Acoustophoresis and its application in microfluidic systems for life science

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Introduction

These lectures will introduce bulk acoustophoresis and its application in microfluidic systems. A special focus is directed towards life science where the combination of acoustic forces and controlled microfluidic environments open new opportunities to address unmet needs in life science research and clinical medicine.

Continuous flow acoustophoresis: basic research and commercialization

The first lecture will follow a historical development line of the research and development of microchip based continuous flow acoustophoresis in the acoustofluidics group at Lund University and the collaborative efforts with the team of Henrik Bruus at DTU, illustrating the synergistic power of linking experimental research to theoretical considerations. Aspects of innovation and entrepreneurial opportunities will also be outlined and if time allows, the challenges in translating academic research to industrial development and commercialization will be discussed.

Life science applications of acoustic trapping

The second lecture will cover the principle of acoustic trapping and different designs of trapping units. Life science applications of acoustic trapping will be described and to a large extent outline the possibilities to manipulate low numbers of cells and /or microbeads. The further discovery that submicron particles, not commonly accessible by conventional acoustophoresis due to the strong size dependency of the acoustic radiation force, actually can be enriched by utilizing interparticle forces from sound scattered between particles will be described. This offers new opportunities within submicron bioparticle enrichment, e.g. bacteria enrichment in diagnostics or extracellular vesicles in disease monitoring. Emerging medical needs related to extracellular vesicle isolation using acoustic trapping will be highlighted.

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