Continuous Square Wave Voltammetry for High Information Content Interrogation of Conformation Switching Sensors

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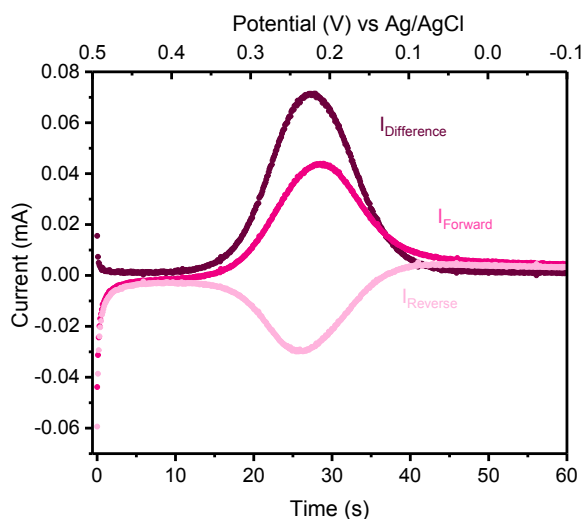
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Figure SI.1– cSWV records all the current time data provided from a single run conducted at a specific native frequency. The figure demonstrates the forward current, reverse current and the net current difference obtained for the soluble redox marker $K_3[Fe(CN)_6]$ interrogated at a native frequency of 10 Hz, plotted against the time corresponding to a voltammogram equivalent of 100 Hz ($\delta t = 5$ ms) along with the potential window interrogated, 0.5 V- (-0.1 V).
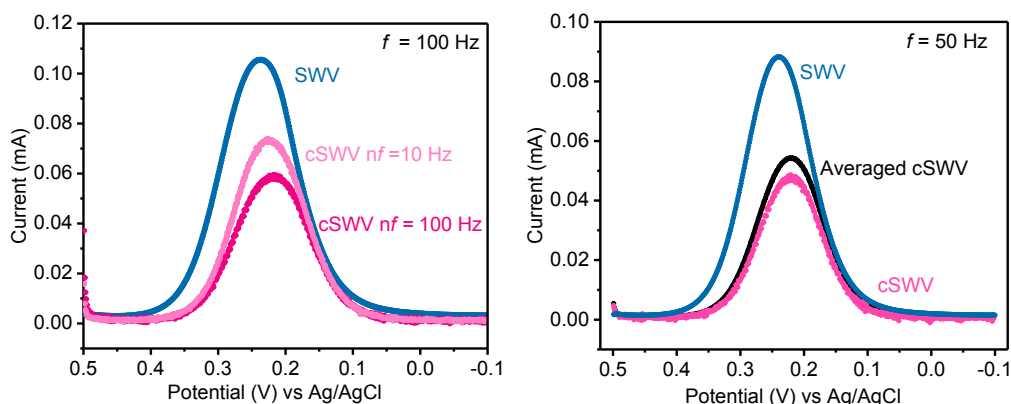

Figure SI.2– In traditional SWV, the current difference between the forward and reverse pulses is displayed as the final response to the faradaic process by averaging the latter half of the pulse. The voltammograms obtained from cSWV are also represented as the difference between forward and reverse pulses at the corresponding δt values. The figure demonstrates the current discrepancy observed between the two techniques. (Left) Comparison of voltammograms obtained at different native frequencies (*nf*) of cSWV to SW voltammogram obtained at 100 Hz. Native frequencies of 10 Hz and 100 Hz were selected and the voltammograms corresponding to $\delta t = 5$ms are shown. (Right) The SWV response obtained at 50 Hz frequency with soluble redox marker $K_3[Fe(CN)_6]$ is shown along with the equivalent cSWV response with the latter half of the pulse averaged similar to SWV (black). The native frequency for cSWV was 50 Hz, and the corresponding cSWV voltammogram for 50 Hz (without averaging) is shown in the pink trace
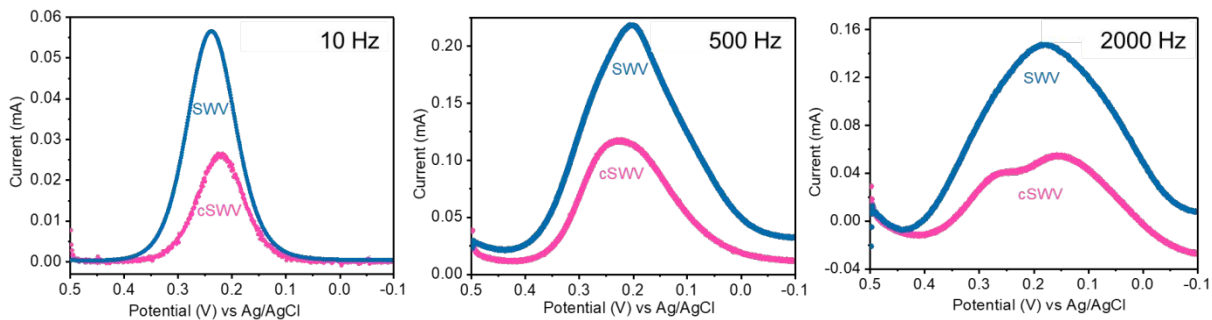
Figure SI.3 – A comparison of voltammograms obtained from traditional SWV and cSWV at varying frequencies are shown for the soluble redox marker $K_3[Fe(CN)_6]$. SW voltammetric responses at 10 Hz, 500 Hz and 2000 Hz are compared with the equivalent cSWV acquired at the native frequency of 10 Hz.
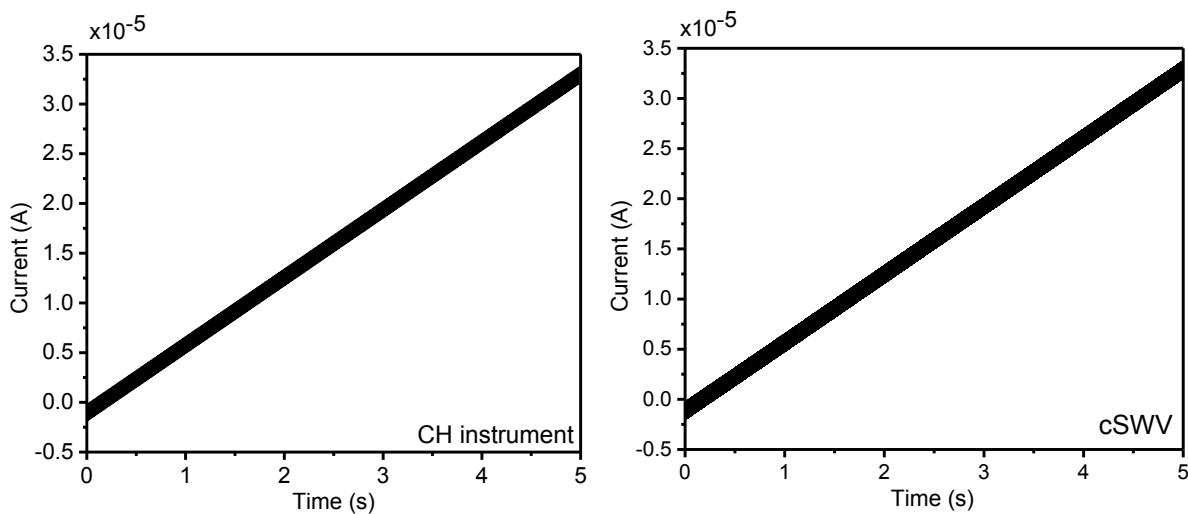

