

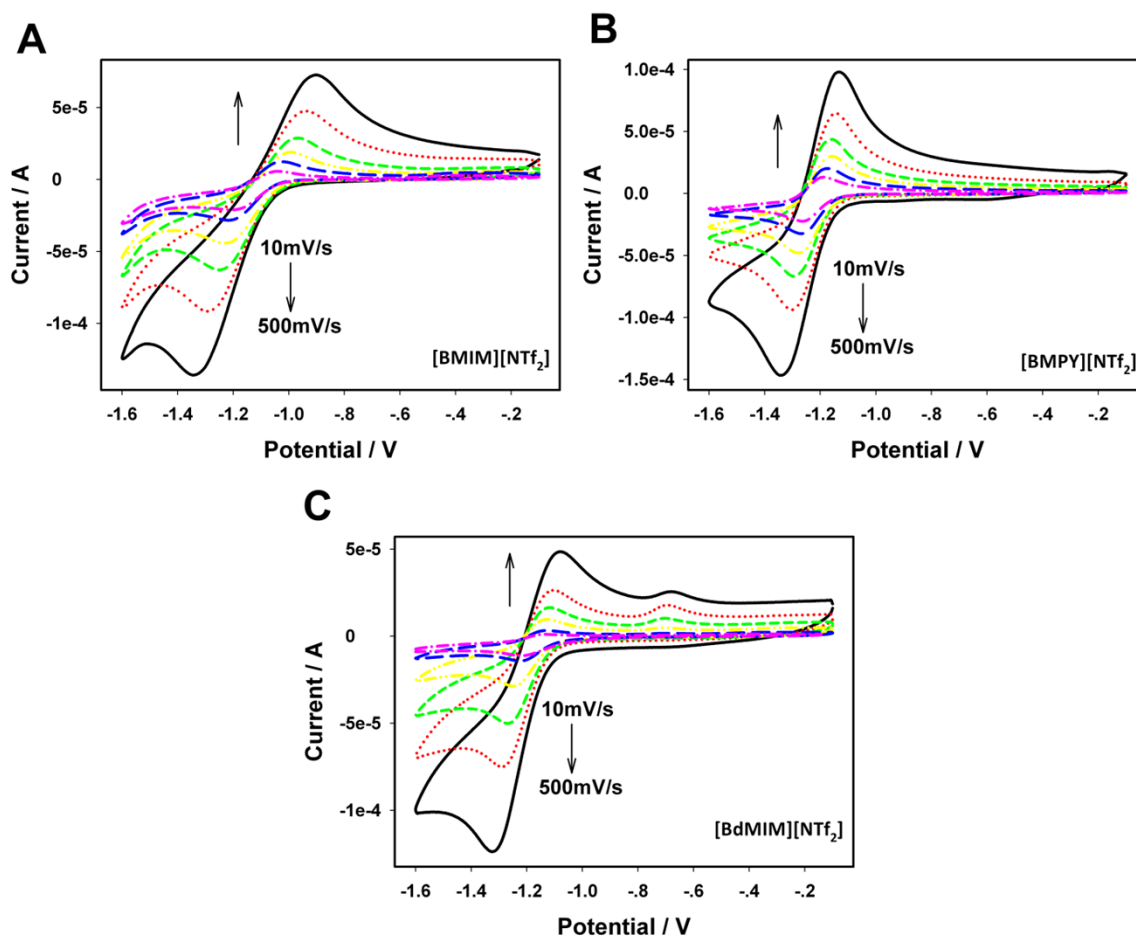
## Electronic Supplementary Information

### Evaluating the Electrochemical Stability of Ionic Liquid/Metal Interface against Reactive Oxygen Species Using In-Situ EQCM

