Electronic Supplementary Material (ESI) for Lab on a Chip


Supplementary information for

# Electrochemical artifacts originating from nanoparticle contamination by Ag/AgCl quasi-reference electrodes

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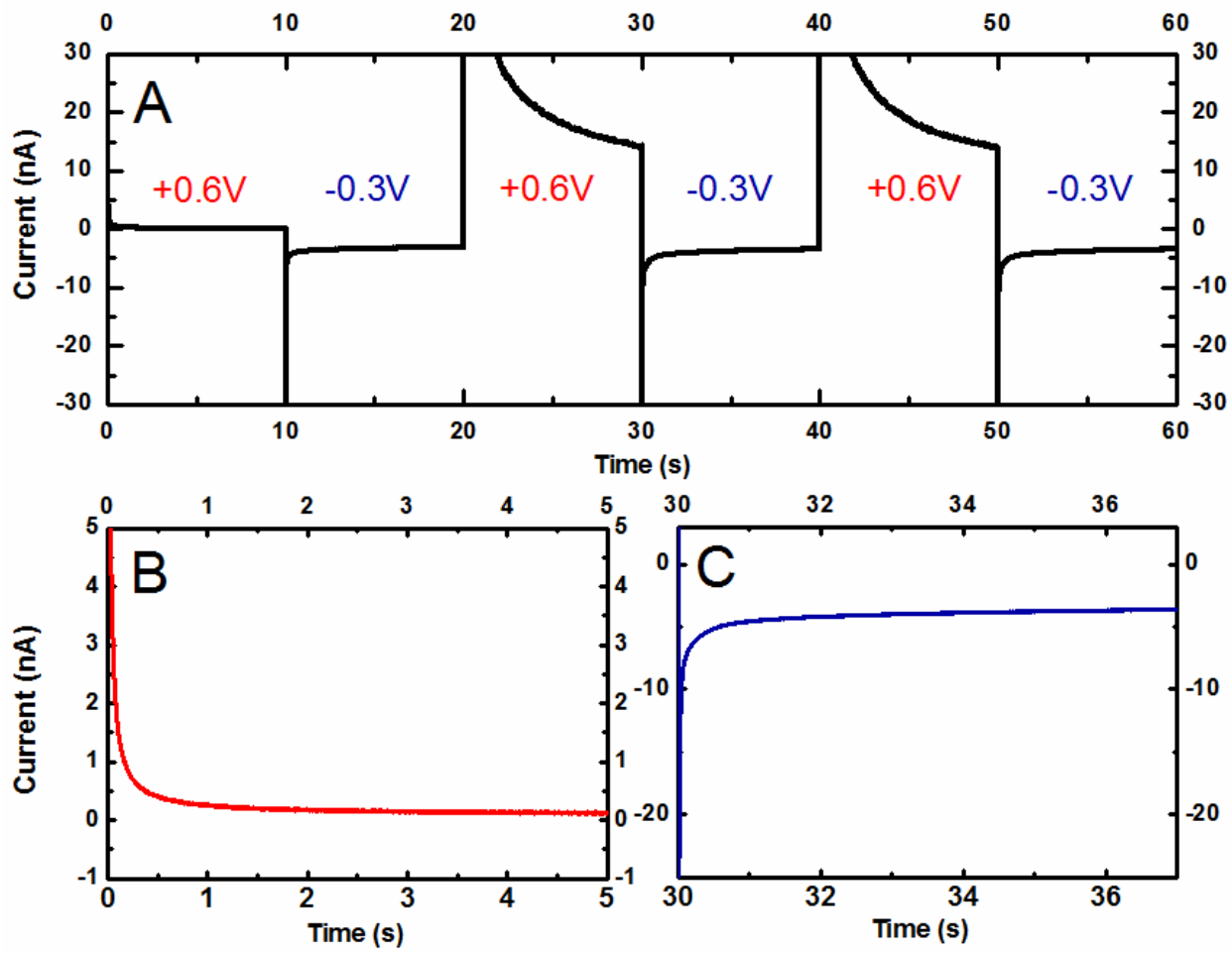
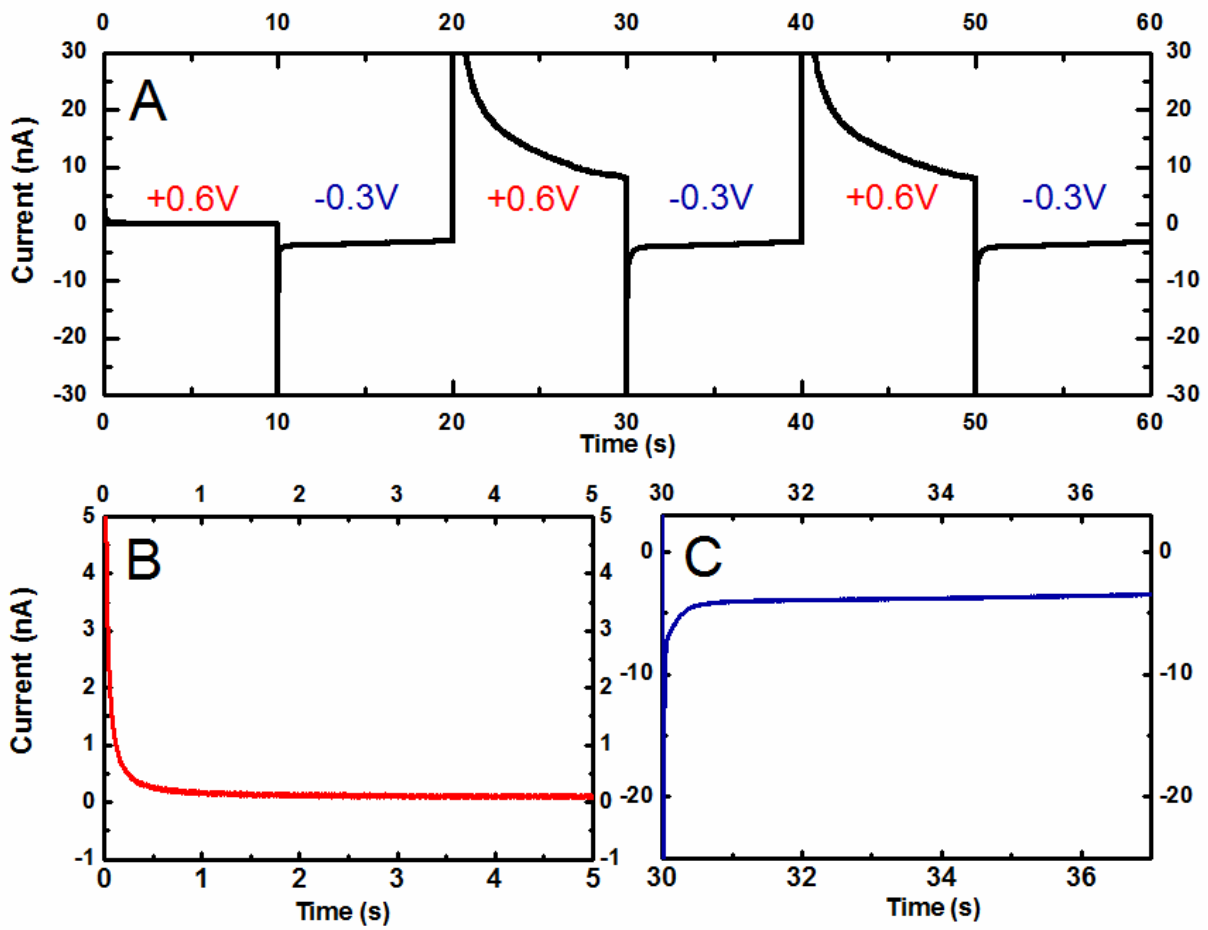


