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Supporting Information

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Confined Catalytic Janus Swimmers in a Crowded Channel: Geometry-Driven Rectification Transients and Directional Locking

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1. Self-Assembled Monolayers of SiO_2 Beads

The glass coverslips were cleaned during 4 min with acetone, isopropanol and distilled water in ultrasonification bath. The coverslips were subsequently treated with plasma for 1 min. The silicon beads were resuspended in distilled water, and this suspension was deposited onto the surface of tilted coverslips. The tilt angle was 30^0. The samples were incubated in a plastic container for 24 h.

2. Deposition of Metal Films

25 nm of Pt was deposited onto the samples using magnetron spattering at Ar pressure of $8x10^{-3}$ mbar at a rate of 0.5 Å/s. The deposition is carried out in high vacuum chamber with a base vacuum of 10^{-7} mbar.

3. Fabrication of Microfluidic Chips

First, 20 μm layer of negative SU-8 2010 photoresist (MicroChem) was spin-coated onto the surface of a silicon wafer. The photoresist was patterned using photolithography. Subsequently, a PDMS mold from the master structure was prepared. Finally, the mold and a PDMS covered glass slip were treated with plasma for 20 s and sealed together.

4. **Characterization of the Motion of Janus particles and Passive Beads.**

The velocities in Fig. 1C, Fig. 2C and Fig. 3C were determined as follows: (a) trajectories of the moving particles were recorded; (b) the instantaneous velocities along the longitudinal axis and along the broad axis of the channel were determined; (c) the velocities were determined as a square root of the sum of squared instantaneous velocities for each time frame.

5. **Reagents.**

The hydrogen peroxide solutions were prepared by dilution of the stock hydrogen peroxide solution (30 wt %, Sigma Aldrich) with distilled water.

6. **Mean squared displacement of the Janus particles in the channel**

It is shown that the value of MSD increases sharply along the enlargement of the time since the motion is in the centre in Fig.S1. However, the increase became gent when the motor slides along the wall. When the motor slides at the wall, because the Janus motor collided with and “trapped” by the wall, the motor displays the slow motion along the y-axis. Thus, the motion is transformed from 2D motion to quasi-1D motion that lead to the decrease of the velocity and the slope of MSD. We also calculate and compare the MSD of Janus particle in channels with different width, as shown in Fig. S1. The slope in the MSD curve decreases with decreasing the channel width. The motor in the narrower channel has higher possibility to collide with the wall and more time to slide along the wall, so the MSD curve in narrower channel is lower than the MSD curves for wider channels. When the width of the channel is large enough, the Janus particle will hardly experience collision with the wall and act as a quasi-free particle.

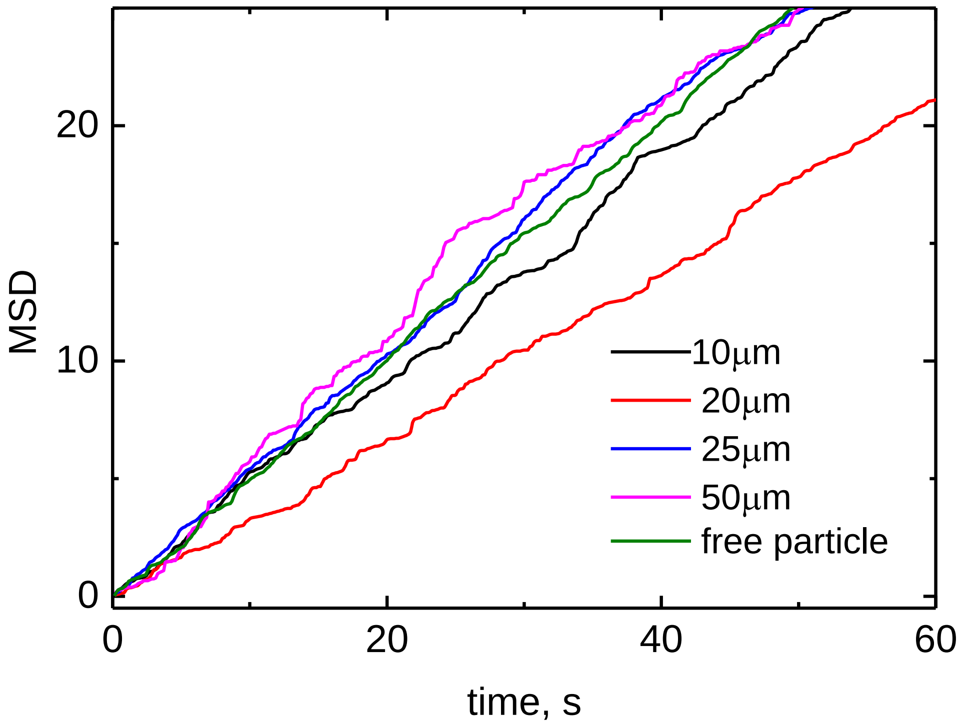

Fig. S1 Dependence of the mean squared displacement on width of the channels.