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Complex traffic of drops in 2D microchannels: self-organization, periodicity and reversibility DANNY RAJ MASILA, RAGHUNATHAN RENGASWAMY, Indian Institute of Technology Madras — In a 2D microchannel, drops slowdown and accelerate in the diverging and converging sections of the channel respectively. Drops entering the microchannel, approach each other when they slowdown in the diverging section. They start to interact hydrodynamically to form different layered structures depending on the spacing between the drops prior to entry into the channel. These patterns break in the converging end of the channel before the drops exit. We devised a multi-agent approach that was able to capture the dynamic pattern formation of drops inside the microchannel. The self-organized dynamic patterns formed are a function of the inlet spacing of the drops. These patterns due to complex drop traffic result in a non-linear outlet spacing between exiting drops. We present a study where we investigate how every spatial event inside the microchannel can result in a temporal signature in the outlet spacing of drops. Understanding the dynamic pattern formation also sheds light on the response of the microfluidic device to flow reversal. We observe that when the layering and breaking patterns of drops are similar the system is reversible.

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