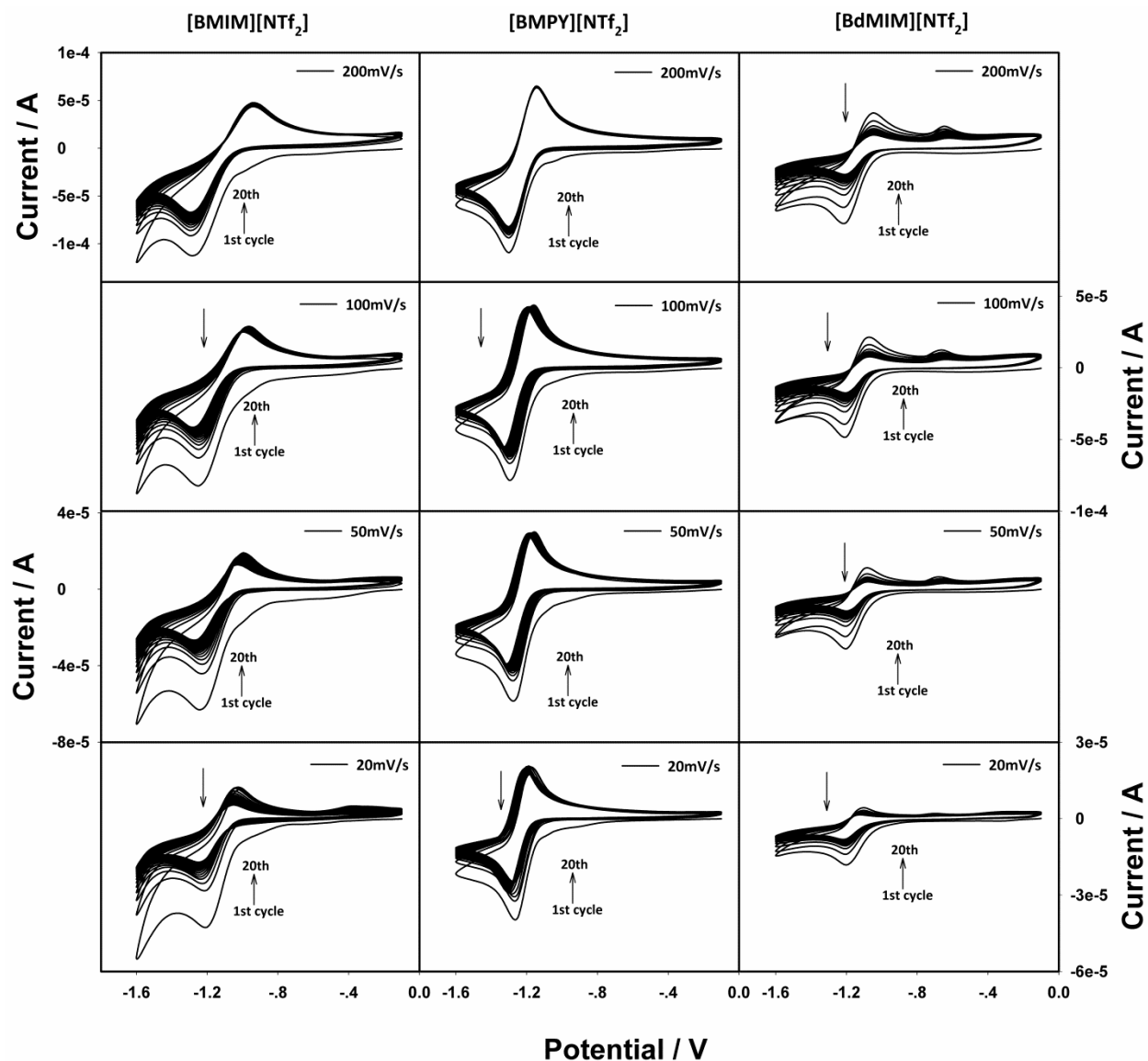
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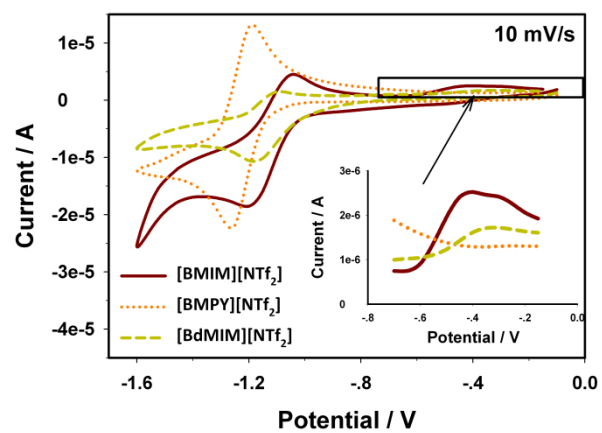
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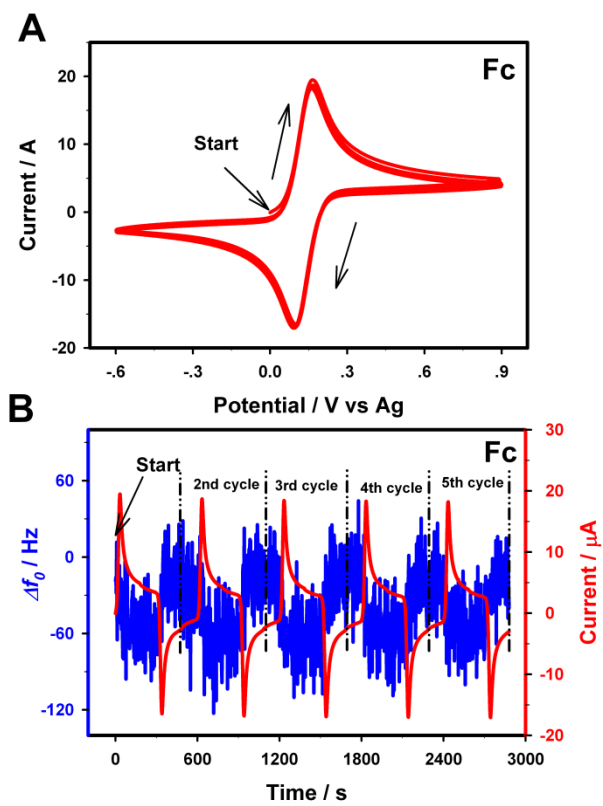
**Figure S1:** CVs at various scan rates (10, 20, 50, 100, 200, 500mV/s) in three ILs in the presence of oxygen (vol. % = 40%) (Second potential cycle). Nitrogen is the dilution gas.



