[Supplementary Information]

Direct measurement of extracellular electrical signals from mammalian olfactory sensory neurons in planar triode devices

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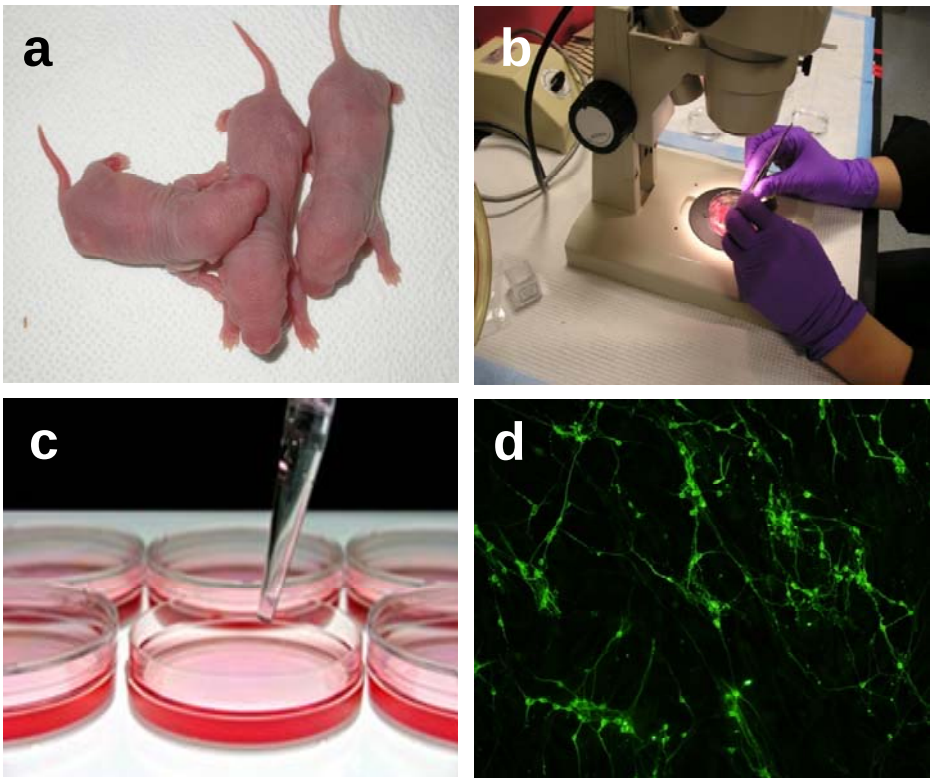

Figure S1. A procedure of olfactory sensory neuron (OSN) primary culture from rat pup nose was expressed. Postnatal rat pups **(a)** were used. After exposure of olfactory area **(b)**, olfactory epithelium was dissected and isolated OSNs were placed on the culture dish **(c)**. Immunofluorescent staining of OSNs with neuron specific tubulin (NST) antibody **(d)** was measured using by a fluorescence microscope.

