Electronic Supplementary Information (ESI)

Origami Paper-Based Fluidic Batteries for Portable Self-Powered Electrophoretic Devices

Sung-Sheng Chen,[a] Chih-Wei Hu,[b] I-Fan Yu,[a] Ying-Chih Liao,[b,*] Jing-Tang Yang[a,*]

[1]Department of Mechanical Engineering, National Taiwan University, No. 1, Sec. 4, Roosevelt Road, Taipei, 10617 Taiwan(R.O.C.) [2]Department of Chemical Engineering, National Taiwan University. No. 1, Sec. 4, Roosevelt Road, Taipei, 10617 Taiwan(R.O.C.) E-mail: jtyang@ntu.edu.tw

Contents:

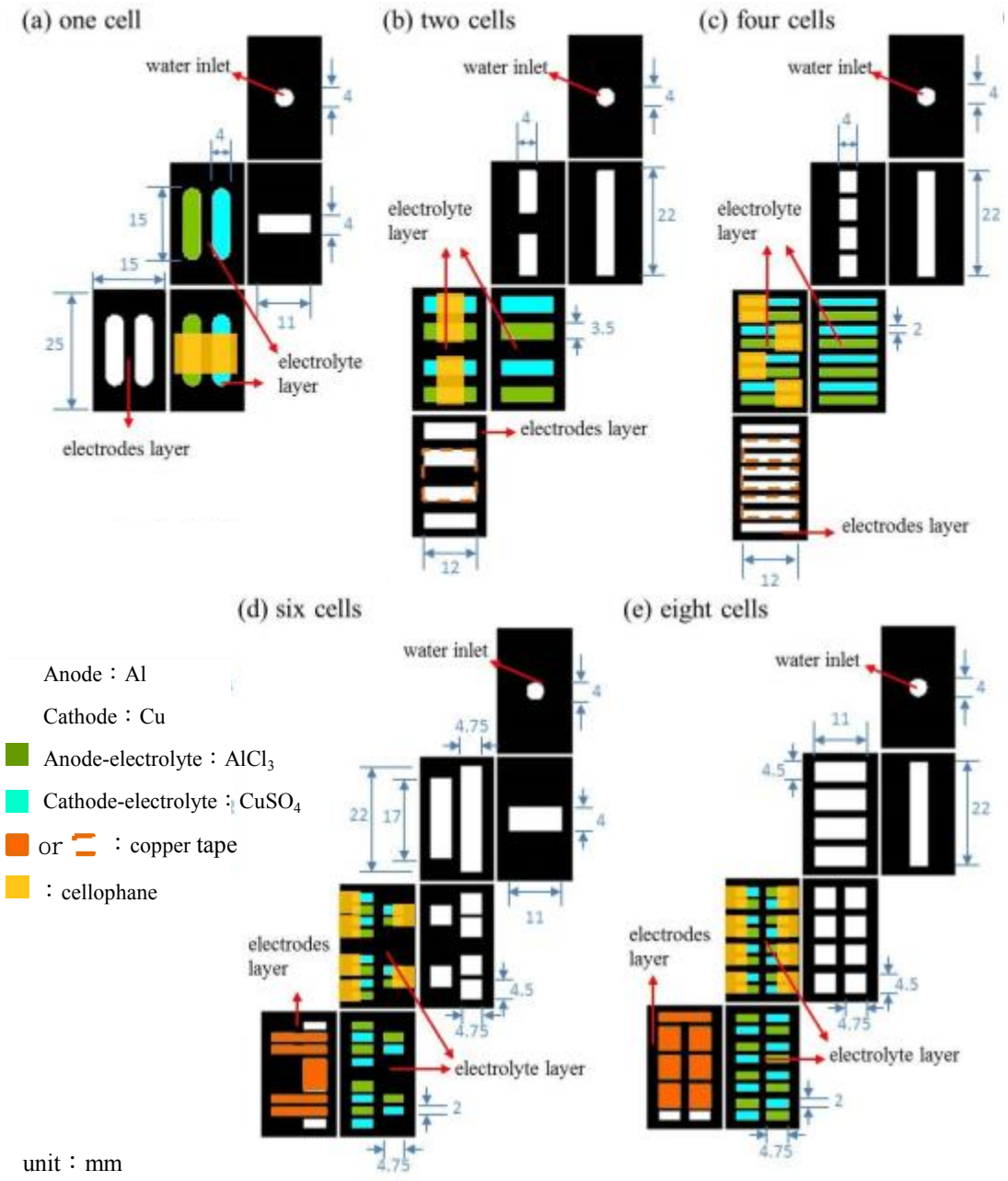

Fig. S1 2D layouts of 3-D fluidic batteries: (a) single cell, (b) two cells in series, (c) four cells in series, (d) six cells in series, and (e) eight cells in series.

