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Designing ridged microchannels for continuous separation of cells based upon stiffness ALEXANDER ALEXEEV, JOHN P. ARATA, Georgia Institute of Technology — The mechanical stiffness of human cells can be a key parameter that reveals the disease state of the cell, for example, in various cancers and in malaria. However, for stiffness to be utilized in diagnostic settings, we will require methods for continuous monitoring of the stiffness of cells in high throughput. Using three-dimensional computational modeling, we show that a pressure-driven microfluidic flow in a channel with solid diagonal ridges can effectively separate compliant microscopic particles, which represent biological cells and synthetic microcapsules. The flow separation is driven by an energy minimization process associated with periodical deformations of elastic particles in narrow constrictions. As a result of this process soft and stiff particles disperse to the opposite walls of microfluidic channel, thus enabling continuous flow separation of mechanically distinct particles. This simple microfluidic method could prove useful in various biomedical applications for continuous stiffness-based separation of biological cell.

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