Spatial resolution of single cell exocytosis by microwell-based individually addressable thin film ultra-microelectrode arrays

Jun Wang†,‡, Raphaël Trouillon†, Johan Dunevall ‡, Andrew G. Ewing†,‡

†Department of Chemistry and Molecular Biology, University of Gothenburg, Sweden

‡Department of Chemical and Biological Engineering, Chalmers University of Technology, Sweden

4 by 4 microwell-based MEA 5 by 5 microwell-based MEA 6 by 6 microwell-based MEA

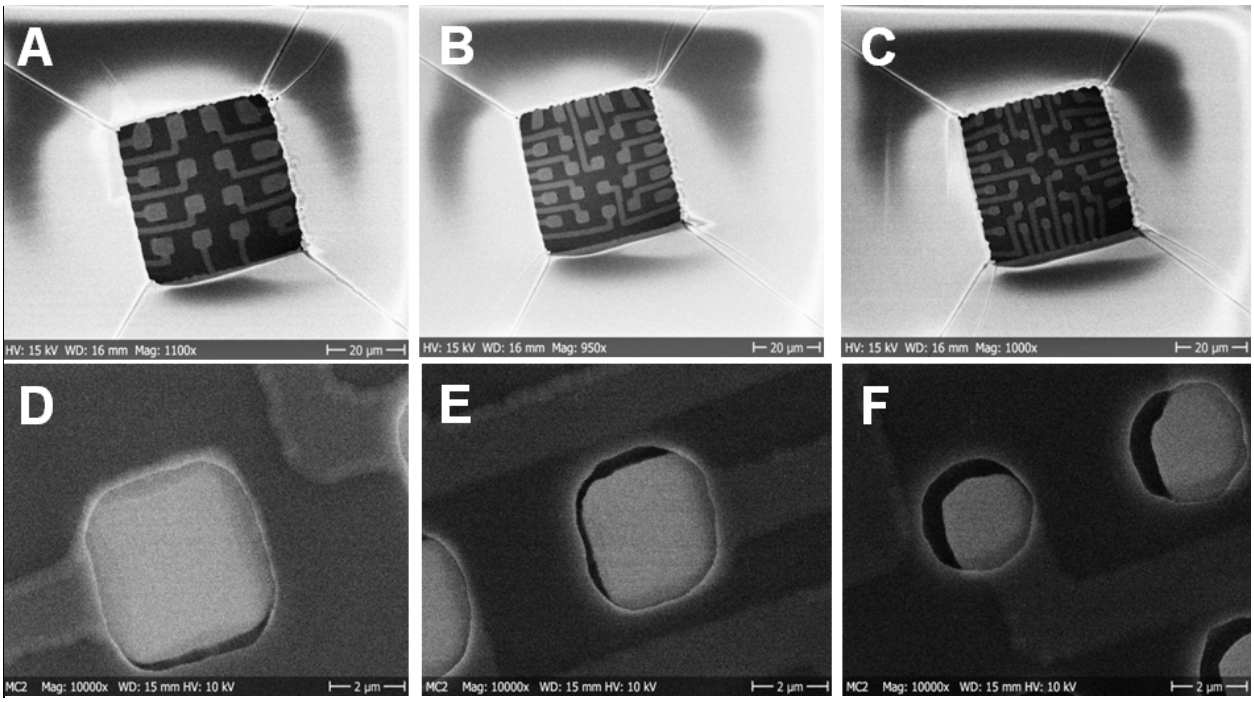

Figure S1. SEM pictures of the microwell based MEAs with 16, 25, 36 ultra-microelectrodes. A, B, C) SEM pictures of microwell-based MEAs containing 16, 25, 36 microelectrodes (scale bar is 20 µm); D, E, F) SEM pictures of single microelectrodes in the corresponding microwell-based MEAs of 16, 25, 36 microelectrodes (scale bar is 2 µm).