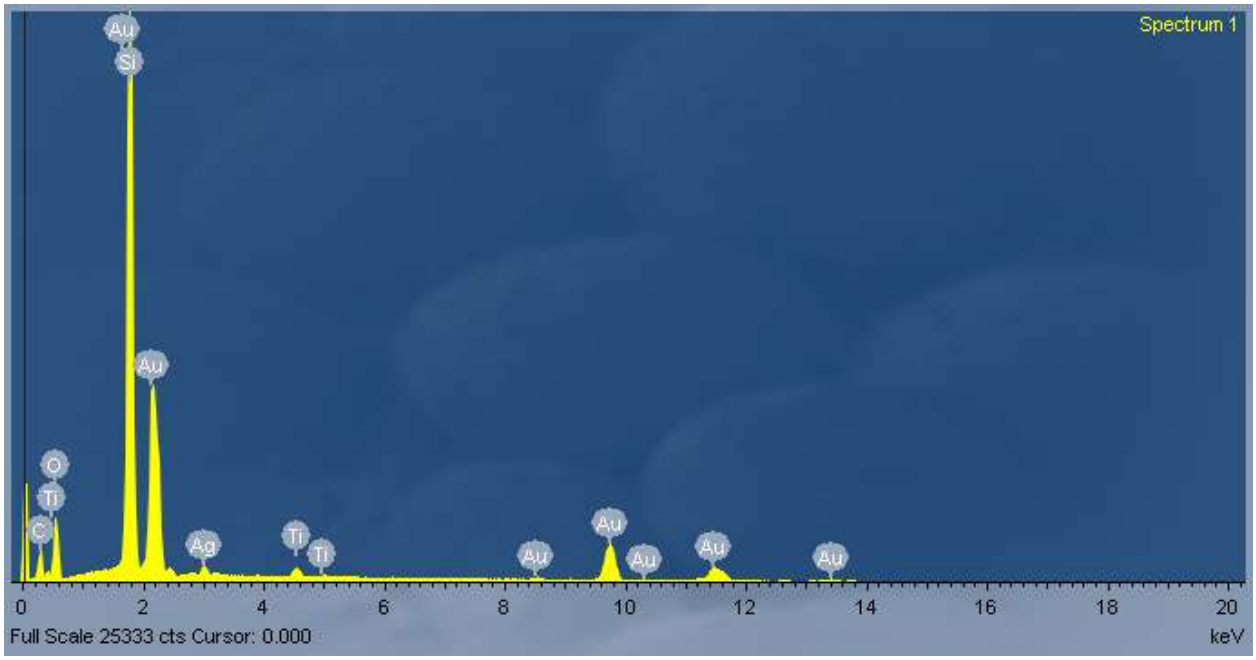

**Supplementary Fig. S1** Amperometric measurement of an uncontaminated MEA, which had never been exposed to an Ag/AgCl wire, with a conventional Ag/AgCl reference electrode (RE-6, BASi, Kenilworth, United Kingdom). Switching between the anodic and cathodic potentials. A.) Trace with 3 anodic/cathodic cycles. B.) Zoom into the anodic part at +0.6 V. C.) Zoom into the cathodic part at -0.3 V.



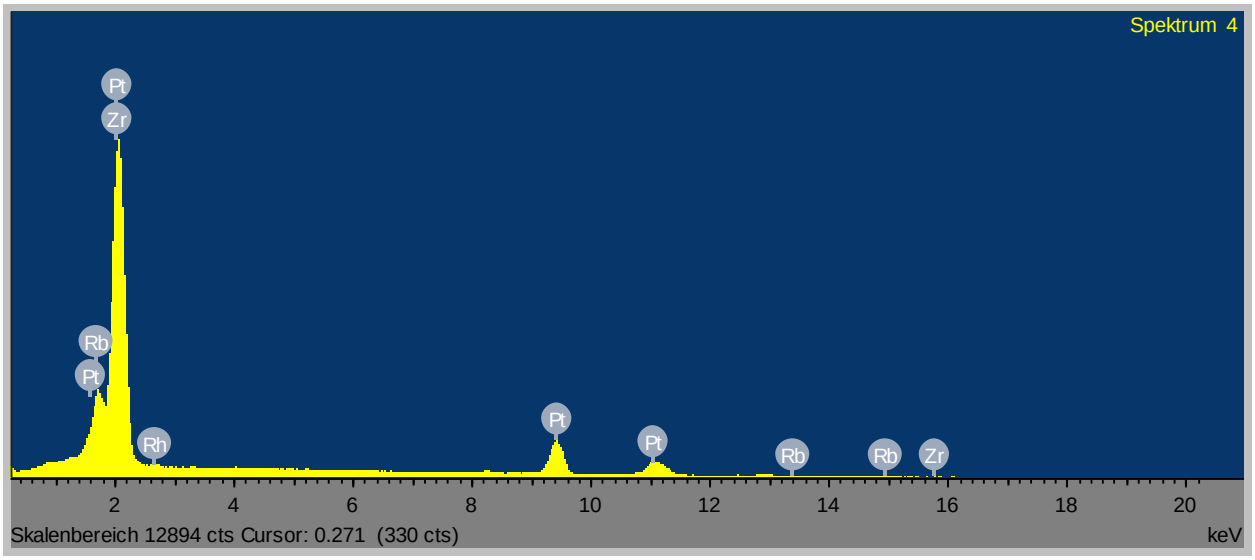

**Supplementary Fig. S2** Amperometric measurement of an uncontaminated MEA, which had never been exposed to an Ag/AgCl wire, with a Calomel reference electrode (Schott B3510 Ch0 141 Kalomel, Schott AG Mainz, Germany). Switching between the anodic and cathodic potentials. A.) Trace with 3 anodic/cathodic cycles. B.) Zoom into the anodic part at +0.6 V. C.) Zoom into the cathodic part at -0.3 V.

