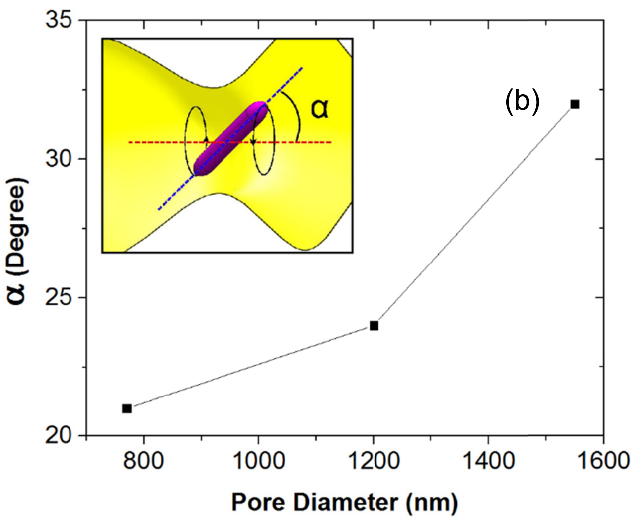




**Figure S4**. Effective volume of silica rods 230 nm x 590 nm as measured by three PET pores with different average opening diameter. (a) The y-axis shows the parameter by which the geometrical volume has to be multiplied to obtain the experimentally measured excluded volume from resistive pulses. The error bars show the standard deviations in the measurements of multiple rods. (b) Estimated angle of a double-cone the rods sweep out when translocating calculated based on the average values shown in (a).

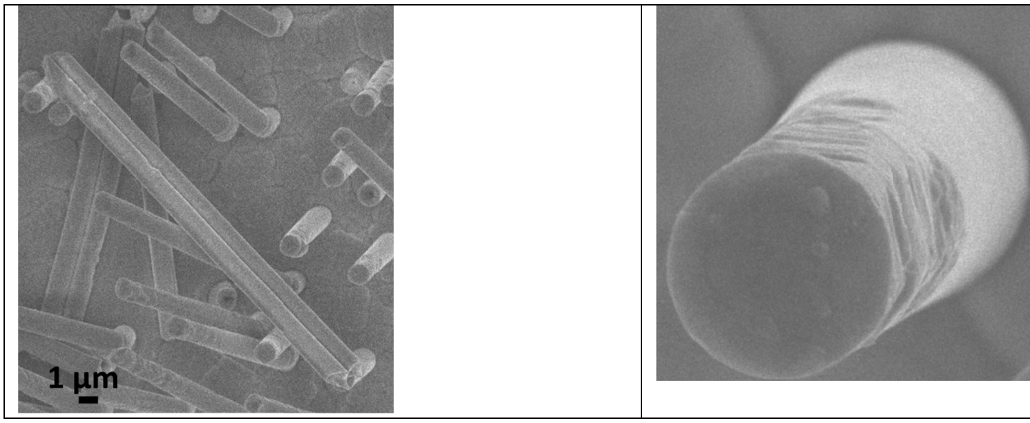



**Figure S5**. Copper microwires fabricated by electrodeposition in 30 μm thick polycarbonate track-etched membranes. The membranes were prepared by heavy ion irradiation with energetic Au ions (11.1 MeV/u), and subsequent etching in 6 M NaOH at T = 50 ºC. The membranes contained $10^7$ pores/$cm^2$. A thin Au layer (~ 200 nm) was sputtered on one side of the membrane, and reinforced electrochemically with a few µm thick Au layer creating a cathode; a copper rod was used as an anode in a two electrode electrochemical cell. The deposition was performed applying a potential of U = -0.04 V at 60 °C.[1] Facets of copper crystals can be seen as well due to the low deposition potential.