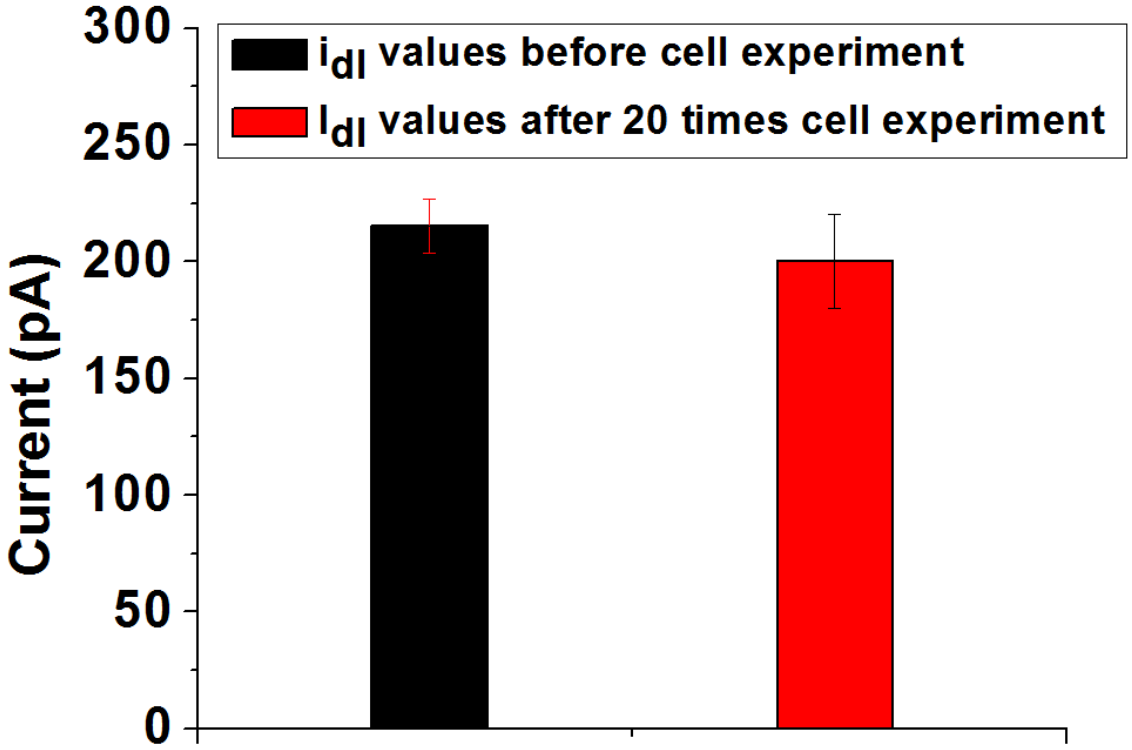

Figure S2. Stead state current (i_{dl}) at microelectrodes from a 6 by 6 MEA from a new MEA device or microelectrodes from the used MEA device after cleaning procedures.

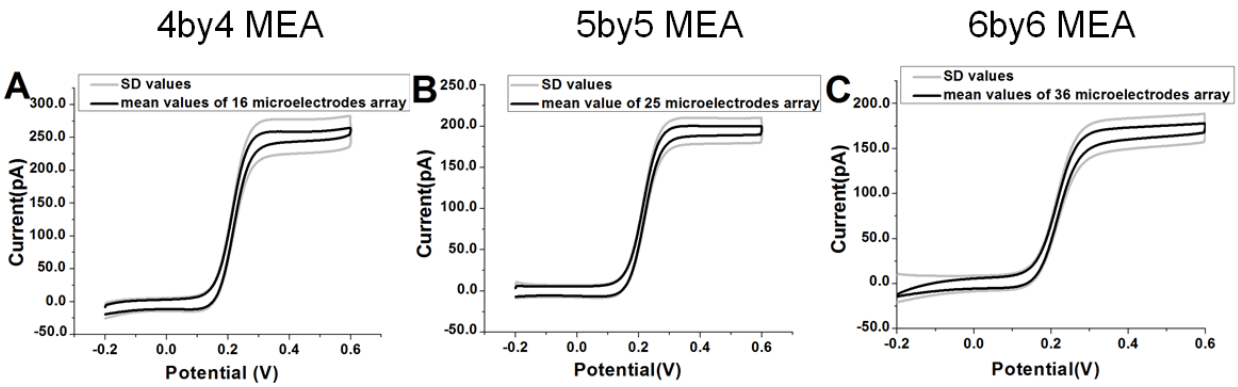

Figure S3. Electrochemical characterization of microelectrodes in three kinds of microwell based MEAs featuring A) 16, B) 25 and C) 36 electrodes by simultaneously applying potential to multiple microelectrodes. The cyclic voltammograms (scan rate: 20 mV/s) were obtained in 1 mM FcMeOH in PBS. The black curves show the average voltammogram obtained from the signals measured at each channel of the MEA, and the gray curves show the corresponding standard deviation (SD) values (16 electrode MEA, n=16; 25 electrode MEA, n=25; 36 electrode MEA, n=36).

