Supporting Information

Supporting Information S1: Physical properties of EGaIn.

Table S1. Physical properties of EGaIn

Material	EGaIn
Melting point (℃)	15.5
Density (kg/m^3)	6280
Electricity conductivity (S/m)	3.4×10^6
Viscosity (Pa · s)	2.0×10^{-3}
Surface tension (N/m)	0.624

Supporting Information S2: Morphology of different sizes of FCLM droplets and calculation on thickness of each layer of the FCLM droplet.

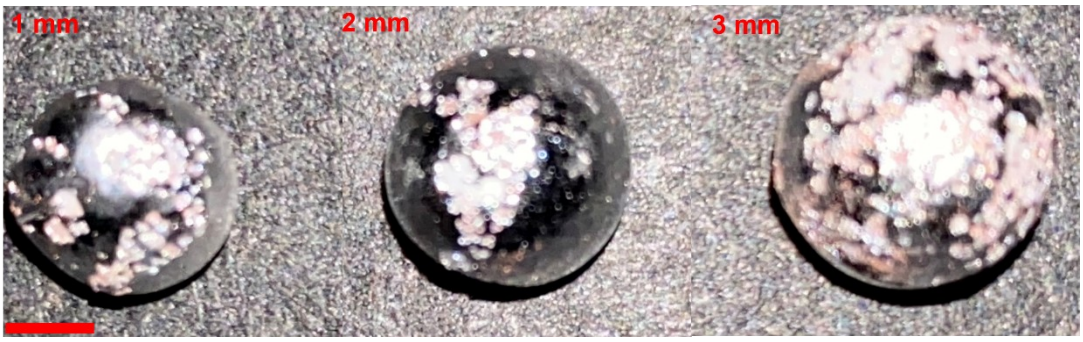

Figure S1. Different sizes of FCLM droplets. (Radius of foam core: 1, 2, 3mm, from left to right) Scale bar is 1 mm.

The thickness of EGaIn layer and glue-Cu layer can be calculated by the following formula:

$$\rho_{foam}\frac{4}{3}\pi r_{foam}^{3} + \rho_{glue-Cu}\frac{4}{3}\pi[(r_{foam}+t_1)^3 - r_{foam}^{3}] + \rho_{EGaIn}\frac{4}{3}\pi[(r_{foam}+t_1+t_2)^3 - (r_{foam}+t_1)^3] = m_{FCLM}$$

where ρ_{foam}, $\rho_{glue-Cu}$, ρ_{EGaIn} are the density of the foam core, glue and Cu, EGaIn, respectively. r_{foam}, t_1, t_2 are the radius and thickness of foam core, glue and Cu, EGaIn, respectively.

Supporting Information S3: Morphology of the FCLM droplet cross section.

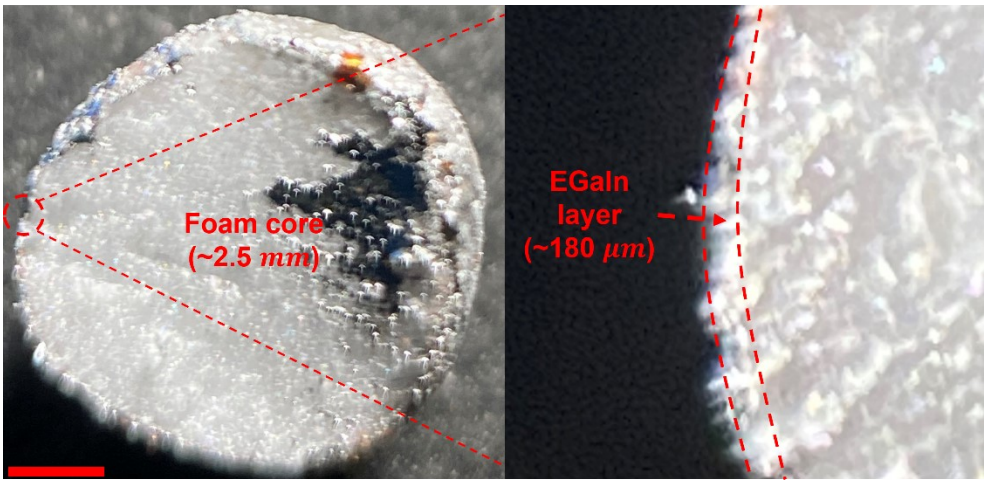

Figure S2. Morphology of the FCLM droplet cross section. The scale bar is 1 mm.