Figure SI.4- The amperometric traces obtained with CH instrument and cSWV under 100 Hz native frequency when connected to 150 kΩ±5 resistor. The electrochemical cell yields same current predicted by Ohm's Law.
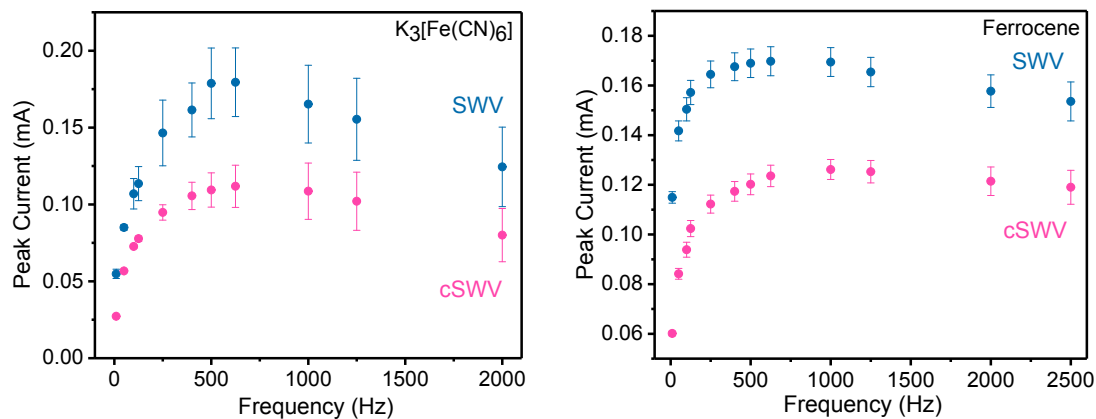
Figure SI.5 – Comparison of the peak current responses obtained from the two techniques SWV and cSWV at different frequencies for the soluble redox markers are represented. Frequencies ranging from 10 Hz to 2500 Hz were selected to perform traditional SWV (blue traces). Equivalent frequencies for cSWV are extracted from a cSW voltammetric sweep performed at a native frequency of 10 Hz (pink trace)
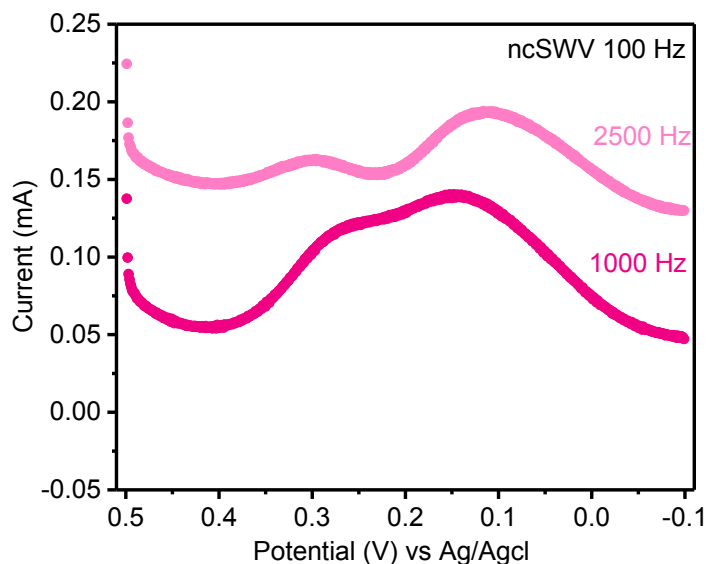

Figure SI.6– Peak splitting is observed at high frequency when the bare electrodes are interrogated with cSWV in soluble redox marker and voltammograms for $K_3[Fe(CN)_6]$ at the native frequency of 10 Hz are shown.