Table 1. Amounts of salts and sizes of attached films used in fluidic batteries.

	1-cell	**2-cell**	**4-cell**	**6-cell**	**8-cell**
$CuSO_4$	10 μL	5 μL×2	2 μL×4	1 μL×6	1 μL×8
$AlCl_3$	10 μL	5 μL×2	2 μL×4	1 μL×6	1 μL×8
Cellophane film	10×15 mm^2	5×10 mm^2	5×5 mm^2	5×5 mm^2	5×5 mm^2
Copper electrode	4×25 mm^2	4×25 mm^2	2×25 mm^2	2×15 mm^2 1×5 mm^2	5×5 mm^2 1×5 mm^2
Aluminum electrode	4×25 mm^2	4×25 mm^2	2×25 mm^2	2×15 mm^2 1×5 mm^2	5×5 mm^2 1×5 mm^2

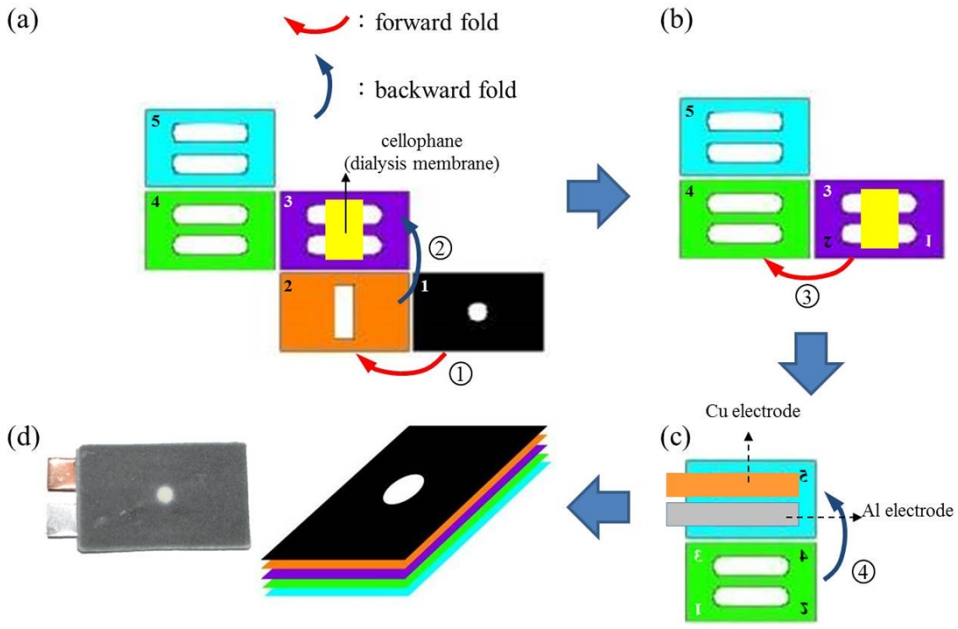

Fig. S2 Origami folding sequence of the single-cell fluidic battery shown in Fig. S1(a).

