



Contribution ID: 150

Type: Poster Presentation

Experimental setup for optical observation of ultrasound-assisted cell manipulation

Ultrasonic technology is available, affordable and non-invasive. We use ultrasound to manipulate biological cells and micromaterials. The ultimate purpose of ultrasonic cell manipulation is the separation and eradication of unwanted cells.

This study presents an experimental setup designed for ultrasonic cell manipulation.

A perspex water-filled container is placed on the microscope stage of an Olympus CKX31 inverted microscope (Olympus Corporation, Shinjuku, Tokyo, Japan) with an Olympus CX PL C-Plan 20 \times objective lens (Olympus Corporation, Shinjuku, Tokyo, Japan). The objective has a numerical aperture of 0.4 and a working distance of 1.2 mm. The illumination is from the top.

The charge couple device of a FASTCAM MC1 high-speed camera (Photron (Europe)) Limited, West Wycombe, Bucks, United Kingdom) is mounted on the microscope eyepiece through an adapter and connected to its processing unit. The camera is controlled by a laptop computer.

A cellulose capillary with a 200 μm internal diameter is fixed across the intersection of the optical and acoustic focus. Biological cells flow through the capillary. These cells are sonicated with an ultrasound transducer, mounted at variable angles.

This setup enables the study of cellular dynamics with an optical resolution below 1 μm and interframe times below 1 millisecond.

Apply to be considered for a student award (Yes / No)?

Yes

Level for award (Hons, MSc, PhD, N/A)?

MSc

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Session Classification: Poster Session 1

Track Classification: Track F - Applied Physics