The effect of pH on electrohydrodynamic drop generation in aqueous two-phase microflow

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Electrohydrodynamic drop generation with aqueous two-phase system (ATPS) formed by dissolving tetrabutylammonium bromide (TBAB, MW 322.38) and ammonium sulfate (AS, MW 132.14) is reported. ATPS is an aqueous solution which splits into two equilibrium phases (TBAB-rich and AS-rich phases) separated by clear and stable interface. In this experiment, four different pH buffer solutions were used to dissolve TBAB and AS for adjustment of pH value of ATPS. After separating stable ATPS, TBAB-rich phase and AS-rich phase were individually introduced at two inlets of the microfluidic system and the merged streams reaches a T-junction, where the flow from the main channel is split to two streams to separate outlets. To observe the electrohydrodynamic effect on interface of laminar flow made of ATPS, DC electric voltage was applied as pulsed signal (200ms) through the electrodes located at the outlets. As the electric potential was increased, the minimum voltage necessary to generate AS-rich drop was measured. When pH was increased, AS-rich drop was generated at the lower voltage. From this result, it could be inferred that lager electric attraction force acts on AS-rich phase with higher pH value.