Abstract

Title: The microfluidic approach to control interfacial mixing zone for two co-flowing miscible liquid streams

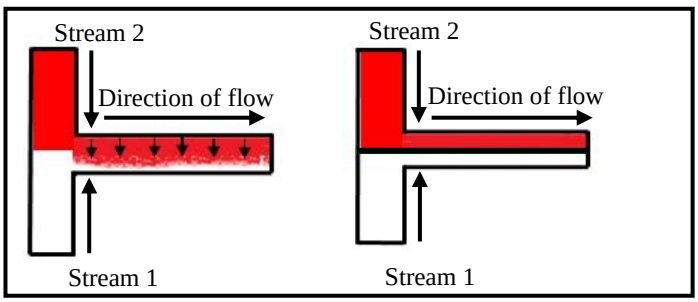
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Keywords: Microfluidics, miniaturization, microchannel, interface, mixing zone.

Miniaturization of chemical devices often serves to predict the information about the performance of the material on different length scales. It permits to optimize the process variables and reduces the risk of path. Microfluidics, micrometer-scale total analysis system or mostly known as 'lab-on-a-chip' devices have been of large interest due to their downscaling purposes, and low volume requirements for fluids samples. Mixing in miniaturized devices is of necessity for many reactions and separation operations. Also, the forces like surface tension must not overcome the collision of these molecules. Pressure-driven flow is used to introduce fluids at microscale, and due to low Reynolds number the injected fluids show laminar flow behaviour. They will meet at the inlet junction and flow side-by-side down the channel with molecular diffusion instead of convective controlling mixing of the two fluids. Here we demonstrate the control of interfacial mixing zone using higher soluble water based dye and deionised water at various flow conditions and geometry (T-shaped) of microchannel. The T-shaped microchannel permits that the reagent start to interdiffuse and react as the two fluids streams are in contact therefore, the time available for diffusion and reaction relates with the distance of the fluid transport. The contact time of the fluid streams with each other governs the overall diffusion of the species across the interface. At low flow rates the liquids are in contact for a longer time and mix through diffusion. A diffusive interface forms between the working fluids, and spreads downstream with increase in contact time. We found that the width of effective diffusive layer can be adjusted by change in flow rates. By observing the broadening of the interface during the initial stages of diffusive mixing it is possible to find out diffusion coefficient, reaction kinetics and binding affinities.

Image:



Controlled mixing zone is widely beneficial for biomedical application like targeting drug delivery, membraneless microfluidic fuel cells (MFFCs) and particles separations.

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I. Biography:-

Paritosh Agnihotri is a research scholar at Sardar Vallabhbhai National Institute of Technology (SVNIT), Surat Gujarat, India. He is currently pursuing his Ph. D. research work under the guidance of Dr. V. N. Lad.

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