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Microfluidics for Soft Matter and Mechanobiology

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Message from the Guest Editor

Microfluidics has served as a useful platform to understand the material properties and technical applications of soft matter, including hydrogels, polymer solutions, emulsions, and colloidal suspensions. The study of the characteristics of soft matter, like viscoelasticity, non-Newtonian fluid mechanics, and deformation has greatly benefitted from using microfluidics to accurately control conditions in time and space.

Microfluidics has also served as a useful platform to study biological cell and tissues systems, including mechanobiology. Using microfluidics, external mechanical stress is regulated in physiologically-relevant systems for studying cells, tissues and organisms. Furthermore, the characteristics of soft matter are exploited when combined with microfluidic platforms to mimic in-vivo microenviroments like extracellular matrix to directly test the influence of mechanical cues such as softness and elasticity. In addition, microfluidics platforms enable us to measure the mechanical properties of cells by establishing defined flow or confined microstructures through viscoelastic particles/cells focusing and droplet microfluidics. Finally, the 3D bio-printing of soft matter via microdevices has become widely employed.

In this Special Issue, we highlight recent progress in microfluidics with research papers, short communications, and review articles that focus on novel methodological developments and applications of microfluidics devices for soft matter and mechanobiology, as well as emerging intriguing phenomena of soft matter in microfluidics.