Electronic Supplementary Material (ESI) for Lab on a Chip.

Supporting Information

Steering Liquid Metal Flow in Microchannels using Low Voltages

Shi-Yang Tang[a], Yiliang Lin[b], Ishan D. Joshipura[b],

Khashayar Khoshmanesh[*a], Michael D. Dickey[*b]

[a]School of Electrical and Computer Engineering, RMIT University, Melbourne, Australia

[b]Department of Chemical and Biomolecular Engineering, North Carolina State University, USA

Corresponding Authors:

Michael D. Dickey: mddickey@ncsu.edu

Khashayar Khoshmanesh: khashayar.khoshmanesh@rmit.edu.au

Supporting Information S1: Formation of liquid metal microdroplets at the entrance of the outlet reservoir.

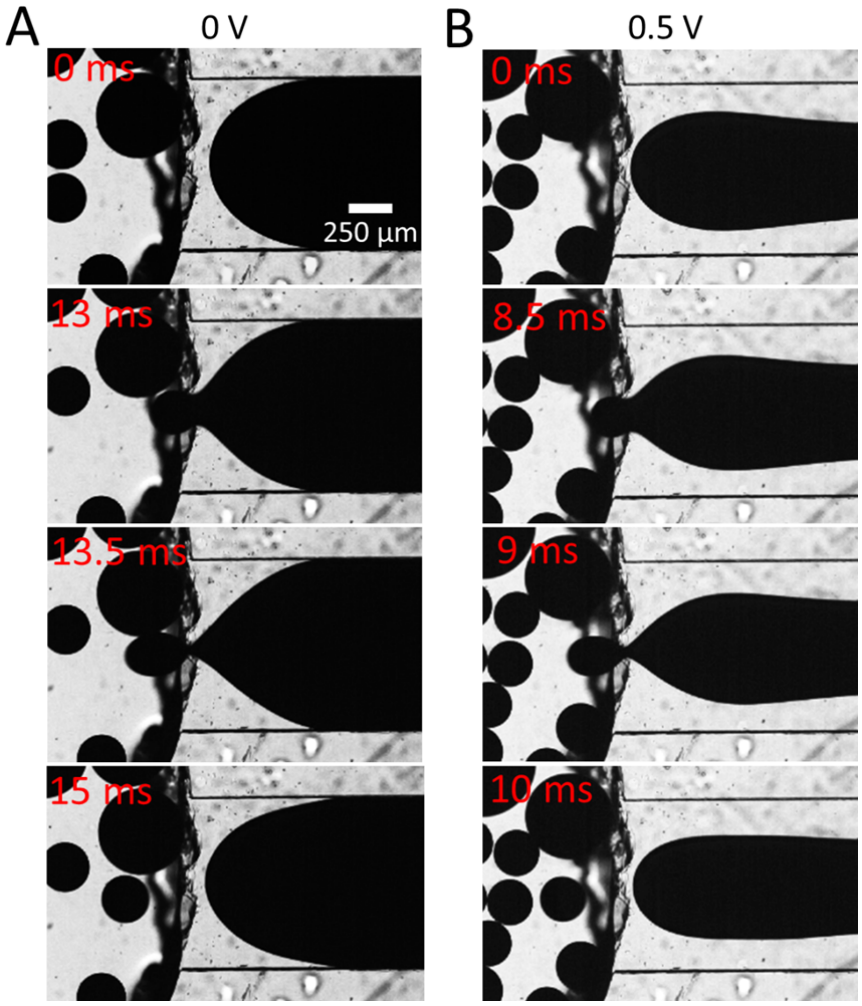

Figure S1. Formation of EGaIn microdroplets. Sequential snapshots for the formation of EGaIn microdroplets at the entrance of the outlet reservoir (A) before and (B) after a 0.5 V potential is applied (see Movie S1). The liquid metal is connected to the cathode and the flow rate of liquid metal is set at 40 µL/min. The diameter of the EGaIn microdroplet is approxmiately 250 µm.

Supporting Information S2: Design of the cascaded T-junction channel.