To measure the thickness of EGaIn layer and its oxidation, we exhibit the morphology of the FCLM droplet cross section, as shown in Fig. S2. The thickness of EGaIn layer is about 180 μm, and the thickness of the oxidation layer is only about 0.01% of the EGaIn layer, which is about 1-5 nm.[43]

Supporting Information S4: Diagram of experiment.

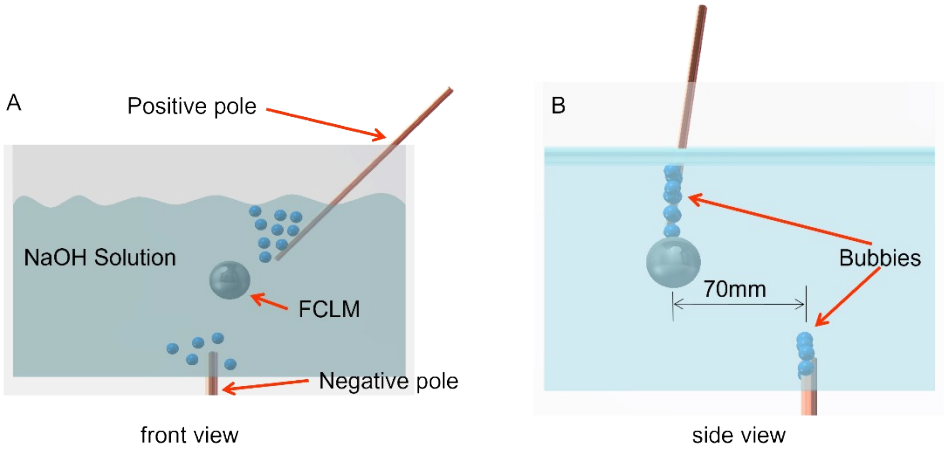

Figure S3. Diagram of experiment

Bubbles occur nearby the negative pole, which keeps a relatively long distance (70mm) from the FCLM droplet, it has no effect on the motion of the FCLM droplet.

Supporting Information S5: Method of lighting in the experiment.

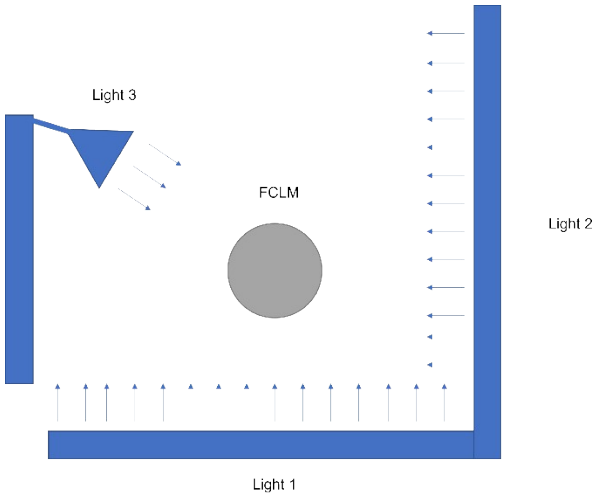

Figure S4. Method of lighting in the experiment

Supporting Information S6: Assembly of three FCLM droplets. (Preparation of pyramid)

