Ion transfer across the interface between a very small organic phase and a bulk aqueous phase

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To study ions transfer across the interface between a very small volume organic phase and another immiscible bulk phase, an organic droplets modified nanometer-sized electrode has been used. The organic droplet is formed when a small gold electrode is firstly soaked in 6-(mercaptohexyl)ferrocene, 1,2-Dichloroethane (DCE) solution, and then immersed in a aqueous phase (see figure 1). The size of the organic droplets is only around several tens of nanometers in radius.

When 6-(mercaptohexyl)ferrocene is oxidized at the electrode surface, it will induce an aqueous anion transfer across the small organic droplet/ aqueous solution interface (see figure 2). The half potential of the transfer of anion across the organic droplets/aqueous solution interface has a negative shift compared with the same reaction across a normal sized liquid/liquid interface.

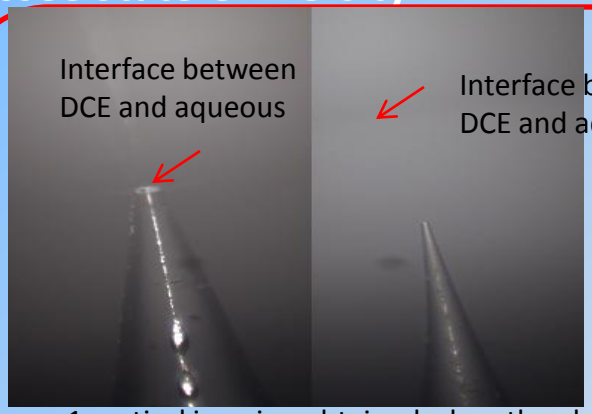

Figure 1. optical imagine obtained when the electrode is in0.1M KNO3. solution. b) optical imagine obtained when the same electrode was moved back to Dichloroethane (DCE)

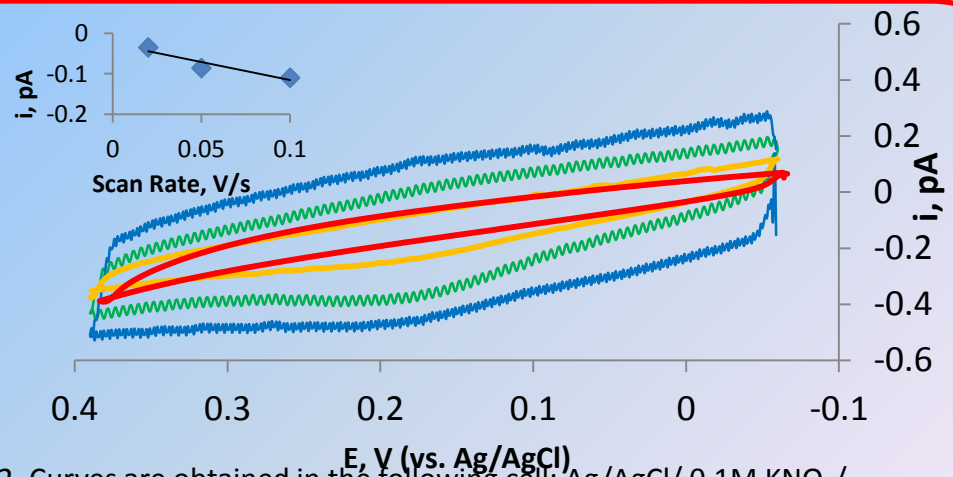

Figure 2. Curves are obtained in the following cell: Ag/AgCl/ 0.1M KNO_3/ 6-(mercaptohexyl)ferrocene droplets/Au. Red curve is obtained without an electroactive monolayer. Electrode radius is 286nm. Scan rates: (1) red curve 20mV/s; (2) orange curve: 20mV/s; (3) green curve: 50mV/s; (4) blue curve: 100mV/s. The inset shows the peak current of curve 2,3 and 4 over their scan rate.