

### Supplementary movies

#### Breathing to Harvest Energy Mechanism towards Making Liquid Metal Beating Heart

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**Movie 1: Beating heart behaviors of liquid GaIn alloy droplet.** The liquid metal with 0.4 mL was located in glass dish filled with NaOH solution (0.5 M). Top part of the liquid metal droplet was exposed to the ambient air. At the early and terminal stage, the interfacial surface of the solution experienced an adjusting period by means of rotating around the droplet. During the steady state phase, the solution near the interfacial surface kept oscillating periodically.

**Movie 2: Side view of the beating heart system.** The videos of the oscillation from two different angles were recorded.

**Movie 3: Nylon fragments moving in the beating heart system.** Several nylon fragments were randomly put into the beating heart system to trace the motion of the solution.

**Movie 4: Fluorescent particles (1.84  $\mu\text{m}$ ) tracing the flow direction of solution.** Fluorescent particles were dispersed into the NaOH solution. They fluctuated with the oscillation of the interfacial surface.

**Movie 5: The beating heart system under oxygen free environment.** The experiment was carried out in argon gas atmosphere.