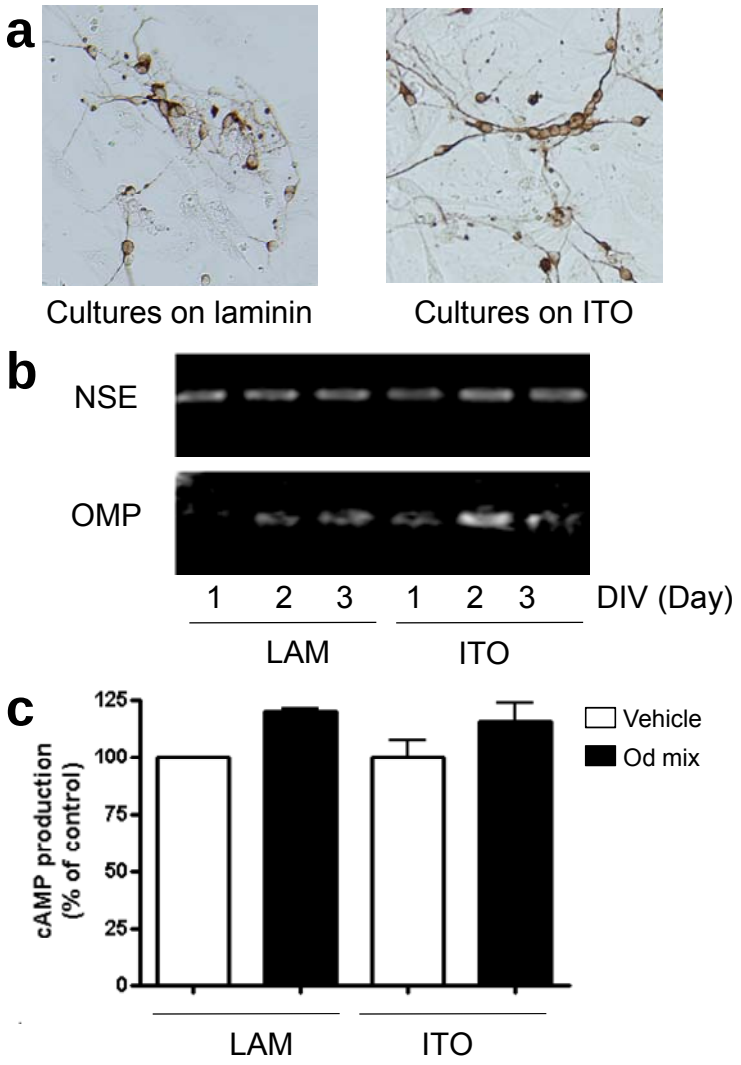

Figure S2. Comparison of cells cultured on the laminin coated plate (left) and the ITO-glass (right). **(a)** Immunohistochemical analysis. Cells were cultured on either laminin coated plates or ITO-glass for 3 days (DIV 3) and stained with TuJ1 (antibody against neuron specific tubulin). Cells under both conditions did not show any clear morphological differences. **(b)** OSN specific protein expression analysis. Cells were cultured on either laminin coated plates or ITO-glass up to 3 days. Protein expression was determined by RT-PCR. Cells under both conditions express a neuron specific protein, NSE (neuron specific enolase) and the OSN specific protein OMP (olfactory marker protein). **(c)** OSN specific functional analysis. Cells were cultured on either laminin coated plates or ITO-glass for 3 days and tested for cAMP production upon odorant (Od mix) stimulation. Cells under both conditions showed cAMP production upon odorant stimulation.