**Supplementary Table S3** Inductively coupled plasma – mass-spectrometry analysis of the liquid from the chip (Ti/Pt/Ti) contaminated with Ag/AgCl nanoparticles chipped off the quasi-reference electrode.

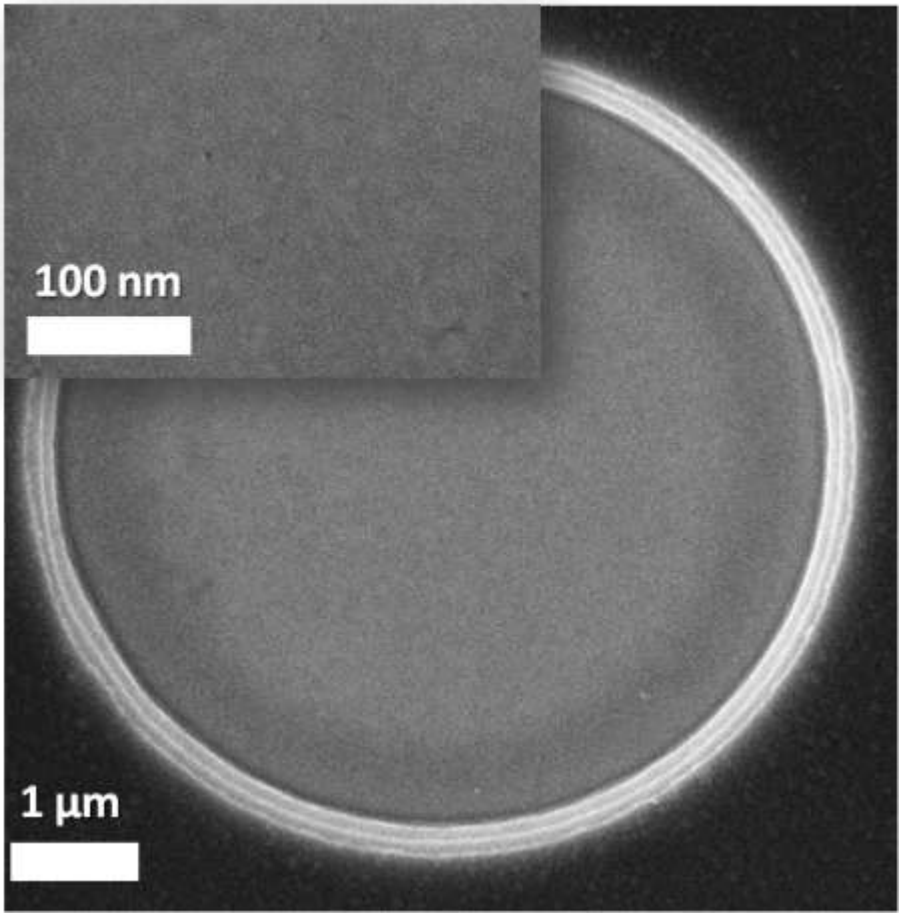
| Element | Concentration in µg/L |
|---|---|
| **Pt** | **465±36** |
| **Ag** | **141±2.6** |
| Fe | **87±9** |
| **Ti** | **62±3** |
| Cu | **44.8±4.3** |
| Zn | **44.3±1.5** |
| Ni | **11.2±0.1** |
| Sn | **11.1±1.5** |
| Al | **9.0±0.6** |
| Hg | **7.7±0.7** |
| Mo | **3.6±0.1** |
| Cr | **<3.3** |
| Zr | **2.2±0.2** |
| Pb | **1.7±0.1** |
| Mn | **0.65±0.05** |
| Cd | **0.25±0.01** |
| Co | **0.18±0.01** |
| Au | **<0.05** |