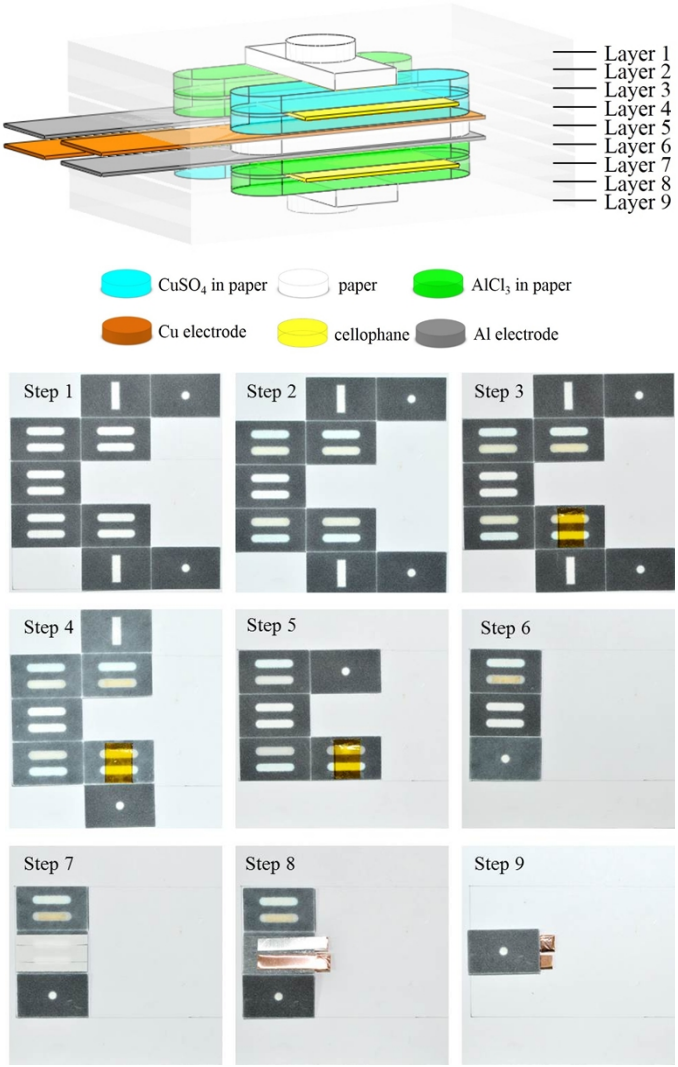

Fig. S3 3-D oblique view and the folding sequence of a battery with two single cells in series. The design of each cell is basically the same as that of a single cell (Fig. S1 (a)). A pair of mirror images was printed and folded into a battery with two single cells in series.

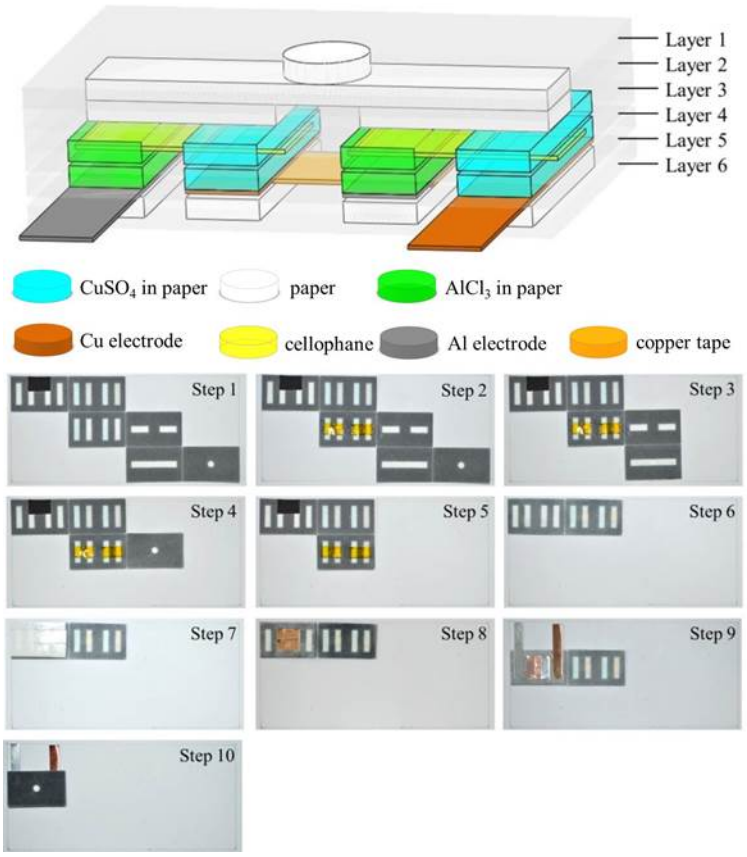

Fig. S4 3-D oblique view of the two-cell fluidic battery in Fig. 1(b) and its folding process by origami technique.

