

# Study of 3D Focused Droplet Generation in a 2D Flow Focusing Microfluidic Geometry

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## Abstract

We have chosen droplet-based microfluidics as a platform for single cell analysis using the encapsulation technique. For this, we study the water in oil droplets formation inside a 2D microfluidic flow focusing geometry designed. We have performed Computational Fluid Dynamics (CFD) simulation using the Laminar Two-Phase Flow, Phase Field method in COMSOL Multiphysics®. Generation of mono disperse droplets of two miscible fluids occurs when the shearing forces of a continuous phase overcome the surface tension of the disperse phase. Here we have used mineral oil as the continuous phase and water as the disperse phase. We observe the generated droplets getting self-aligned to the center of the fluid channel by resulting a 3D focused flow. Here we use the simulation results to optimize the flow parameters for desired droplet size and throughput.