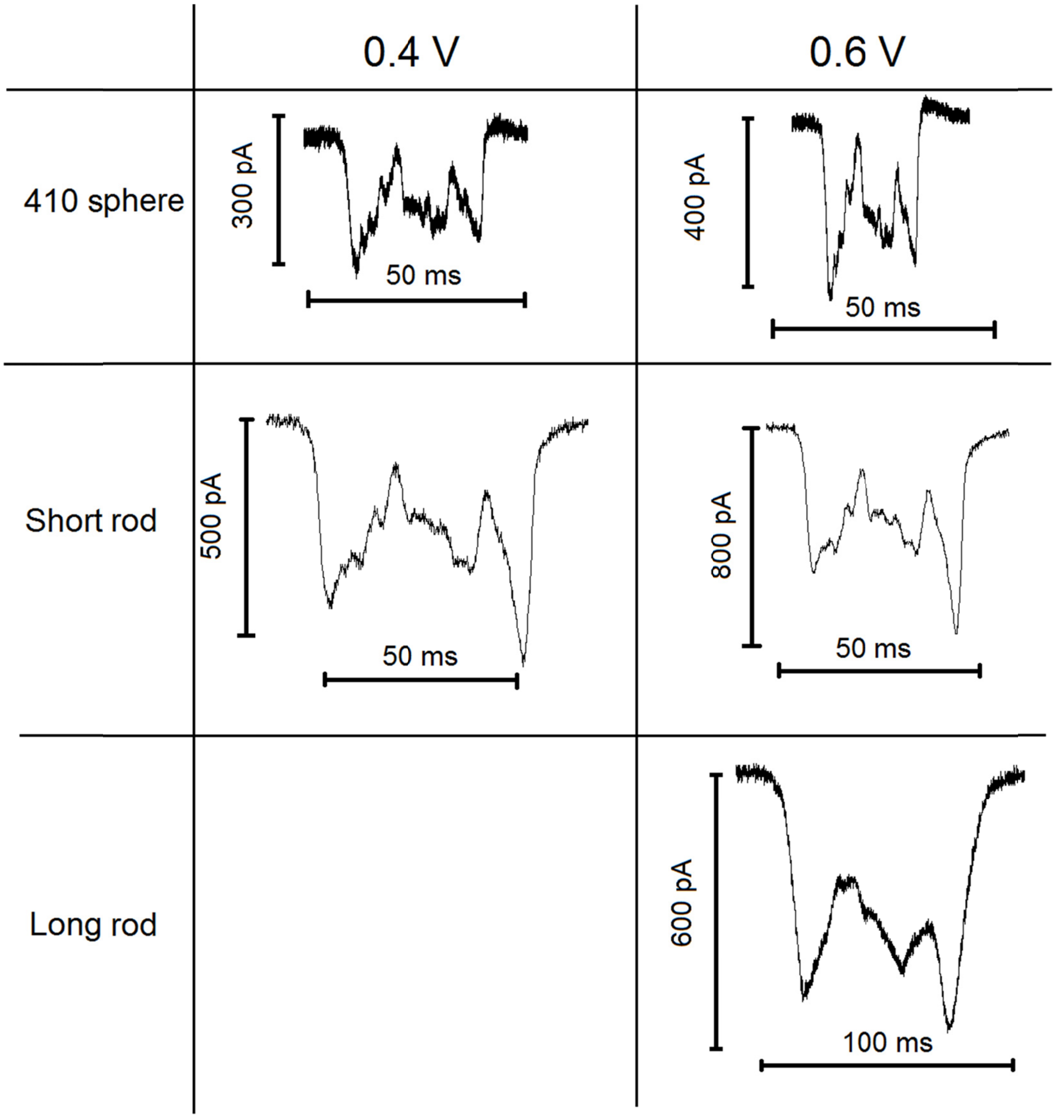



**Figure S6**. Example ion current pulses of 410 nm spheres and two types of rods through a pore with average opening diameter 770 nm recorded in 0.1 M KCl, pH 8 at two different magnitudes of voltage. Note that the spheres pass through the pore towards a positively biased electrode, while the rods translocate towards a negatively biased electrode.

## References


1. Toimil Molares, M.E.; Buschmann, V.; Dobrev, D.; Neumann, R.; Scholz, R.; Schuchert, I.U.; Vetter, J. Single-Crystalline Copper Nanowires Produced by Electrochemical Deposition in Polymeric Ion Track Membranes. *Adv. Mater.* **2001**, *13*, 62-65.