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Reservoir-based dielectrophoresis (rDEP) for continuous separation of particles based upon surface charge XIANGCHUN XUAN, SAURIN PATEL, Clemson University, SHIZHI QIAN, Old Dominion University — Separating particles from complex mixtures is important to many applications. We develop a continuous-flow microfluidic approach to separating 3 μm fluorescent and non-fluorescent particles by charge inside a reservoir under DC-biased AC electric fields. This separation exploits the reservoir-based dielectrophoresis (rDEP), which is induced by the inherent electric field gradient formed at the reservoir-microchannel junction, to continuously isolate the trapped fluorescent particles from the streaming non-fluorescent particles. The obtained particle images agree closely with the predicted particle trajectories from a 2D numerical model. It is, however, found that the streaming non-fluorescent particles may also get trapped in the reservoir due to the influences from the accumulated fluorescent particles, which can significantly lower the separation purity. These influences decrease with the enhanced electrokinetic flow (by increasing the applied DC electric field) and the lowered AC field frequency. Since it takes place inside the reservoir and no in-channel mechanical or electrical parts are needed, the demonstrated rDEP particle sorter can be conveniently integrated with other components into lab-on-a-chip devices for diverse particle handling.

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