

ラン藻のオンチップ機械的特徴量計測



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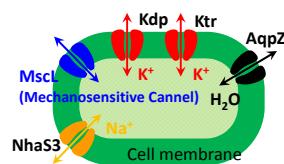


2μmの浮遊細胞の“硬さ”計測へのチャレンジ

Background & Purpose

ラン藻 (Cyanobacteria)
Synechocystis sp. PCC 6803

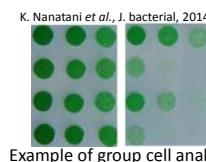
- ✓ Fixation of CO₂
- ✓ Alterative energy



Conventionally...

Group cell analysis

- Floating cell
- Diameter: around 2 μm
- Need to apply nN force to deform



Example of group cell analysis

Purpose Measuring mechanical characteristics of a single cyanobacterium

Fabrication of Robochip

(a) Patterning of etching mask

(b) Etching of borosilicate glass by RIE, and removal of etching mask

(c) Patterning of etching mask

(d) Etching of device layer by DRIE, and removal of etching mask

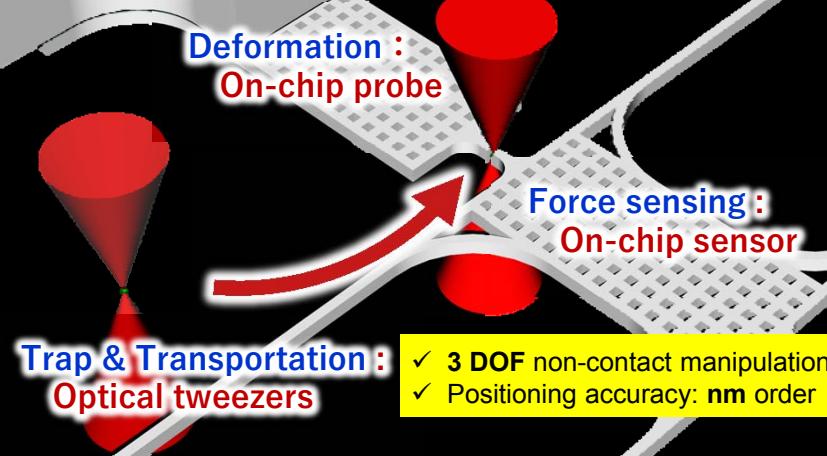
(e) Bonding borosilicate glass and device layer by anodic bonding

(f) Patterning of etching mask

(g) Etching of handle layer and BOx layer, and removal of etching mask

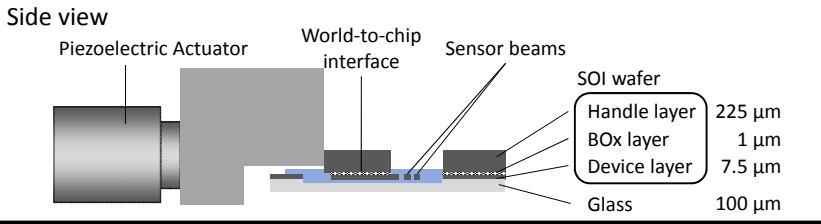
Concept

- ✓ Driven by external actuator
- ✓ Output force: > 1 kN
- ✓ Resolution: nm order



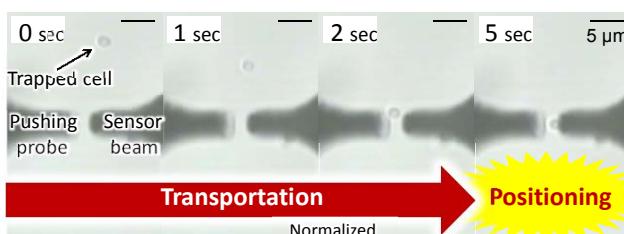
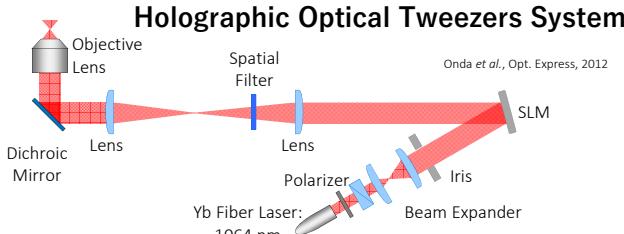
Trap & Transportation : Optical tweezers

- ✓ 3 DOF non-contact manipulation
- ✓ Positioning accuracy: nm order

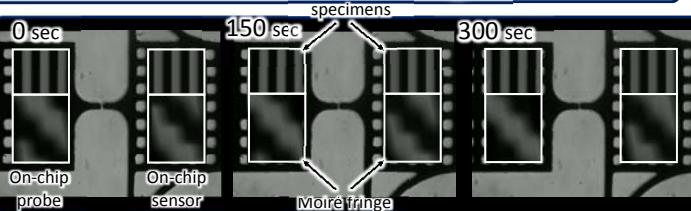


Transportation of a single cyanobacterium

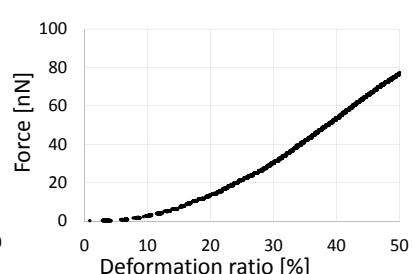
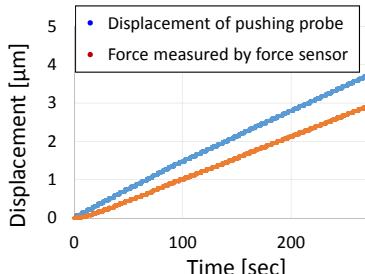
Holographic Optical Tweezers System



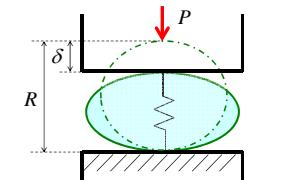
Transportation → Positioning



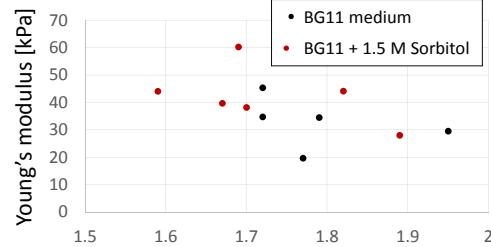
Mechanical characterization



Hertzian contact theory



$$\text{Young's modulus } E_c = \frac{3(1-\nu^2)P}{4R^{1/2}(\delta/2)^{3/2}}$$



Mechanical characteristics were measured!!

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Acknowledgements :

本研究は科学研究費(24686032)の支援をうけて行われたものです。

