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3D deterministic lateral displacement separation systems SIQI DU, GERMAN DRAZER, Rutgers, The State University of New Jersey — We present a simple modification to enhance the separation ability of deterministic lateral displacement (DLD) systems by expanding the two-dimensional nature of these devices and driving the particles into size-dependent, fully three-dimensional trajectories. Specifically, we drive the particles through an array of long cylindrical posts, such that they not only move parallel to the basal plane of the posts as in traditional two-dimensional DLD systems (*in-plane motion*), but also along the axial direction of the solid posts (*out-of-plane motion*). We show that the (projected) in-plane motion of the particles is completely analogous to that observed in 2D-DLD systems and the observed trajectories can be predicted based on a model developed in the 2D case. More importantly, we analyze the particles out-of-plane motion and observe significant differences in the net displacement depending on particle size. Therefore, taking advantage of both the in-plane and out-of-plane motion of the particles, it is possible to achieve the simultaneous fractionation of a polydisperse suspension into multiple streams. We also discuss other modifications to the obstacle array and driving forces that could enhance separation in microfluidic devices.

German Drazer
Rutgers, The State University of New Jersey

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