KEX-Project 2024, KTH Applied Physics - Bio-Opto-Nano Physics
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Acoustofluidic capillary fabrication for protein crystallography using laser heating

Microfluidics combined with acoustics, so called *acoustofluidics*, is an emergent technology to manipulate micron-sized bioparticles, such as cells or protein crystals. The acoustic control of the particles is often done in a square borosilicate capillary, which achieves particle focusing in 2D using a narrow frequency sweep. In protein crystallography, however, a much thinner and smaller circular borosilicate capillary is used to reduce background from the capillary walls and suspension medium. In this project, the students will solve a very practical problem: to connect the square capillary for acoustic focusing with the circular capillary for protein crystallography without any junctions or connections. This will be done by exploring state-of-the-art carbon monoxide laser heating (supervisor: Fokine) in order to pull commercial square borosilicate capillaries (VitroCom, 400x400 μm^2 inner dimension, 800x800 μm^2 outer dimension, 200 µm wall thickness) into thin circular capillaries (<200 µm inner diameter, <20 µm wall thickness) over the distance of a few centimeters. The acostofluidic functionality of the capillaries will be evaluated by assembling a piezoelectric transducer and focusing plastic beads (supervisor: Sellberg).

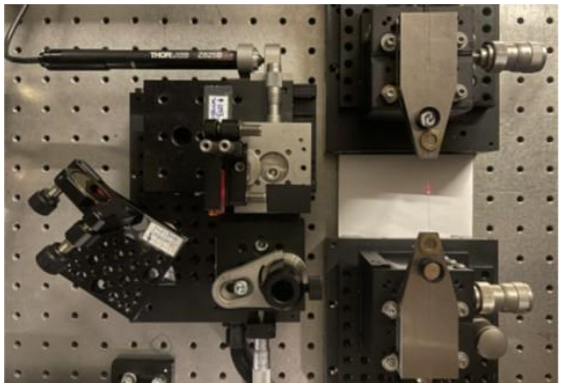

Fig. 1. Photograph of the capillary pulling station.

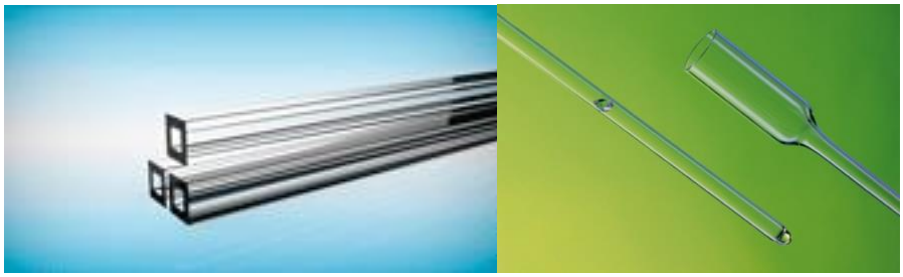

Fig. 2. Photographs of the acoustofluidic square capillary (left) and circular capillary for protein crystallography (right).