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Microdevice for continuous flow magnetic separation for bioengineering applications

Authors:

Abstract: A novel continuous flow microfluidic device, integrated with soft-magnetic wire (permalloy), is fabricated and tested for magnetophoresis based separation. The flow-invasive permalloy wire, magnetized using an external bias field, is positioned perpendicular to the external magnetic field and with its length traversing the introduced sample flow. The microfluidic device is realized in PDMS; the mold for PDMS microstructures is cut out of Plexiglas? sheets with controllable dimensions. Microfluidic devices with microchannel height ranging between 0.5?mm and 2?mm are fabricated. Experiments are carried out with and without sheath flow; with sheath flow the microparticles are focused at the center of the microchannel. When focusing is not employed, the microdevice can exhibit a complete separation (or filtration) with the introduction of the sample at rates lower than a maximum threshold. However, this complete separation is attributed to the fact that part of the particles, once they approach the repulsive field of the wire, will find their way into the attractive region of the wire while the remaining will be indefinitely trapped at the channel walls. On the other hand, when the focused sample is flowing at the same rate but alongside an appropriate sheath flow, the complete separation can be achieved with all (initially repelled) particles being captured on the attractive region of the wire itself.