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Separation in microfluidics using periodic structures

GERMAN DRAZER, Rutgers, The State University of New Jersey

We investigate the complex behavior that takes place during the motion of suspended particles in periodic systems, both when Brownian motion is important as well as when transport is nearly deterministic. We are interested in the development of separation devices that rely on the unique features of transport in periodic structures. A typical system in our studies consists of suspended particles moving either through a periodic array of posts or on top of a periodic pattern fabricated in the bottom surface of a microfluidic channel. In all cases, we investigate how to take advantage of the selective and repetitive effects present in periodic systems to promote and amplify the separation of a mixture of suspended particles. In particular, we focus on vector separation systems in which different species move in different directions within the device. We present analytical and experimental results that show the potential that periodic systems have to induce the spontaneous fractionation of a mixture of particles.