Electronic Supplementary Material (ESI) for Analyst.

Supplemental Information for:

Direct Embedding and Versatile Placement of Electrodes in 3D Printed Microfluidic-Devices

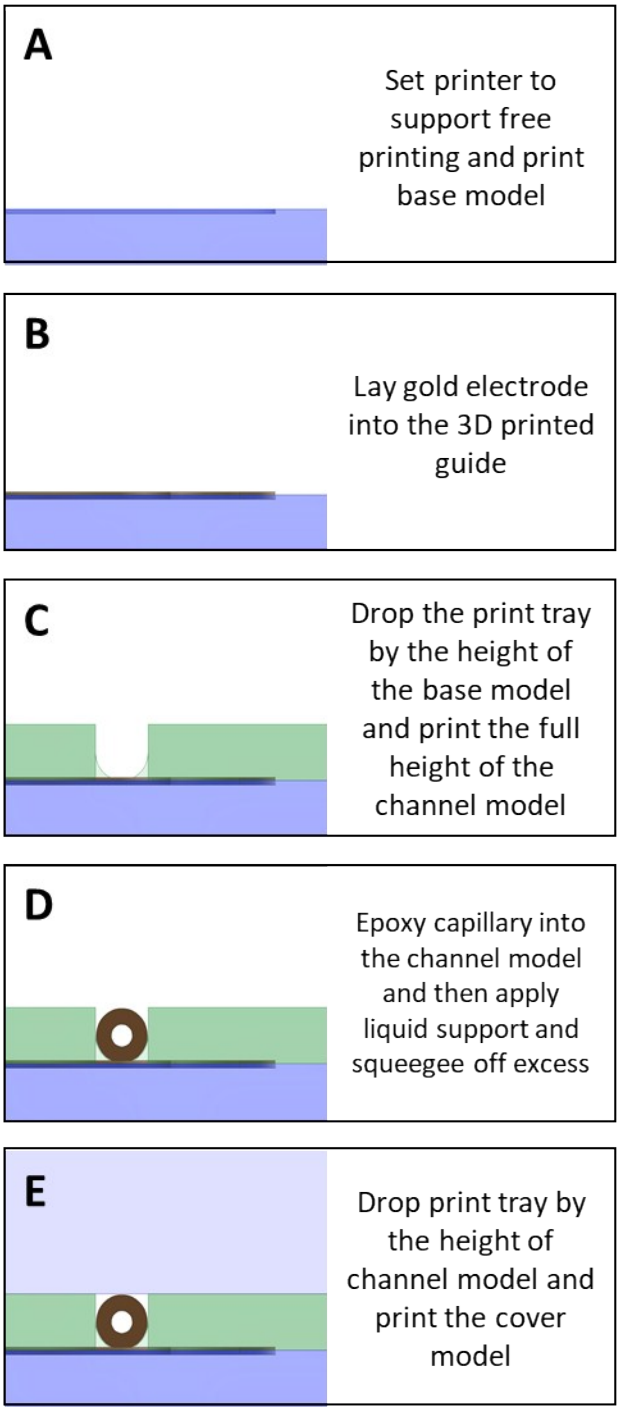

Figure S1. Step-by-step process of making a 3D printed device with an embedded gold electrode placed at the bottom of the channel. Left column contains cross-sectional CAD rendering of each step, and the right column has text explaining the process. In (A) the printer is set to print without a support pedestal and the base layer is printed. Before printing stops, a 30 µm recessed guide for the electrode is printed. In (B) the gold electrode is placed within the guide and the start position of the z-axis is dropped by the height of the print before starting the next part. (C) The channel layer is printed directly on top of the electrode and base layer. This seals the electrode into the printed plastic. (D) A small amount of 5 min two-part epoxy is used to coat a 360 um o.d. capillary before it is placed into the device. Then a mixture of glycerol and isopropanol (65:35 v:v) is applied to the channel and the excess is removed by a PDMS squeegee (this is the liquid support). (E) Finally, the z-axis start position is dropped by the height of the channel layer and the cover layer is printed directly on the previous layer sealing in the liquid support and the capillary. After printing, the liquid support is removed by flushing with isopropanol.