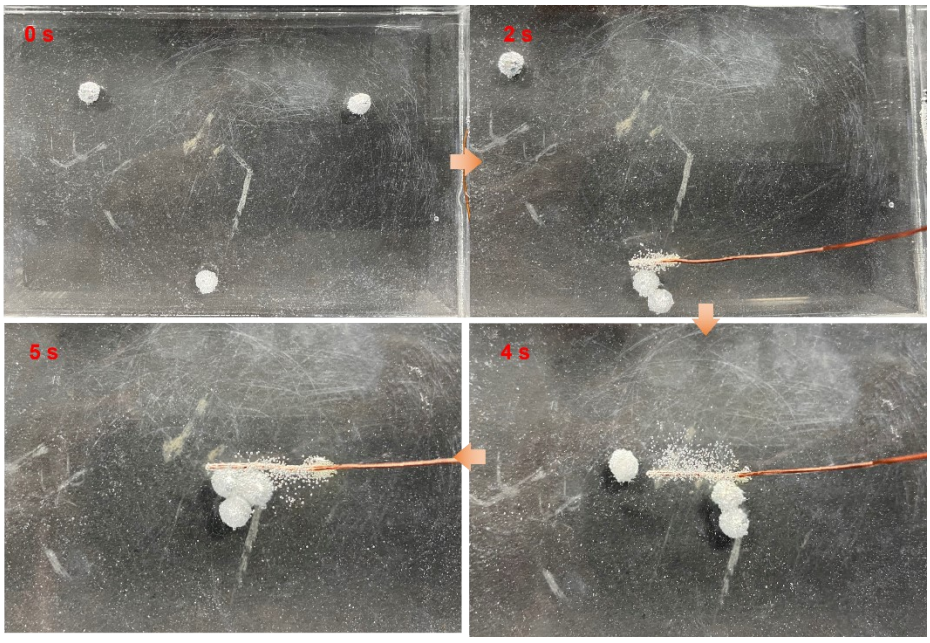

Figure S5. Top view of the assembly of three FCLM droplets to form an integrated

array

Supporting Information S7: The automatic actuation of the FCLM droplet.

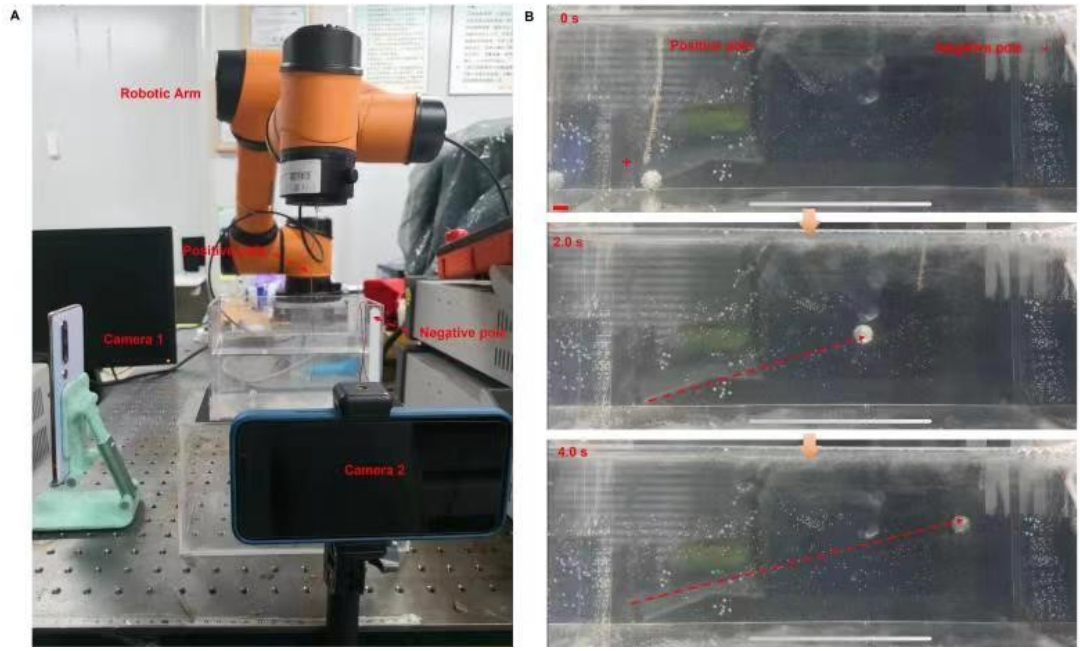

Figure S6. Snapshots showing the automatic actuation of an FCLM droplet in NaOH solution. (A) Image of the experimental setup. (B) The FCLM droplet moves along the diagonal line following the robotic arm. Scale bar is 5mm.