

## Electronic Supplementary Information (ESI)

### ESI Videos

**ESI Video 1** Movement of Au-Fe/Ni nanomotors in a solution containing 10.0 wt% H<sub>2</sub>O<sub>2</sub> and 0.03 wt% N<sub>2</sub>H<sub>4</sub>. The highest velocity is up to 850 μm/s. This video is repeated for 3 times.

**ESI Video 2** Rectilinear motion of the Au-Fe/Ni nanomotors in a solution containing H<sub>2</sub>O<sub>2</sub> and N<sub>2</sub>H<sub>4</sub>.

**ESI Video 3** Rotary motion of the Au-Fe/Ni nanomotors in a solution containing H<sub>2</sub>O<sub>2</sub> and N<sub>2</sub>H<sub>4</sub>.

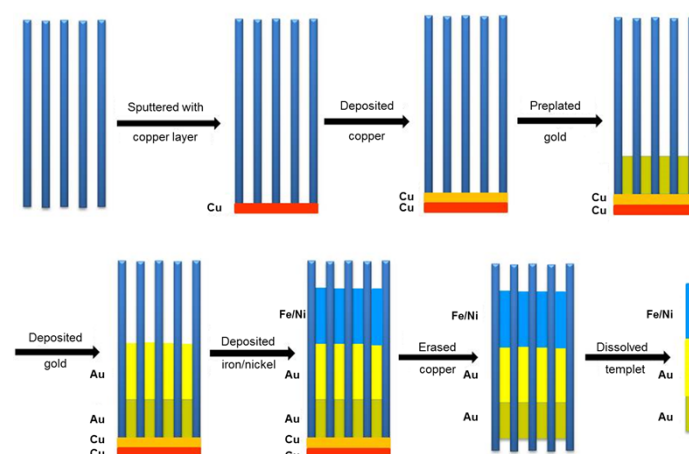
**ESI Video 4** Motion of the Au-Fe/Ni nanomotors with rectilinear and rotary forms alternately in a solution containing H<sub>2</sub>O<sub>2</sub> and N<sub>2</sub>H<sub>4</sub>.

**ESI Video 5** Movement of the Au-Fe/Ni nanomotors controlled by an external magnetic field.

**ESI Video 6** Movement of the Au-Fe/Ni nanomotors controlled by fuel (containing H<sub>2</sub>O<sub>2</sub> and N<sub>2</sub>H<sub>4</sub>) and an external magnetic field.

**ESI Video 7** Rotary motion of a single Au-Fe/Ni nanomotors in a solution containing H<sub>2</sub>O<sub>2</sub> and N<sub>2</sub>H<sub>4</sub>.

## ESI Figures



ESI Fig. 1 Fabricating steps of Au-Fe/Ni nanomotors