Electronic Supplementary Information

Supporting information is included as follows:

Supporting Movie Legends

Supporting Figures

Movie S1: the LM droplet (with volume of 0.7mL) deformation and locomotion on the Cu foil (with size of 20μm×10mm×90mm) surface toward the cathode driven by 10V DC between two electrodes

Movie S2: The LM droplet locomotion on the Cu surface for the two cases, i.e. the case of the both cathode and anode placing in the NaOH, and another case of the cathode contacting with the Cu substrate, both by 10V DC.

Movie S3: The LM droplet locomotion on the surface of porous Cu with length of 90mm and its inward in the NaOH solution under voltage of 12V DC, as well as the impact of different thicknesses of porous Cu on the locomotion.

Movie S4: The LM droplet locomotion on the surface of porous Cu and its inward in the NaOH solution under different voltages.

Movie S5: The cathode placed in the NaOH solution or LM droplet cannot induce the locomotion of the LM droplet in the porous Cu.

Movie S6: The fast and simple method has been demonstrated to imprint $CuGa_2$ on the surface of Cu.

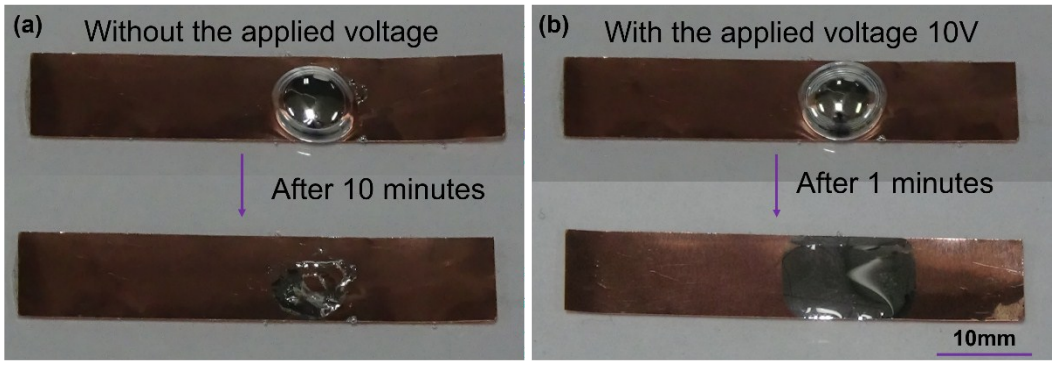

Figure S1 The imprinting effects of the LM on Cu surface without (a) and with (b) the applied voltage.

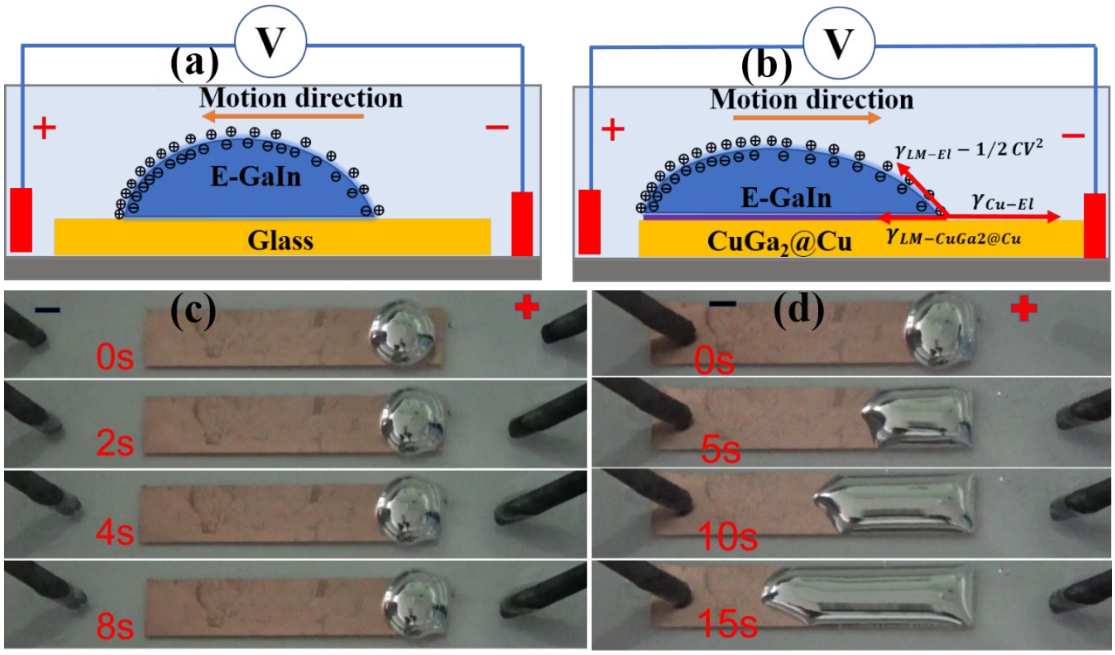

Figure S2 Schematic diagram of the voltage induced locomotion of the LM droplet for two cases of the both cathode and anode placing in the NaOH for (a) and (c), and the case of the cathode contacting with the Cu substrate for (b) and (d). the applies voltage is 10V DC.

