

Viscoelastic microfluidics: from fundamentals to applications

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Complex fluids, which are inherently non-Newtonian viscoelastic, are ubiquitous in industrial applications and biological systems such as blood flow. One intriguing phenomenon triggered by viscoelasticity is lateral particle migration due to imbalanced normal stress differences. Recently, the lateral particle migration, which occurs in Poiseuille flow of viscoelastic media, has been engineered to spatially focus particles or sort cells in microchannels. The viscoelastic particle focusing has various advantages over the existing microfluidic technologies involved in particle focusing and separation. It can be implemented with extremely simple microchannels such as straight microtube. Further, the viscoelasticity-driven particle focusing/sorting has been successfully applied to a wide range of materials including micron-sized cells, DNA molecules and nanoparticles. Here, the relevant principles behind the viscoelastic microfluidics as well as applications is going to be presented and the future direction of the viscoelasticity-based microfluidics will be briefly discussed.