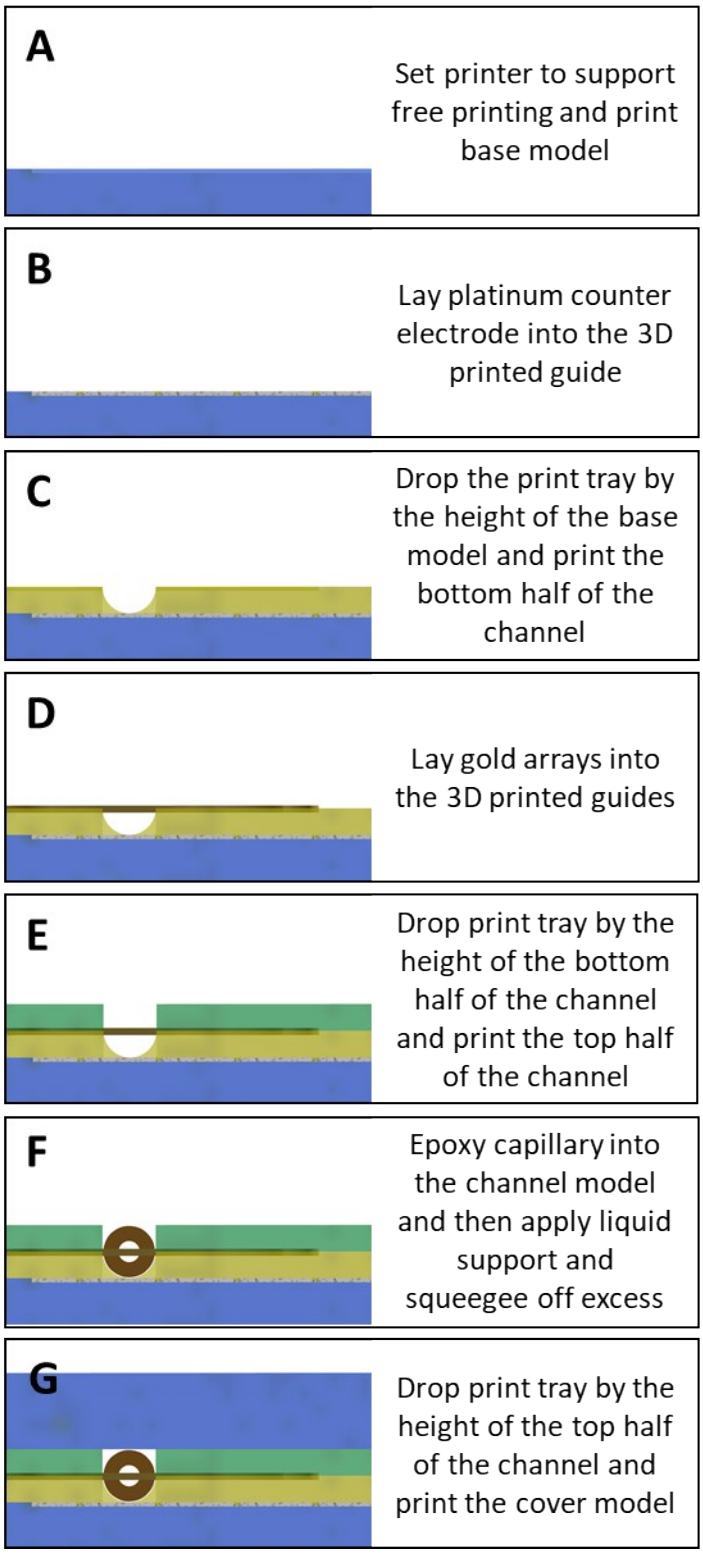

Figure S2. Step-by-step process of making a 3D printed generator-collector device with two embedded gold electrodes placed in the center of the channel and an embedded platinum electrode at the bottom of the channel. Left column contains cross-sectional CAD rendering of the of each step, and the right column has text explaining the process. In (A) the printer is set to print without a support pedestal and the base layer is printed. Before printing stops a 30 µm recessed guide for the electrode is printed. In (B) the platinum foil (3mm x 5mm) electrode is placed within the guide and the start position of the z-axis is dropped by the height of the base layer before starting the next part. (C) Half of the channel layer is printed directly on top of the electrode and base layer. This seals the electrode into the printed plastic. (D) The two gold arrays are placed into the device according the recessed guides. (E) The z-axis is dropped by the height of the first half of the channel layer and the second half of the channel is printed directly on top of the first. (F) A small amount of 5 min two-part epoxy is used to coat a 360 um o.d. capillary before it is placed into the device. Then a mixture of glycerol and isopropanol (65:35 v:v) is applied to the channel and the excess is removed by a PDMS squeegee (this is the liquid support). (G) Finally, the z-axis start position is dropped by the height of the channel layer and the cover layer is printed directly on the previous layer sealing in the liquid support and the capillary. After printing. the liquid support is removed by flushing with isopropanol.

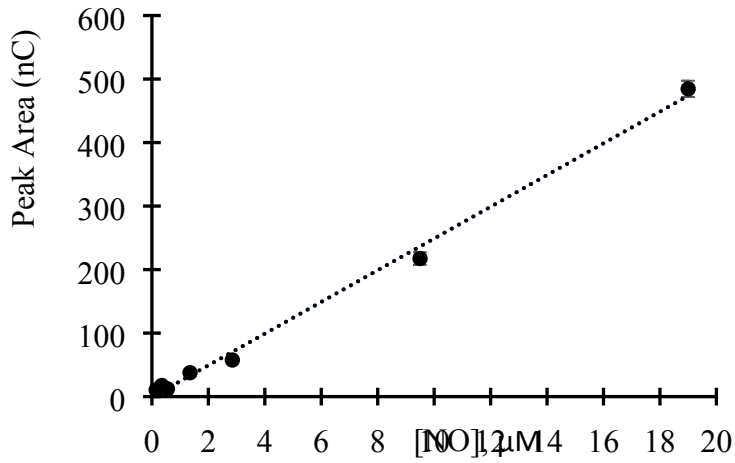

Figure S3. Calibration curve of nitric oxide using 5-post array placed in the middle of the channel (r^2 = 0.9956).