Electronic Supplementary Material for PCCP

Electronic Supplementary Information for

Interrogation of living cells using alternating current scanning electrochemical microscopy (AC-SECM)

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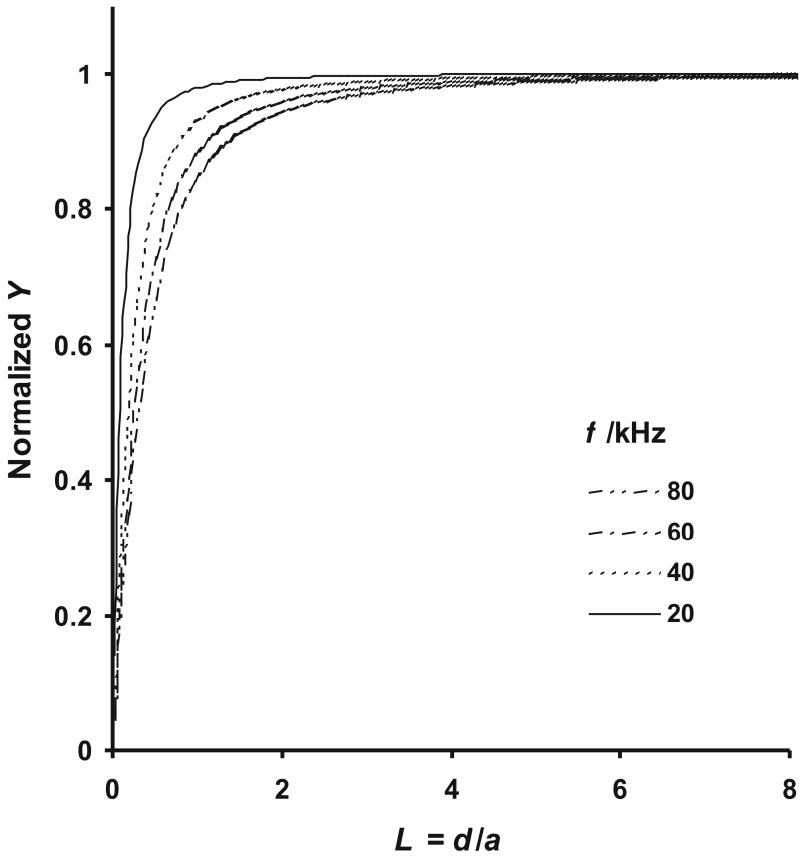

Fig.s1 Predicted normalized AC-SECM approach curves for negative AC feedback at four different frequencies. Calculations were based on Equations 1 and 2, and analytical approximation for negative SECM feedback current ($RG = 10$).

As predicted by Equations 1 and 2, the shape of the AC approach curves varies with frequency. At higher frequencies the AC current magnitude decreases at larger tip-sample separations than at lower frequencies. This is due to the fact that when high

frequencies are used the simple RC equivalent circuit model is dominated by the resistive element. Similar effect can be also observed if ionic strength of the supporting electrolyte is changed, since it will affect the relative contribution of capacitive and resistive elements to the overall system impedance. When ionic strength is decreased, a similar effect is observed as for increasing frequency.

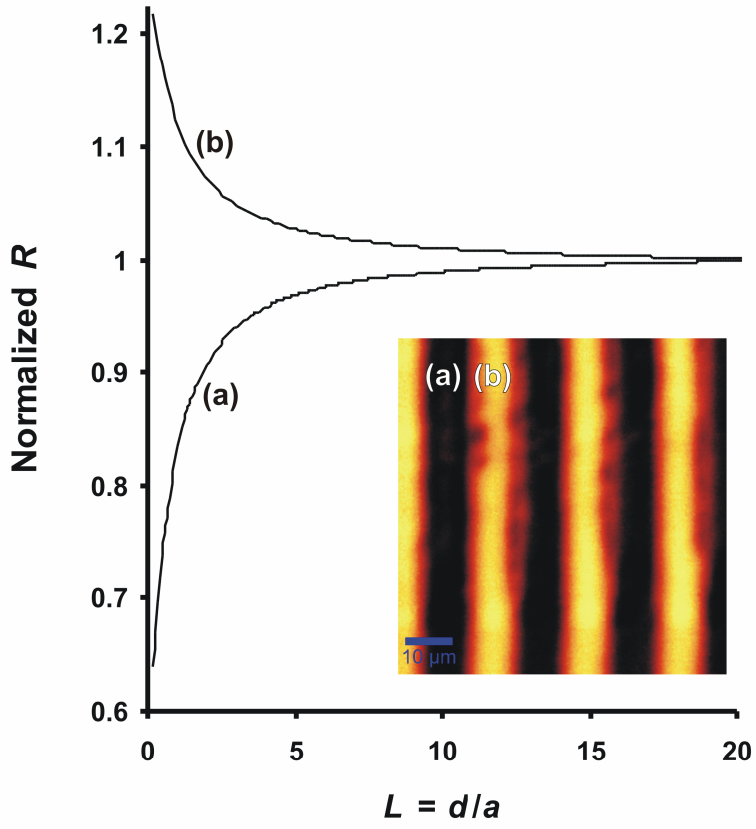

Fig. s2 Normalized AC approach curves observed above a gold band (curve a) and above a glass band (curve b) with a 2 µm Pt tip electrode in a 10 mM KCl at 90 kHz frequency, 200 mV p-p amplitude and E_{dc} = 0.4 V. Inset is a constant height AC-SECM image of the band electrode. In the inset bright and dark colors correspond to high and low values of AC current.

The experimental system was thoroughly tested before experiments involving living cells were carried out. The system behaved as expected. Above a conductive substrate, positive AC feedback was observed when relatively high frequency was used

in 10 mM KCl. Above an insulating substrate, negative AC feedback occurred. Testing of the setup, also involved imaging experiments. The sample AC-SECM image of the interdigitated gold band electrode is shown as an inset in Fig. s2.