Supplementary table T1:

	Pt Electrodes	FM Electrodes
	Time (mins)	Time (mins)
Process (clean-room)		
FNA cleaning and N_2 drying of wafer	10	Nil
Dehydration at 230 °C	10	Nil
Pt Sputtering	30	Nil
IPA cleaning and N_2 drying	10	10
Dehydration at 230 °C	120	10
Photolithography	30	30
IBM etching	30	Nil
Final cleaning (NPM sonication/O_2 Descum)	30	Nil
Process (non clean-room)		
Soft lithography	90	90
Metal filling	Nil	10
Solidification	Nil	10
Plasma bonding	10	10
Clean-room time	270	50
Non clean-room time	100	120
Total time	370	170
Requirement for 6n devices with electrodes (assuming 6 electrode pairs each wafer)		
Clean-room requirement	n X 270	60 (one time)
Total time	n X 370	60 + n X 120

Table T1: A comparison between FM and conventional Pt microelectrode fabrication processes in regards to fabrication time.

Supplementary figure S1:

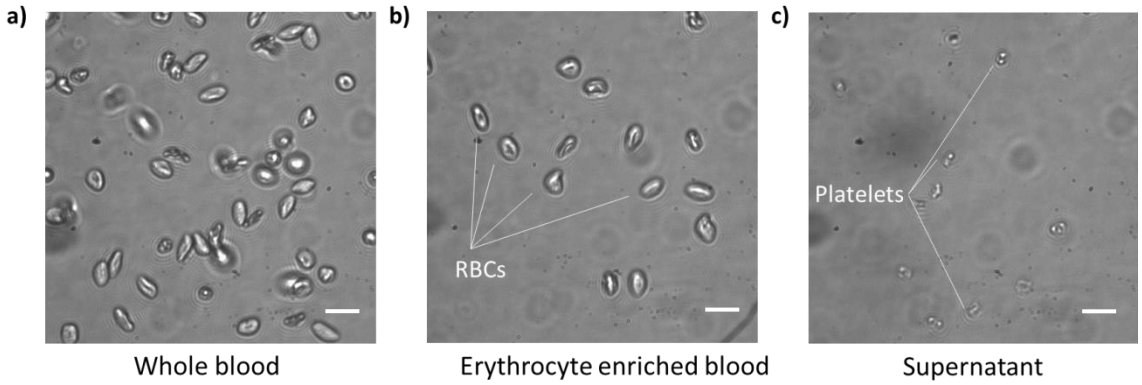

Figure S1: Erythrocyte enrichment. Brightfield microscopy images of **a)** Human whole blood. **b)** Sample after erythrocyte enrichment. **c)** Discarded supernatant. Scale bar is 5 microns.

Supplementary figure S2:

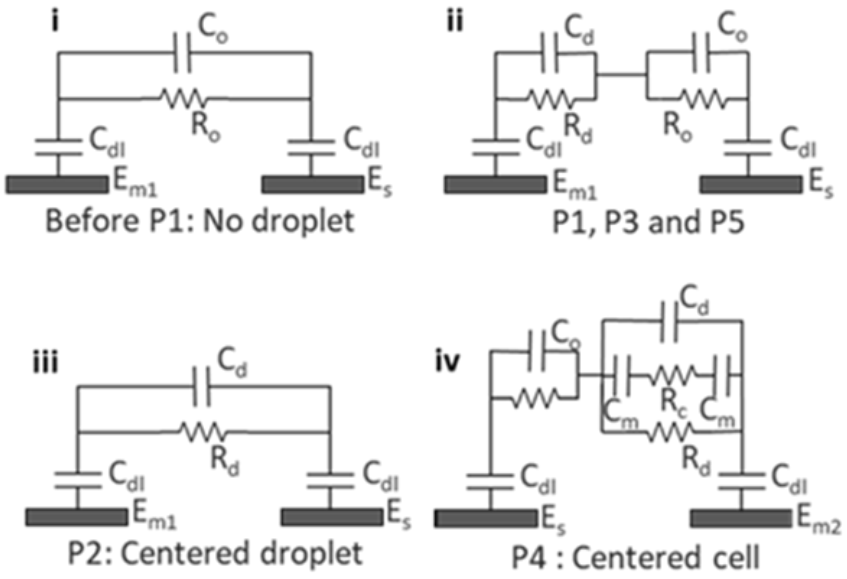

Figure S2: Equivalent electrical circuit model for the droplets at different positions is drawn (C_{dl}: equivalent double layer capacitance due to all interfaces (electrode-oil, oil-electrolyte and electrolyte-electrode); C_o, R_o, C_d, R_d: capacitance and resistance due to oil and droplet respectively; C_m: cell membrane capacitance, R_c: cytoplasmic resistance) **i:** Base impedance without droplet, accounting for low conductivity and dielectric constant of carrier phase (Oil). **ii:** As the aqueous droplet touches E_{m1} (and not E_s), the higher dielectric constant of droplet starts to contribute to the signal. **iii:** Primary peak appears as the droplet touches both the electrodes reaching maximum conductivity and dielectric constant between the electrodes. **iv:** Secondary peak appears as the cell crosses the centre of E_s and E_{m1}.