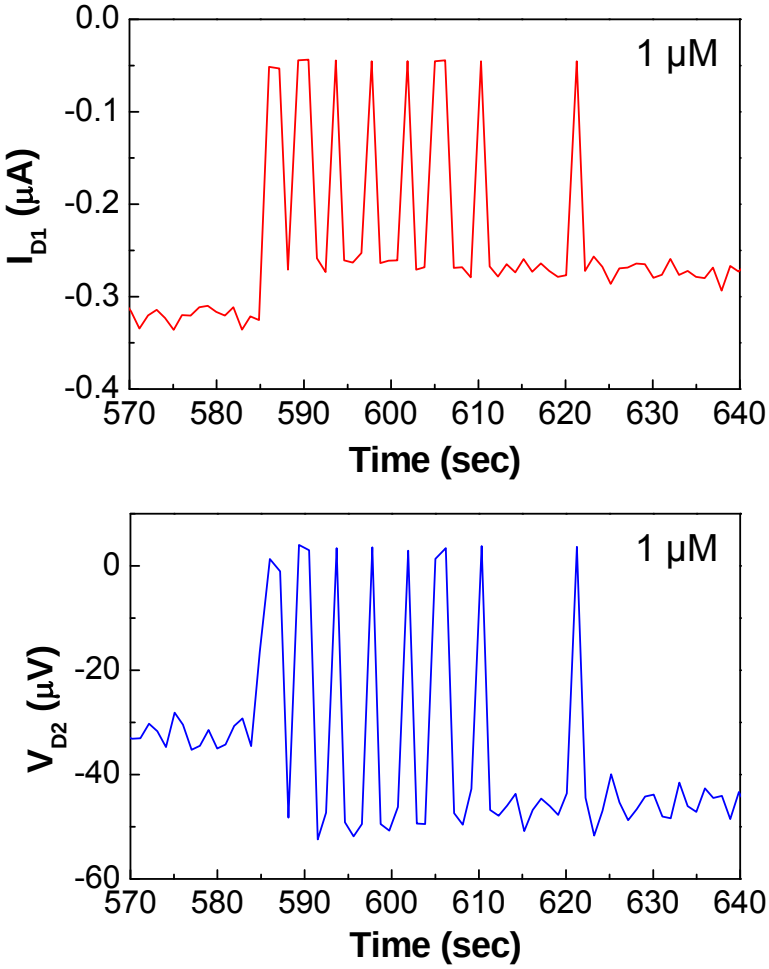

Figure S3. Enlarged D1 current (I_{D1}) and D2 voltage (V_{D2}) plot of the **1 μM** signal part in Fig. 3.

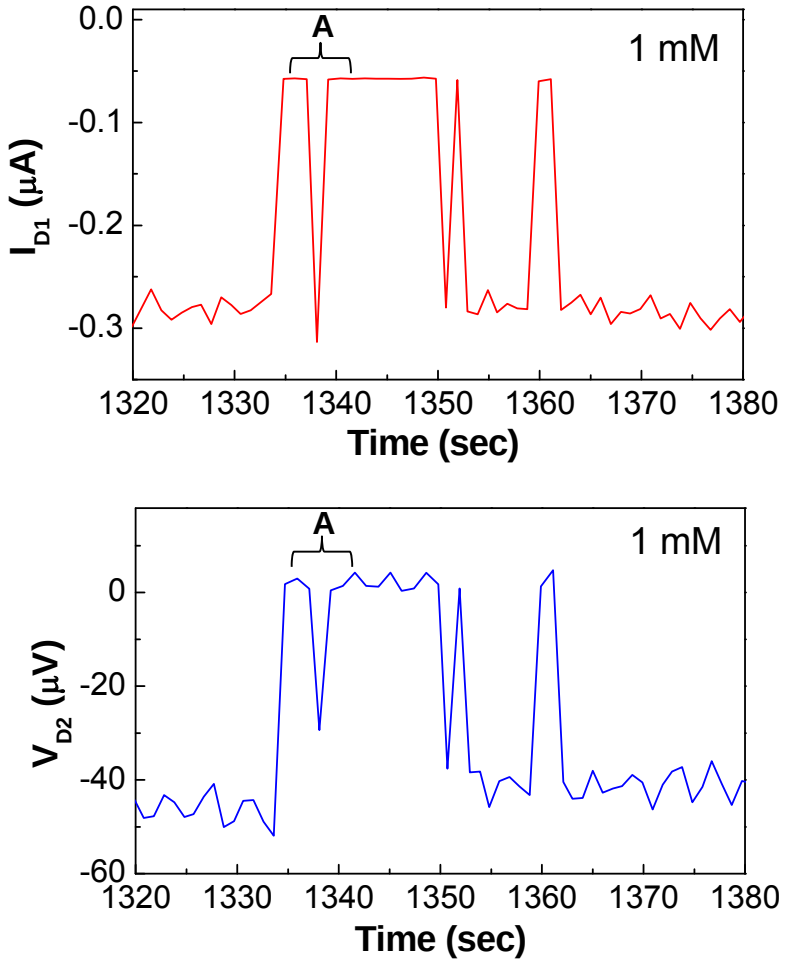

Figure S4. Enlarged D1 current (I_{D1}) and D2 voltage (V_{D2}) plot of the **1 mM** signal part in Fig. 3.