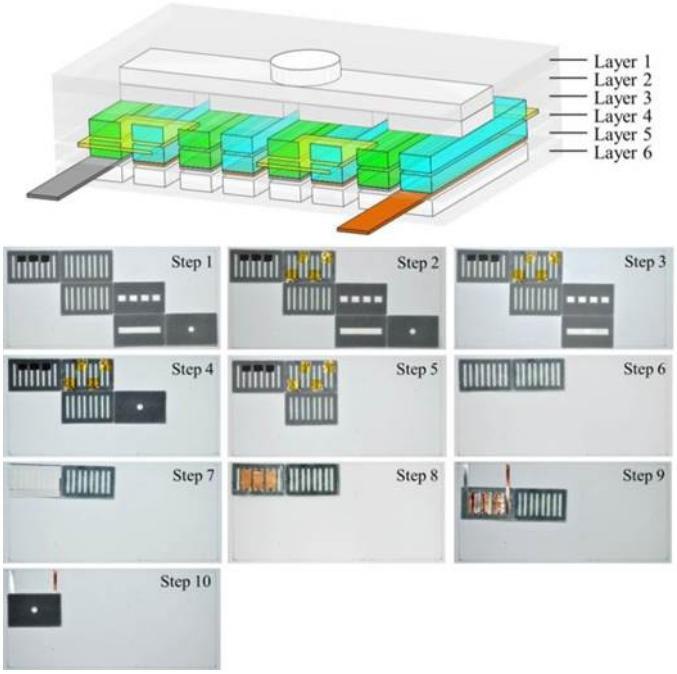

Fig. S5 3-D oblique view of the four-cell fluidic battery in Fig. 1(c) and its folding process by origami technique.

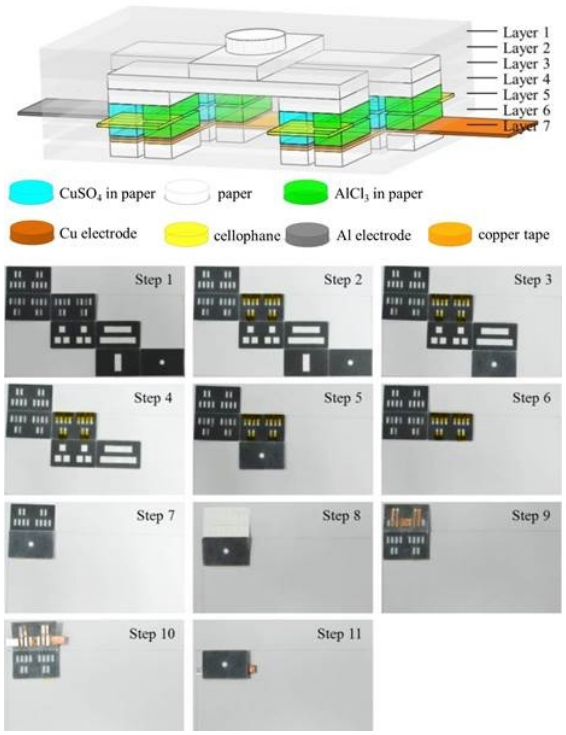

Fig. S6 3-D oblique view of the six-cell fluidic battery in Fig. 1(d) and its folding process by origami technique.

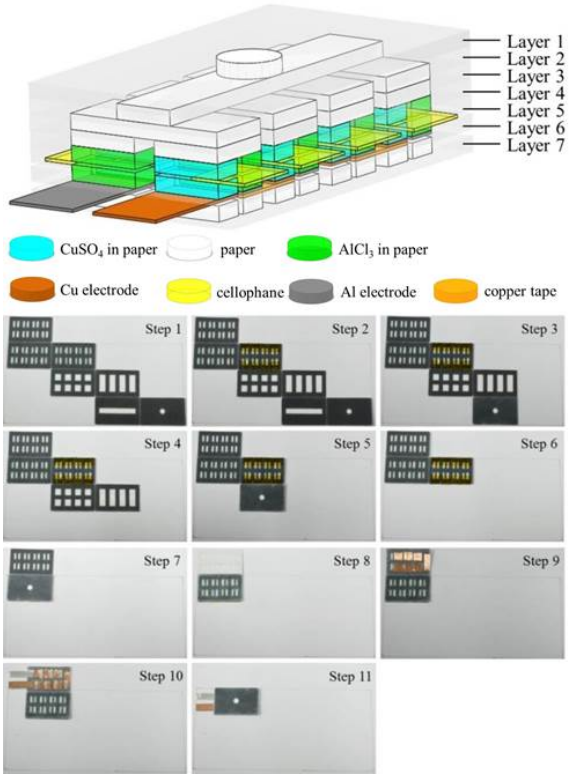

Fig. S7 3-D oblique view of the eight-cell fluidic battery in Fig. 1(e) and its folding process by origami technique.