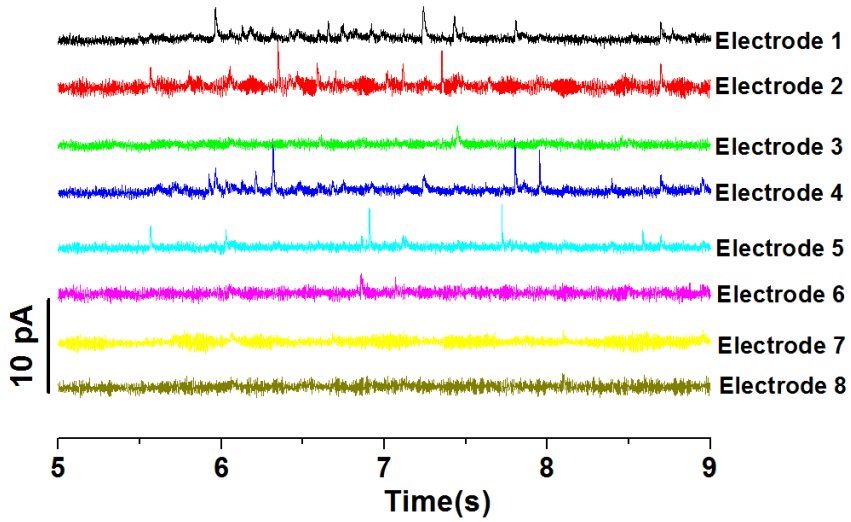

Figure S4: Four-min traces expanded from Figure 3C.

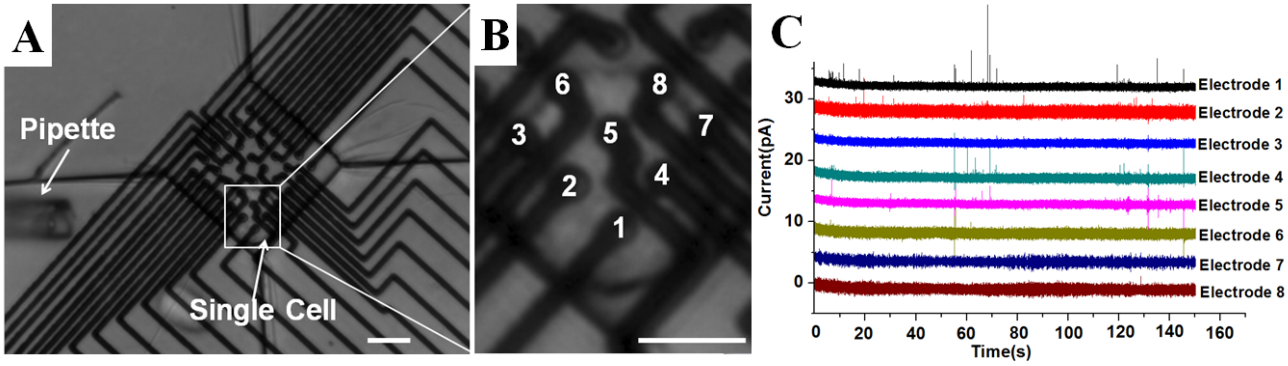

Figure S5. Electrochemical imaging of a single PC12 cell partially covering the microwell based 6 by 6 MEA. A) Micrograph of the setup, showing the 36-electrode array partially covered by a single PC12 cells (scale bar: 10 μm); B) expanded view of the electrode array showing a single cell and the labelling of the electrodes (scale bar: 10 μm); C) Amperometric traces of exocytotic release traces obtained for 25-s stimulations (three times stimulation) of the cell;