

Application of Aqueous Two-Phase System into Microfluidic Generation of Droplets by Electrohydrodynamic Force

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Aqueous two-phase system (ATPS) is the favorable liquid-liquid two-phase system and has many potential applications for the stable analysis of wide range of biomolecules, since its aqueous nature renders hydrophilic and biocompatible conditions, unlike organic/aqueous two-phase system which is generally used for generation of drops in microfluidics. We report the electrohydrodynamic generation of droplets in an aqueous two-phase system formed by dissolving ammonium sulfate and tetrabutylammonium bromide to utilize them as discrete fluid carriers and reactors of nanoliter volume with the advantage of rapid mass transfer in microfluidic device. A small volume of fluid of one phase is separated from its laminar stream to be dispersed in the other phase by the perturbation of the liquid-liquid interface immediately after the d.c. electric pulse over a critical voltage is applied. The size of dispersed droplets is tens of micrometers. The number of droplets generated by one pulse application is controlled by the change in the magnitude and duration of d.c. pulse.