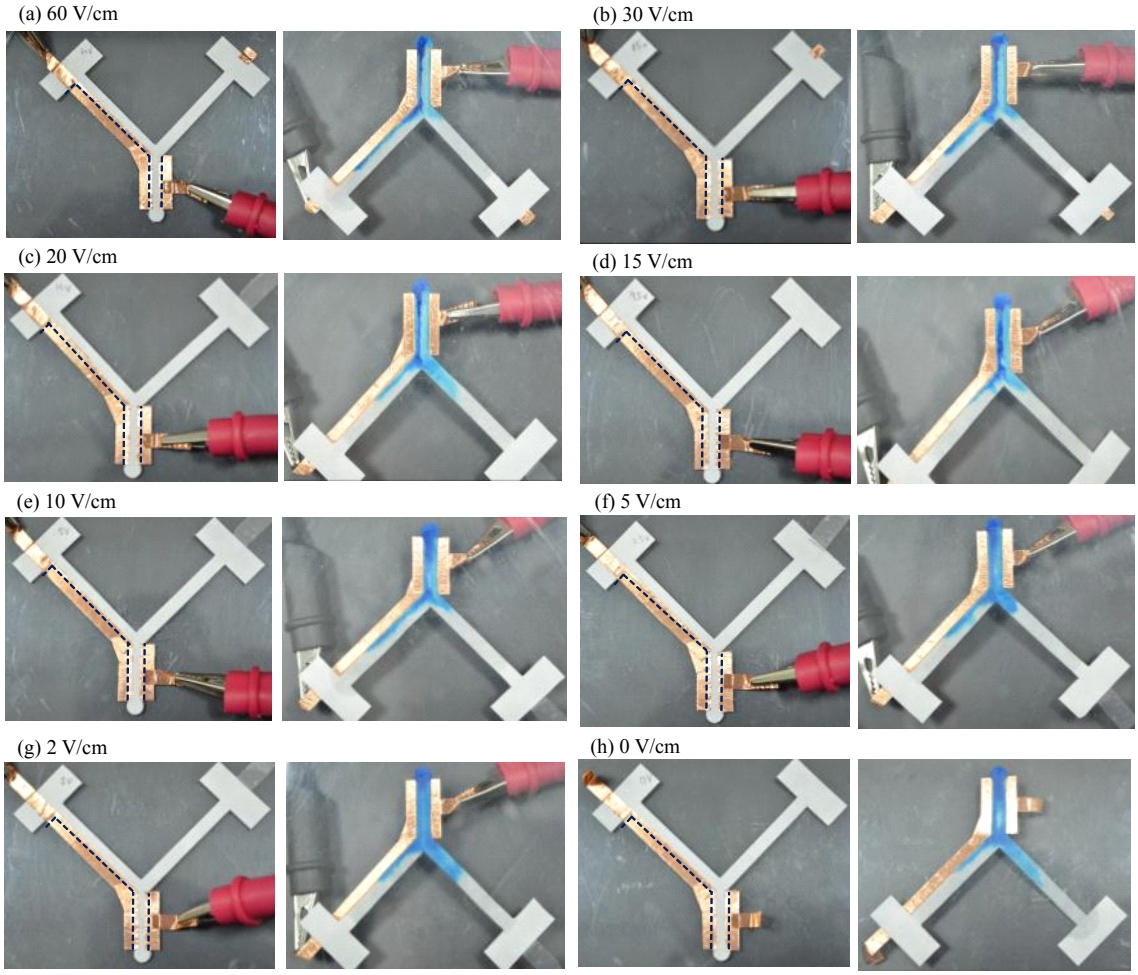

Fig. S8 The electrophoretic effects on separating methylene blue (MB) solution in paper-cut Y-channels were demonstrated with a regular external power supply to provide controllable electric field intensity. 20 μL MB solution was dripped in the circular reservoir at the bottom. The electric field (indicated above the figure) drives the anionic MB molecules moving toward the cathode. As the electric field is larger than 30 V/cm, solute enrichment is fairly obvious and MB flows into one of the branching channels only. The total time to wet the channels is about 5 minutes.

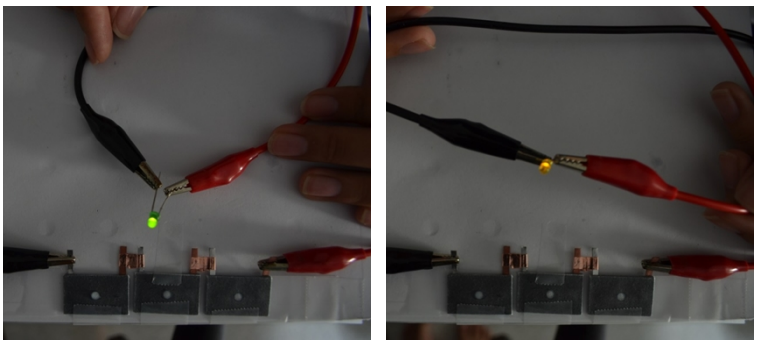

Fig. S9 After performing the electrophoresis experiment for 5 times, the batteries still can light regular LEDs (purchased from a local electronic accessory store) for more than two hours.