Electronic Supplementary Information (ESI)

Tadpole-like artificial micromotor

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Experimental Section

Fabrication of the tadpole-like structure: Schematic illustration of the preparation process is given in Fig. S1. Polycaprolactone (PCL, Mn=80000, J&K Scientific Ltd.) is dissolved in dichloromethane at a mass fraction of 6 wt%. Functional materials, such as Rhodamine 6G (R6G, 2 mg/ml, Aldrich) or 20 nm Fe_3O_4 nanoparticles (Fe_3O_4NP, 99%, 5 mg/ml, Aladdin Reagent) can also be introduced during this process. The solution is then loaded to a syringe with 22 gauge needle and pumped at a constant rate of 5 mL/h through a syringe pump (Longer Pump Lspol-1A). The needle is connected to a high-voltage power supply, that is capable of generating direct current (DC) voltage of up to 50 kV and here is operated at 12.5 kV. The distance from the end of the needle to the collector is fixed at 10 cm. Platinum is sputtered onto the fabricated micromotors at room temperature in a desktop DC sputtering system. The working Ar pressure is kept at about 0.01 mbar. The total thickness of sputtered metal is about 2.5 nm, as indicated by quartz crystal microbalance (QCM) in the sputtering machine.

Equipments: Leica DM4000M fluorescence microscope is utilized to obtain fluorescence images. Scanning electron microscope (SEM) Quanta 200 FEG (FEI Company) is used for studying the morphology of the artificial tadpole. The deposition of platinum on the surface of micromotor is carried out on a Quorum Technologies Q150TS DC sputtering system. For micromotor study, the tadpole-like structure is placed in H_2O_2 aqueous solution (30%). The motion of the micromotor is studied and recorded using a Nikon Eclipse 80i microscope. The in-situ heating experiment to partially dissolve the artificial tadpole is performed on a DB-H heating stage (Lankai company). Magnetic control experiment was carried out by applying a neodymium (NdFeB) magnet 5 cm far from the sample. PhysVis software is utilized to analyze the captured video and acquire the trajectory of the moving micromotors.

Video S1 The autonomous motion of the fabricated artificial tadpoles in H_2O_2 aqueous solution at 22 °C.

Video S2 The autonomous motion of a similar structure without the tail part in H_2O_2 aqueous solution at 22 °C.

Video S3 The thermo-responsibility of a tadpole-like micromotor at 40 °C temperature after (a) 2 mins (b) 10 mins, respectively. The tail part that falls off the tadpole-like structure is indicated in (b) by an arrow.

Video S4 The remote control of the tadpole-like micromotor under an external magnetic field.

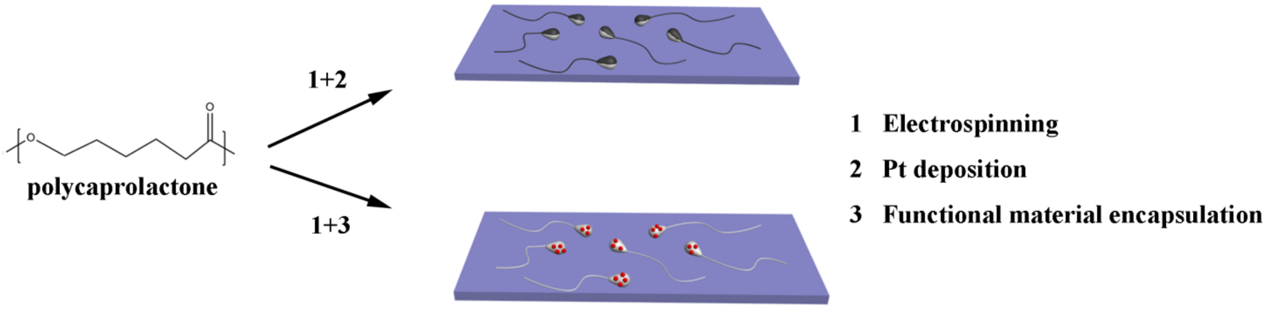

Fig. S1 Schematic illustration of the fabrication process of the artificial tadpoles.

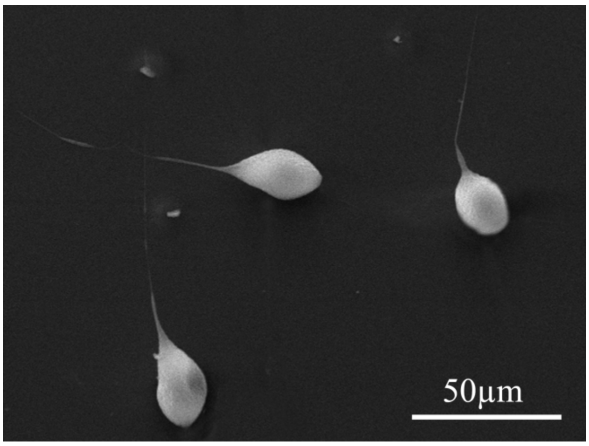

Fig. S2 SEM image of the fabricated tadpole-like structure.

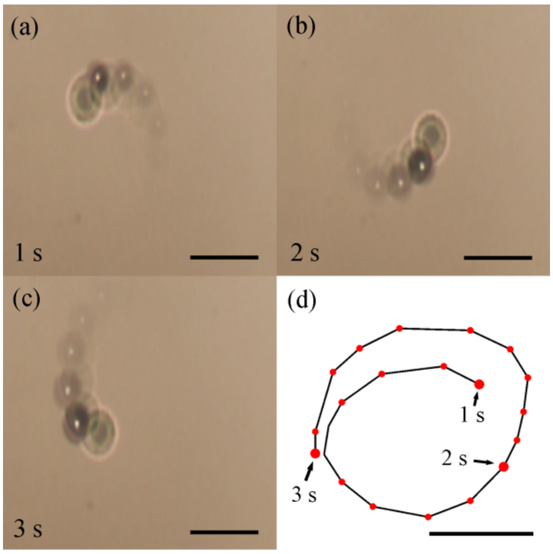

Fig. S3 (a-c) Optical microscopic images showing a similar micromotor without the tail part in H_2O_2 aqueous solution captured from Video S2 (ESI†) at 1 s interval. (d) Trajectory of this micromotor. Scale bar: 50 μm.