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Isolation of nanoscale exosomes using viscoelastic effect.[1] GUOQING HU, LNM, Institute of Mechanics, Chinese Academy of Sciences, CHAO LIU, National Center for Nanoscience and Technology — Exosomes, molecular cargos secreted by almost all mammalian cells, are considered as promising biomarkers to identify many diseases including cancers. However, the small size of exosomes (30-200 nm) poses serious challenges on their isolation from the complex media containing a variety of extracellular vesicles (EVs) of different sizes, especially in small sample volumes. Here we develop a viscoelasticity-based microfluidic system to directly separate exosomes from cell culture media or serum in a continuous, size-dependent, and label-free manner. Using a small amount of biocompatible polymer as the additive into the media to control the viscoelastic forces exerted on EVs, we are able to achieve a high separation purity (>90 %) and recovery (>80 %) of exosomes. The size cutoff in viscoelasticity-based microfluidics can be easily controlled using different PEO concentrations. Based on this size-dependent viscoelastic separation strategy, we envision the handling of diverse nanoscale objects, such as gold nanoparticles, DNA origami structures, and quantum dots.

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