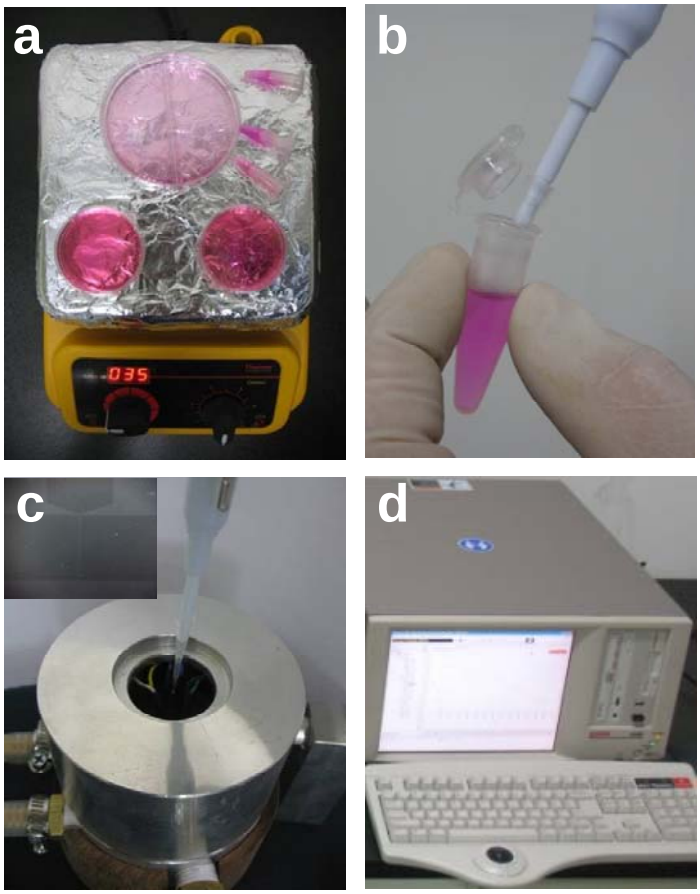

Figure S5. Photographs for the measurement of electrical signals from the planar triode olfactory devices by the stimulation of odorant mixture solutions: **(a)** Odorant mixture solution kept at 35 ^{o}C, **(b)** taking out odorant mixture, **(c)** dropping the odorant mixture solution on top of the planar triode olfactory device mounted on the measurement stage where the temperature was controlled by the circulating water from outside bath, and **(d)** actual screen of measurement system during the acquisition of current and voltage signals.

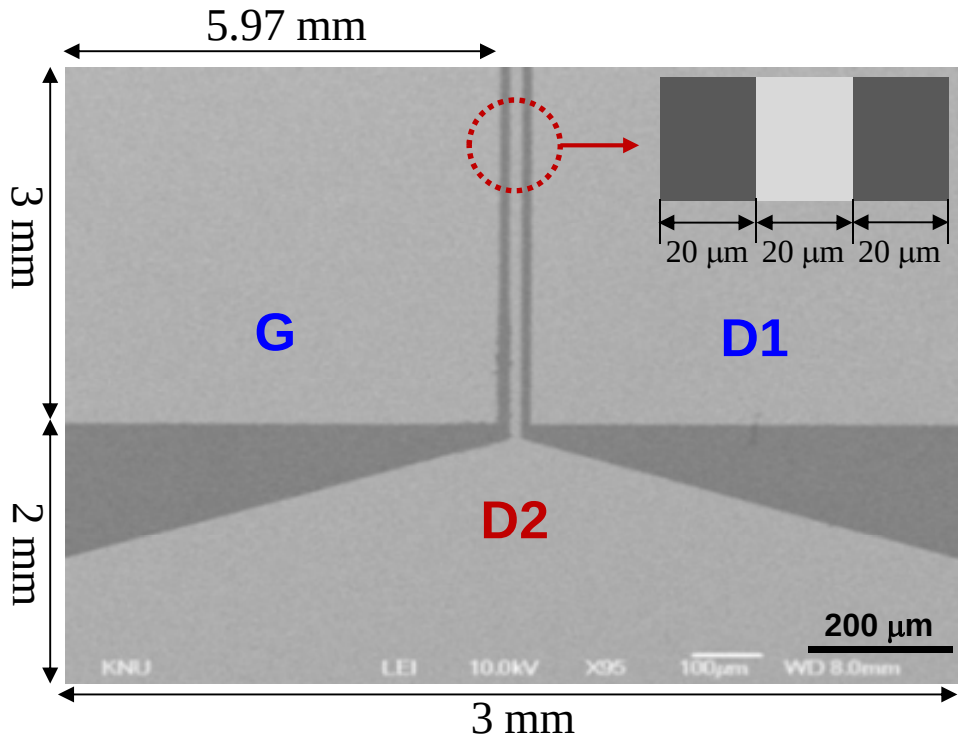

Figure S6. Selected SEM image for marking the dimension of ITO electrodes: The red dotted circle informs the width of the D2 electrode and the gap between the three electrodes (G, D1 and D2).