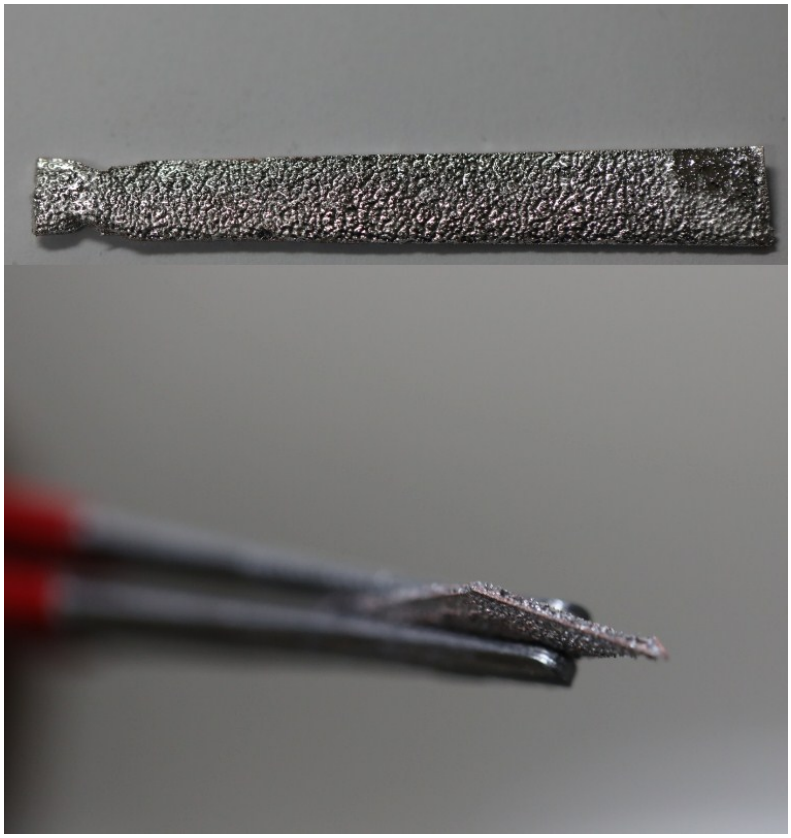

Figure S3 Digital images of the sloping section of Cu porous strip (2mm thickness) perfused with the LM through the vacuum filling method with vacuum degree 133Pa.

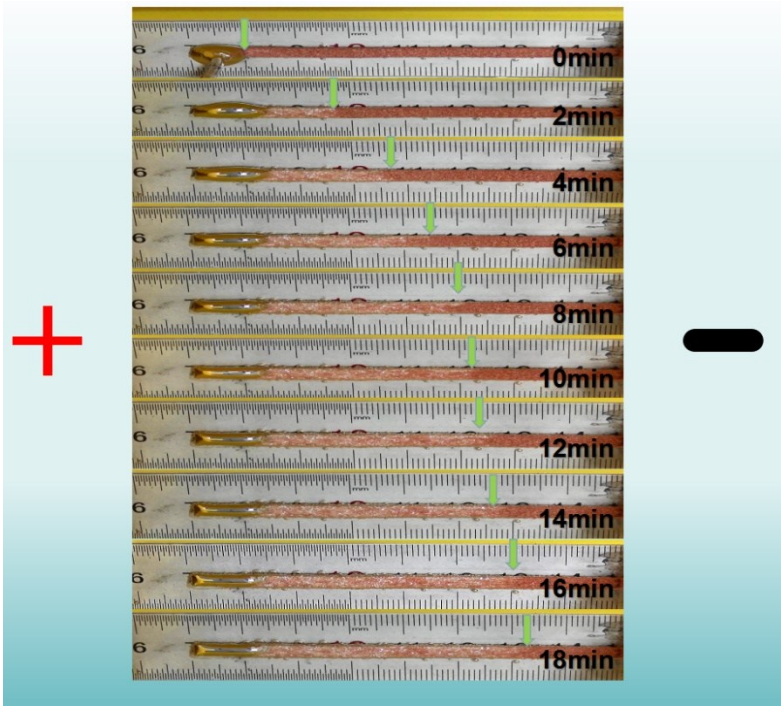

Figure S4 Sequential snapshots for LM droplet locomotion on the surface of porous Cu ($2mm \times$ 4mm $\times$ 90mm) and its inward in the NaOH solution under voltage of 4V DC