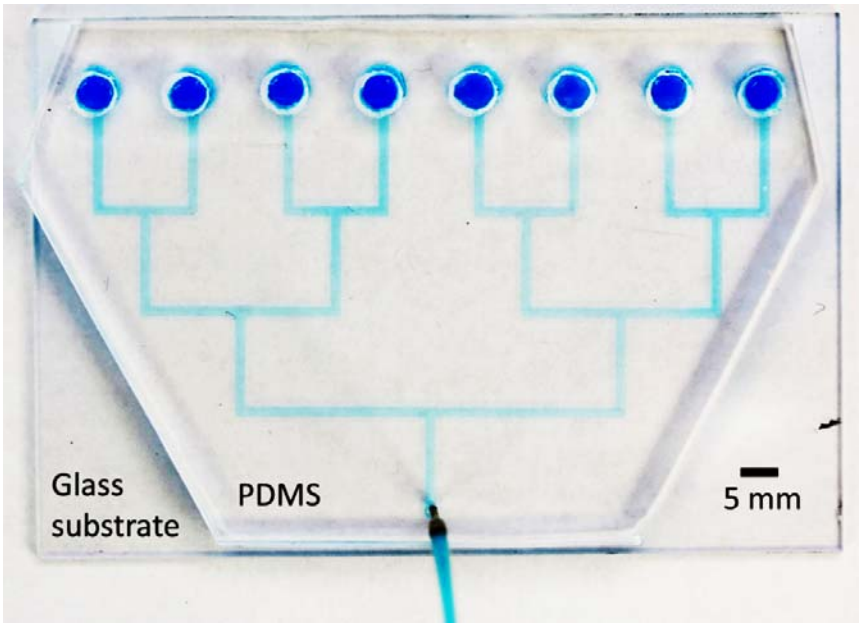

Figure S2. Top view of the cascaded T-junction channel. The microchannel is fabricated using PDMS and bonded to a glass substrate. The width and the height of the channel is 1000 and 75 μm, respectively. Here, the channels are filled with blue food coloring in water for visualization.

Supporting Information S3: Experiments conducted with NaF solution.

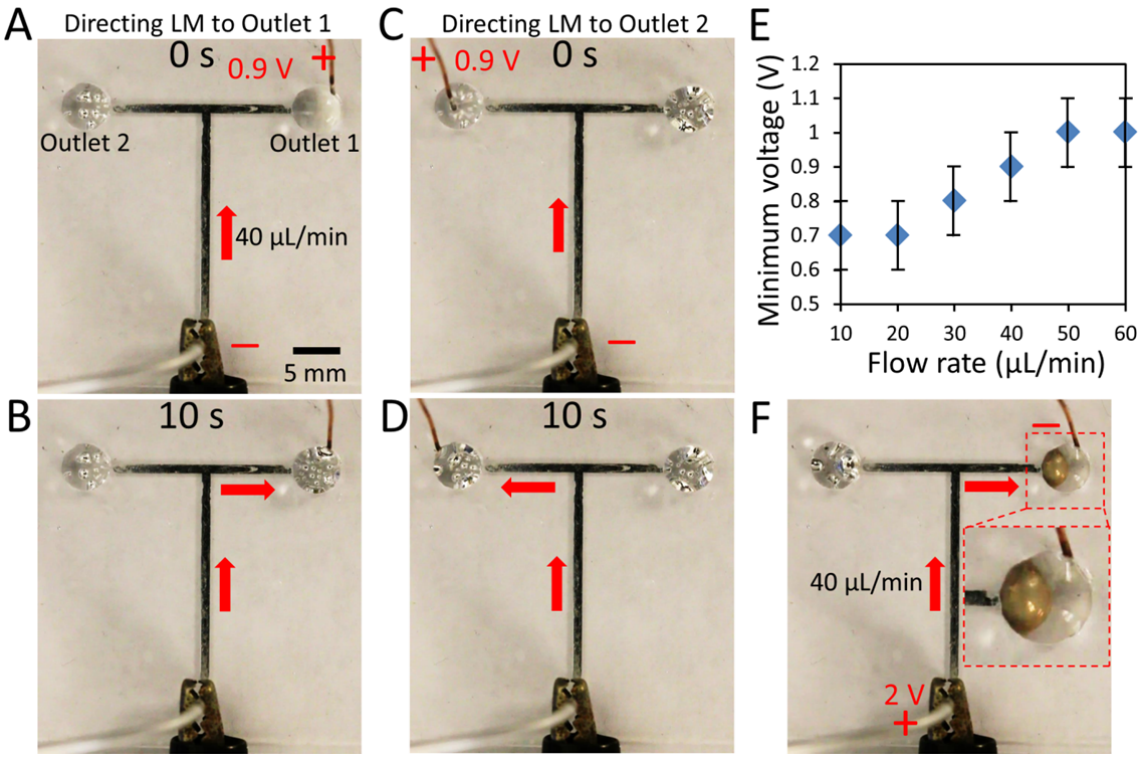

Figure S3. Directing the flow of liquid metal using NaF solution. Sequential snapshots for directing the flow of liquid metal using CEW towards (A-B) Outlet 1 and (C-D) Outlet 2, when a 0.9 V DC voltage is applied. (E) Plot for the minimum voltage required for directing the flow of liquid metal *vs* the flow rate of liquid metal. (F) Image for the experiment when the liquid metal is connected to the anode when a 2 V DC voltage is applied. The liquid metal spreads within Outlet 1 and is electrochemically oxidized, as evidenced by a color change on the surface of the metal, as shown in the magnified image in (F).