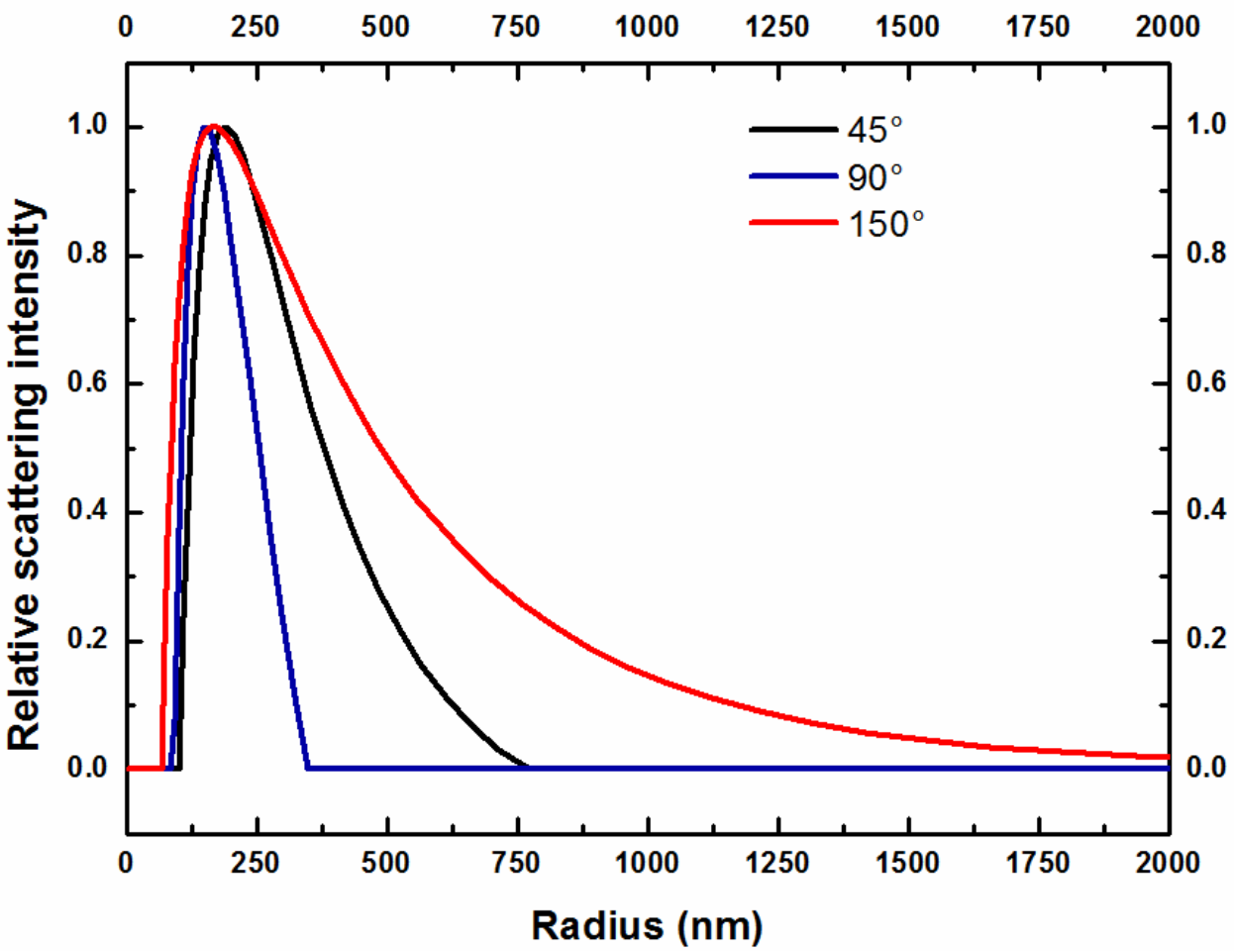

**Supplementary Fig. S4** EDX-analysis of a MEA (Ti/Au/Ti, 10/150/10 nm) surface contaminated with Ag/AgCl wire. V = 20 kV, I = 0.4 nA. Element assignment: Au, Ti – electrode material and adhesion layers; O, Si, N – dielectric passivation layer; Ag – contamination from the Ag/AgCl quasi-reference electrode. The ratio of the weight percentage of the main electrode material – Au and Ag contaminants was ~ 20 to 1. The amount of Ag was higher than that of Ti adhesion layers.




**Supplementary Fig. S5** EDX-analysis of a clean MEA (Ti/Pt/Ti, 10/150/10 nm) surface that has never been exposed to Ag/AgCl wire. V = 20 kV, I = 0.4 nA. Element assignment: Pt – electrode material.




**Supplementary Fig. S6** SEM image of a single MEA microelectrode (Ti/Pt/Ti), which has never been exposed to an Ag/AgCl wire. Inlay: zoom onto the electrode surface.




**Supplementary Fig. S7** Dynamic Light Scattering of Ag/AgCl nanoparticles in PBS. Examples of radii distributions for three angles (45°, 90° and 150°) are shown and the radius with the highest scattering intensity ranges from 148 to 190 nm depending on the angle. DLS measurements of a blank PBS solution resulted in negligible signals at least two orders of magnitude lower than a signal coming from a PBS solution exposed to an Ag/AgCl wire.