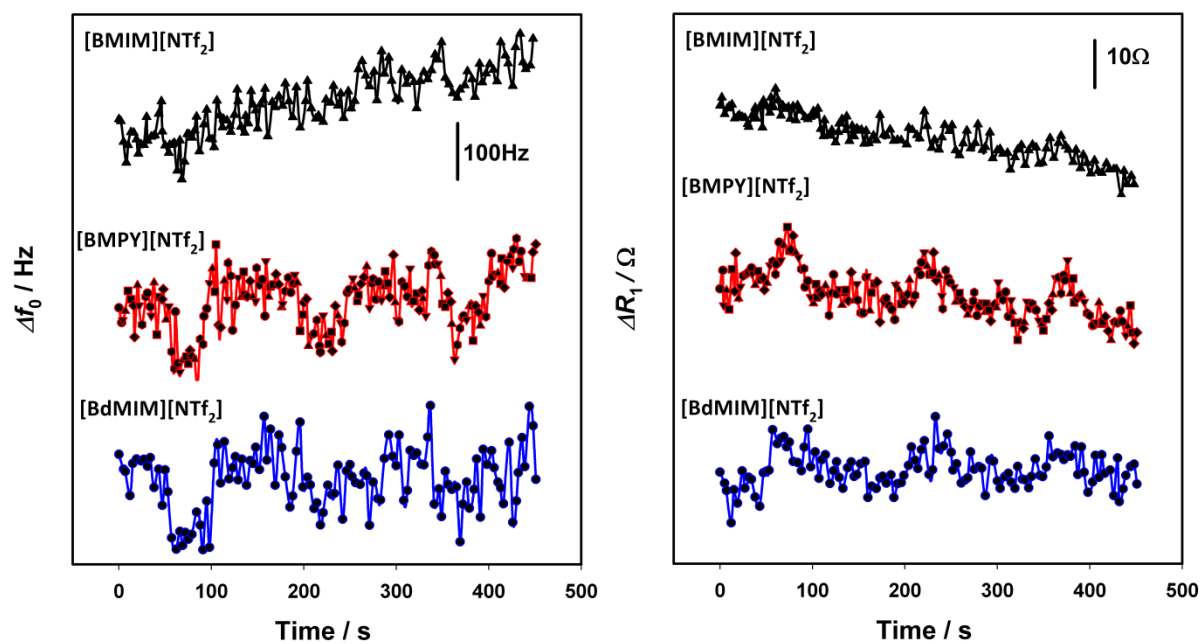
**Figure S2:** CV responses at various scan rates (20, 50, 100, 200mV/s) in three ILs in the presence of oxygen (vol. % = 40%) (20 cycles). Nitrogen is the dilution gas.



