NANOFAB BIOTECHNOLOGY

CNST Center for Nanoscale Science & Technology

Microfabricated Substrates for Studying Single Molecule Mechanics

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GOAL

To fabricate substrates that can enable the simultaneous use of Total Internal Reflection Fluorescence (TIRF) microscopy and force measurements using optical tweezers for studying molecular motor mechanics, including the actin-myosin interaction.

KEY ACCOMPLISHMENTS

Created rectangular pedestal structures that improve optical tweezer force measurements by allowing the use of TIRF microscopy to observe molecular motion while simultaneously measuring molecular kinetics.

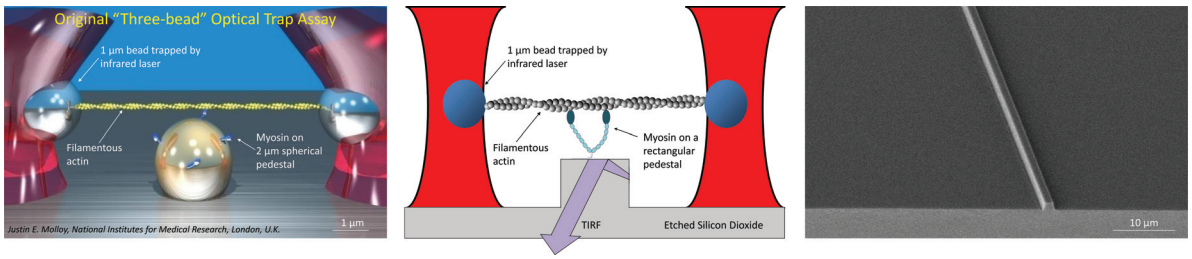
Developed a photolithographic process for fabricating specialized thin quartz substrates for use in optical microscopy.

KEY NANOFAB PROCESSES

Standard photolithographic processing of thin quartz substrates.

Plasma dry etching of rectangular quartz structures.

Left: A schematic of an optical trap where myosin interacts with an actin molecule tethered between two microbeads that are held in place by two highly focused laser beams. Middle: Replacing the center bead with an etched rectangular pedestal structure allows the addition of TIRF microscopy to observe the motion of individual myosin molecules. Right: Scanning electron micrograph of an etched rectangular pedestal structure.



REFERENCE

https://intramural.nhlbi.nih.gov/labs/LMP/Pages/default.aspx