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High throughput sorting of spherical particles in inertial microfluidics PHANINDRA TALLAPRAGADA, SENBAGARAMAN SUDARSANAM, NILESH HASABNIS, Clemson University — The fundamental problem of sorting sphere like particles by size in flows at low Reynolds numbers in confined geometries is one which is frequently encountered in microfluidic engineering. The inertial sorting of particles in Dean flows, demonstrated in pioneering work by Papautsky and Bhagat et.al and DiCarlo et.al is specific to particular sizes of particles and it is not apparent how particles of different or larger sizes could be sorted. This is because the phenomena of particle focusing across a large parametric regime is poorly understood. Additionally the unexplored case where larger particles need to be sorted by size is especially important in applications involving large cells such as Islet cells whose diameter can vary from 50 μm to 200 μm. We characterize the transitions in particle focusing with changing channel Reynolds number, particle Reynolds number and the Dean number and exploit these transitions to sort particles by size. Based on such transitions, particles across size ranges of 3 μm to 100 μm in various 2-particle mixtures are sorted. We also find that this separation occurs in a narrow range of channel Reynolds number. We demonstrate our findings by sorting particles in different mixtures.

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