

Monitoring impedance changes associated with motility and mitosis of a single cell

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Supplementary Information

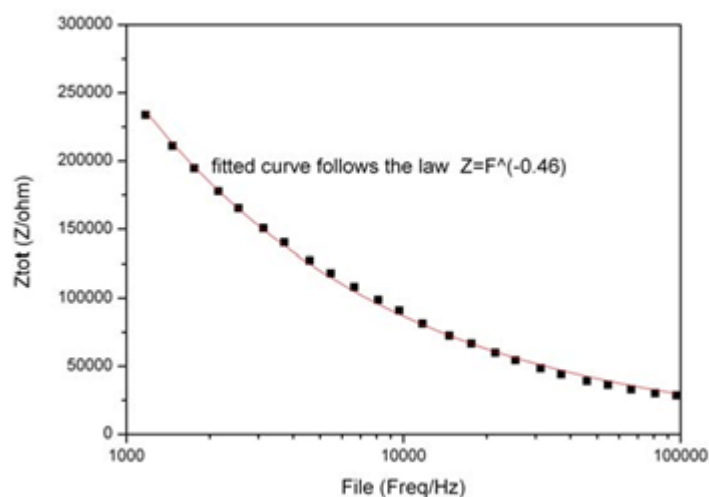
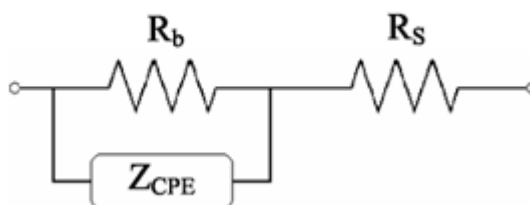


Fig. S1. Impedance versus frequency across the two Pt electrodes. The input voltage was 10 mV. The exact power law varies from electrode to electrode but was always less than 1.



$$Z_{CPE} = 1/[A.(j\omega)^\alpha]$$

Fig. S2. Electrical circuit model for the electrode–electrolyte interface.

Z_{CPE} : electrode–electrolyte interface impedance

R_b : charge transfer resistance (for DC behavior)

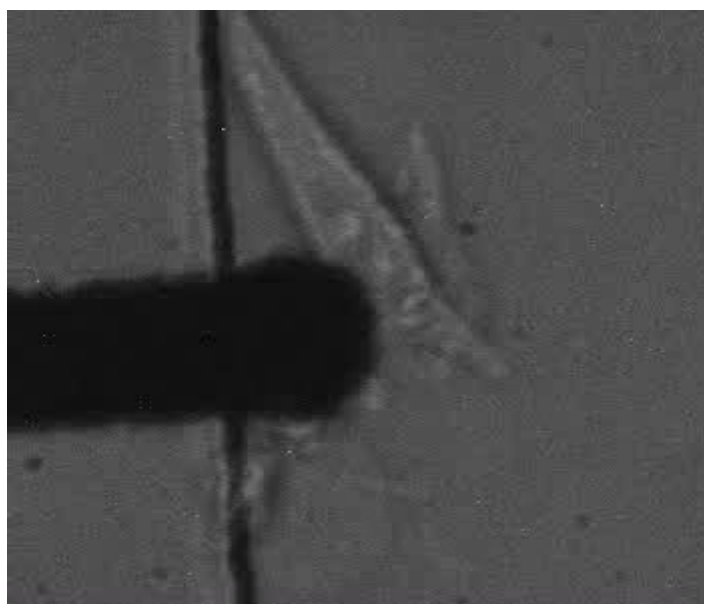
R_s : solution resistance

α is less than 1 (ref. 1). For example, for Fig. S1, $\alpha = 0.46$. R_s could not be determined from the frequency range of our measurements (Circuit taken from ref. 1).

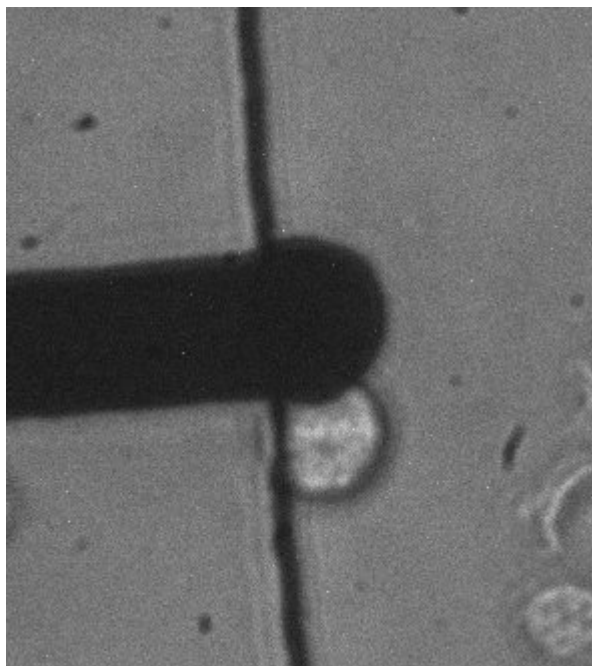
1. Chang J, Park J, Pak YK, Pak JJ. Fitting improvement using a new electrical circuit model for the electrode-electrolyte interface. *Proc 3rd Int IEEE EMBS Conf on Neural Engin*, Hawaii, USA, May 2-5, 2007, pp. 572-574, and references therein.



Movie S1. Attraction of cells to the edge of the sensing electrode by positive dielectrophoresis. The full movie lasts 11 seconds. Here the snapshot was taken just before the cell was trapped at the edge of the central electrode (region of strongest electric field). 5V at 1MHZ were applied across the electrodes.



Movie S2. Single-cell motility. The full movie lasts 62.4 hours. This is snapshot C of Figure 2 taken when the cell began to move away from the electrode, reflected by the sudden steep decrease in impedance seen in Figure 2.



Movie S3. Single-cell mitosis. The full movie lasts 3 hours. This is snapshot G of Figure 3 taken when there is condensation of the chromosomes in the equatorial plate. This corresponds to metaphase, which represents ~ 1% of the cell cycle.