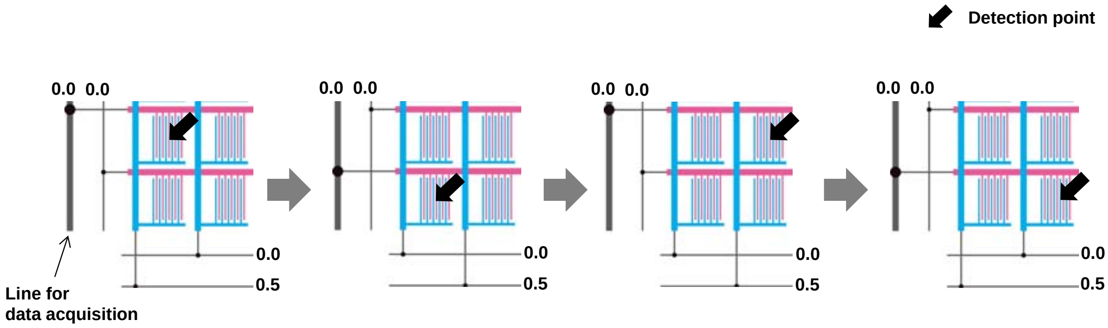
Supporting Information

Movie 1

Movie of electrochemical imaging of water droplets containing $FcCH_2OH$ during evaporation (as shown in Fig. 3). The movie is shown at a speed 200-fold faster than reality.

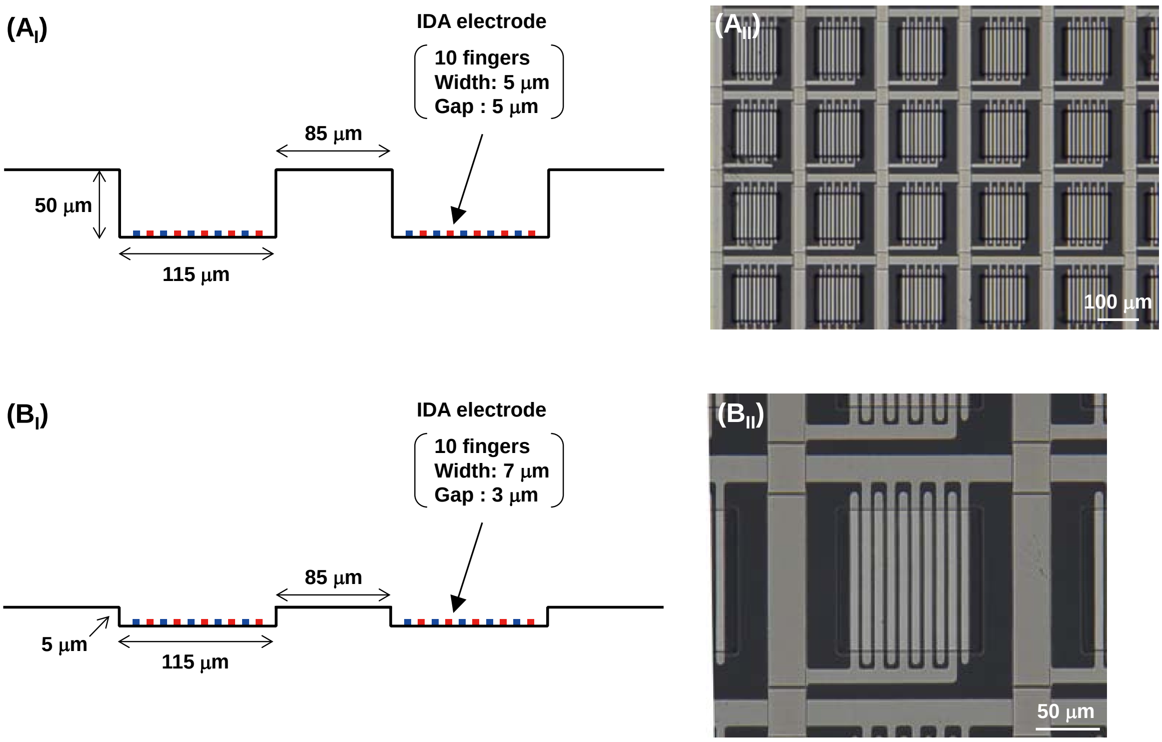
Movie 2

Movie of electrochemical imaging of water droplets containing $FcCH_2OH$ after covering the water droplets with a mineral oil (as shown in Fig. 4). The movie is shown at a speed 177-fold faster than reality.



Supporting Figure 1

Scanning process for the detection of $FcCH_2OH$. This figure shows the procedure used to detect electrochemical responses at the 2×2 crossing points. The row electrodes are used for voltage control and data acquisition, and the column electrodes are used only for voltage control. The block arrows indicate the detection point. All electrodes were held at 0.00 V. The first column electrode was then stepped from 0.00 to 0.50 V. The $FcCH_2OH$ was oxidized at the first column electrode and the oxidation product ($FcCH_2OH^+$) was reduced back to $FcCH_2OH$ at the row electrodes. After current stabilization was achieved, the reduction current at the first row electrode was acquired. After switching the electrodes with the multiplexer, the reduction current at the second row electrode was then acquired. After measuring responses at the first column electrode, the potential for the first column electrode was stepped back from 0.50 to 0.00 V, and the electrode for the second column electrode was stepped from 0.00 to 0.50 V. The electrochemical signals at the sensor points of the second column electrode are then sequentially acquired. After completing electrochemical detection, a 2D electrochemical image was constructed from the electrochemical signals. The scanning process was performed automatically using a LabVIEW program. Electrochemical detection was performed in a Faraday cage. For detection of alkaline phosphatase (ALP) activity on the EBs, *p*-aminophenyl phosphate (PAPP) was used as a substrate and -0.30 and 0.30 V were applied instead of 0.00 and 0.50 V, respectively.[1, 2]



Supporting Figure 2

Optical image of LRC-EC chip devices with (A) deep microwells and (B) shallow microwells. Illustrations (A_I and B_I) and top view images (A_{II} and B_{II}) are shown.

References

1. K. Ino, T. Nishijo, T. Arai, Y. Kanno, Y. Takahashi, H. Shiku, T. Matsue, *Angew. Chem. Int. Ed. Engl.*, in press.
2. K. Ino, W. Saito, M. Koide, T. Umemura, H. Shiku, T. Matsue, *Lab Chip*, 2011, **11**, 385.