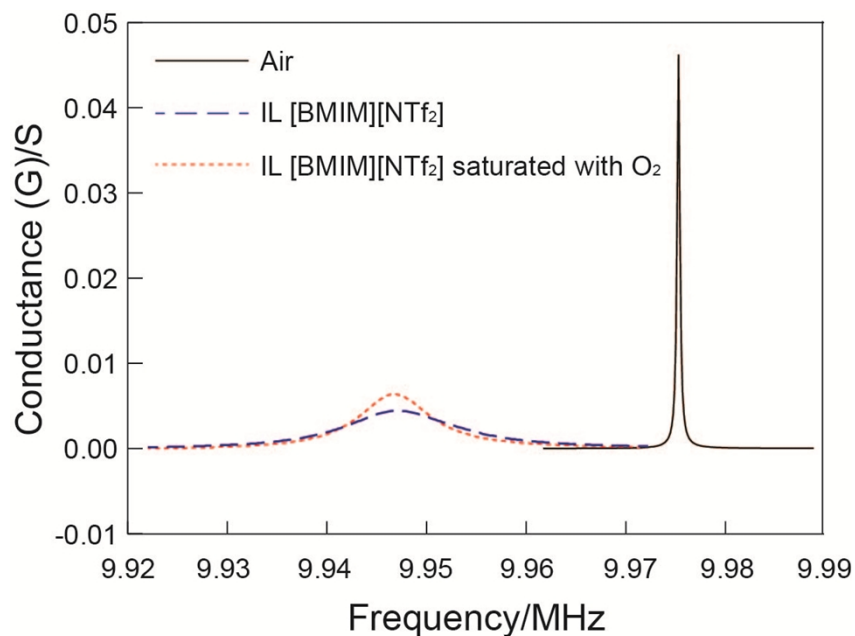
**Figure S3:** CVs at scan rate of 10mV/s in three ILs in the presence of oxygen (vol. % = 40%) (single cycle). Inset: enlarged view of the zone area marked with black box. Nitrogen is the dilution gas.



**Figure S4:** CV at scan rate of 5mV/s (5 cycles) and simultaneously recorded  $\Delta f_0$  changes in [BMPY][NTf<sub>2</sub>] containing 5mM Fc in nitrogen atmosphere.



**Figure S5:** Simultaneously recorded  $\Delta f_0$  and  $\Delta R_1$  changes during 3 cycles of CV (-0.1~-1.6V) at scan rate of 20mV/s in three ILs in the presence of oxygen (vol. % = 40%). Nitrogen is the dilution gas.



**Figure S6:** Conductance spectra of the QCM crystals when the crystal is mounted in air environment, in the IL, and in the IL saturated with oxygen. From these spectra, it is clear that IL systems have such a high viscosity that causes the damping of QCM oscillation to a huge extent. As a result, the instrument stability for reading and adjusting the frequency reaches to the limits, thereby generating large amplitude of background noise in frequency. (Note: In this experiment, thin layer of IL is coated at the Au QCM. In EQCM experiment, a thicker IL coating was used which should have even higher damping of QCM oscillation.