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Continuous Separation of Microparticles in a Microfluidic Channel via the Elasto-inertial Effect of Non-Newtonian Fluid SEHYUN SHIN, JEONGHUN NAM, HYUNJUNG LIM, Korea University — Pure separation and sorting of microparticles from complex fluids are essential for biochemical analyses and clinical diagnostics. In this study, we present a simple and label-free method to separate microparticles with high purity using the elasto-inertial characteristic of non-Newtonian fluid in microchannel flow. At the inlet, particle-containing sample flow was pushed toward the side walls by introducing sheath fluid from the center inlet. Particles of 1 μm and 5 μm diameter that were suspended in viscoelastic fluid were successfully separated in the outlet channels: larger particles were notably focused on the centerline of the channel at the outlet, while smaller particles kept flowing along the sidewalls with minimal lateral migration to centerline. The same technique was further applied to separate platelets from diluted whole blood. Through cytometric analysis, we found that the purity of collected platelets was close to 99.9%. Conclusively, the technique of microparticle separation using elasto-inertial forces in non-Newtonian fluid is proven to be an effective method for separating and collecting microparticles based on size differences with high purity.

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