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Self-Sorting of Deformable Particles in a Microfluidic Circuit¹ MARCO A. CARTAS-AYALA, MOHAMMED RAAFAT, ROHIT KARNIK, MIT — Sorting of cells, droplets, and particles based on physical characteristics including size and deformability is important for bioseparation, diagnostics, and two-phase microfluidics. While several methods have been developed to sort particles based on size, few techniques exist for sorting of particles based on deformability. Here, we present a microfluidic circuit that enables self-sorting of deformable particles based on the hydraulic resistance that the particle induces in a microchannel, which directly relates to the particle deformability. The present method employs a feed-forward circuit that biases a microfluidic Y-junction based on the hydraulic resistance induced by the particle as it enters a sensing channel. Since particles encountering a symmetric junction follow the branch with the higher flow rate, the resulting modulation of fluid flow at the junction switches the particle into one of two output channels depending on the resistance induced by the particle. Since hydraulic resistance can be influenced by particle-wall interactions, it also opens possibilities for functionalizing the sensing channel for sorting based on specific interactions. This technique may find use in cell sorting and analysis and in two-phase microfluidics.

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Marco A. Cartas-Ayala
MIT

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