

Supporting Information

Simultaneous self-exfoliation and autonomous motion of MoS₂ particles in water

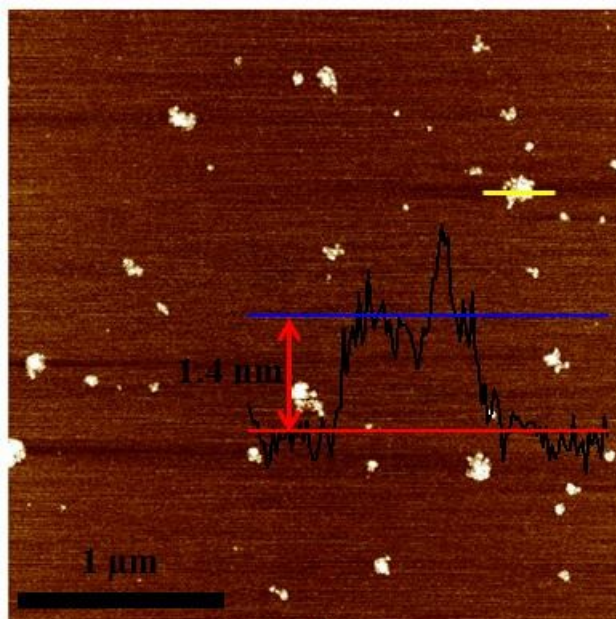
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Experimental section

To synthesize MoS₂ motors, in 100 ml of dry tetrahydrofuran (THF) was dissolved 8.0 g of naphthalene and then 1.4 g of sodium was subsequently added. After dissolution of sodium by vigorous stirring for 1 hour, 2.0 g of MoS₂ was added to the reaction mixture and the reaction mixture was further stirred for 12 hours. The formed sodium intercalated MoS₂ was separated by suction filtration and dried at room temperature. The lithium intercalated MoS₂ used for control experiment was obtained by stirring 3 g of the bulk powder in 20 mL of 1.7 M *t*-butyllithium in pentane for 72 h at 25°C. The resulting compound was then separated by suction filtration and washed repeatedly with dried hexane. All operation was performed under argon atmosphere inside glovebox. Naphthalene and THF were obtained from Penta, Czech Republic. THF was dried by distillation from sodium-benzophenone mixture under argon atmosphere. Sodium, *tert*-butyllithium (1.7M in pentane) and molybdenum disulfide were obtained from Sigma-Aldrich, Czech Republic. Hexane was obtained from Lach-ner, Czech Republic. SEM and STEM images were acquired using a JEOL 7600F field-emission scanning electron microscope. Atomic force microscopy analysis was performed using Multimode 8 (Brukers, USA) under ScanAsyst mode. Optical micrographs were obtained with Nikon Eclipse 50i microscope. Video sequences captured by camera were processed with Nikon NIS-ElementsTM software.



Supplementary Figure S1. AFM image of Na-exfoliated MoS₂ flakes. Height profile along the yellow line is overlaid on the image.

SI video 1. Translational motion of a MoS₂ based motor in deionized water.

SI video 2. Rotational motion of a MoS₂ based motor in deionized water.

SI video 3. Control experiment using lithium intercalated MoS₂ prepared with t-butyl lithium as lithiation agent.

SI video 4. Motion of an acetylnaphthalene particle in deionized water.

SI video 5. Motion of a dihydroxynaphthalene particle in deionized water.